



## Acerca de este libro

Esta es una copia digital de un libro que, durante generaciones, se ha conservado en las estanterías de una biblioteca, hasta que Google ha decidido escanearlo como parte de un proyecto que pretende que sea posible descubrir en línea libros de todo el mundo.

Ha sobrevivido tantos años como para que los derechos de autor hayan expirado y el libro pase a ser de dominio público. El que un libro sea de dominio público significa que nunca ha estado protegido por derechos de autor, o bien que el período legal de estos derechos ya ha expirado. Es posible que una misma obra sea de dominio público en unos países y, sin embargo, no lo sea en otros. Los libros de dominio público son nuestras puertas hacia el pasado, suponen un patrimonio histórico, cultural y de conocimientos que, a menudo, resulta difícil de descubrir.

Todas las anotaciones, marcas y otras señales en los márgenes que estén presentes en el volumen original aparecerán también en este archivo como testimonio del largo viaje que el libro ha recorrido desde el editor hasta la biblioteca y, finalmente, hasta usted.

## Normas de uso

Google se enorgullece de poder colaborar con distintas bibliotecas para digitalizar los materiales de dominio público a fin de hacerlos accesibles a todo el mundo. Los libros de dominio público son patrimonio de todos, nosotros somos sus humildes guardianes. No obstante, se trata de un trabajo caro. Por este motivo, y para poder ofrecer este recurso, hemos tomado medidas para evitar que se produzca un abuso por parte de terceros con fines comerciales, y hemos incluido restricciones técnicas sobre las solicitudes automatizadas.

Asimismo, le pedimos que:

- + *Haga un uso exclusivamente no comercial de estos archivos* Hemos diseñado la Búsqueda de libros de Google para el uso de particulares; como tal, le pedimos que utilice estos archivos con fines personales, y no comerciales.
- + *No envíe solicitudes automatizadas* Por favor, no envíe solicitudes automatizadas de ningún tipo al sistema de Google. Si está llevando a cabo una investigación sobre traducción automática, reconocimiento óptico de caracteres u otros campos para los que resulte útil disfrutar de acceso a una gran cantidad de texto, por favor, envíenos un mensaje. Fomentamos el uso de materiales de dominio público con estos propósitos y seguro que podremos ayudarle.
- + *Conserve la atribución* La filigrana de Google que verá en todos los archivos es fundamental para informar a los usuarios sobre este proyecto y ayudarles a encontrar materiales adicionales en la Búsqueda de libros de Google. Por favor, no la elimine.
- + *Manténgase siempre dentro de la legalidad* Sea cual sea el uso que haga de estos materiales, recuerde que es responsable de asegurarse de que todo lo que hace es legal. No dé por sentado que, por el hecho de que una obra se considere de dominio público para los usuarios de los Estados Unidos, lo será también para los usuarios de otros países. La legislación sobre derechos de autor varía de un país a otro, y no podemos facilitar información sobre si está permitido un uso específico de algún libro. Por favor, no suponga que la aparición de un libro en nuestro programa significa que se puede utilizar de igual manera en todo el mundo. La responsabilidad ante la infracción de los derechos de autor puede ser muy grave.

## Acerca de la Búsqueda de libros de Google

El objetivo de Google consiste en organizar información procedente de todo el mundo y hacerla accesible y útil de forma universal. El programa de Búsqueda de libros de Google ayuda a los lectores a descubrir los libros de todo el mundo a la vez que ayuda a autores y editores a llegar a nuevas audiencias. Podrá realizar búsquedas en el texto completo de este libro en la web, en la página <http://books.google.com>

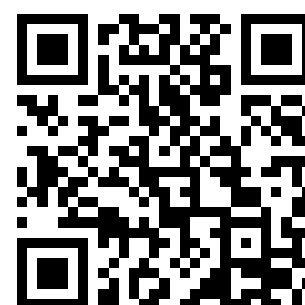


---

This is a reproduction of a library book that was digitized by Google as part of an ongoing effort to preserve the information in books and make it universally accessible.

Google<sup>TM</sup> books

<https://books.google.com>



  
C 3 9015 00358 602 4  
University of Michigan - BUHR





TK  
1  
E33



# **ELECTRICAL ENGINEERING**

With which is incorporated

**THE ELECTRICAL ENGINEER**

(Established 1884)

---

**VOL. IX.**

**JANUARY TO DECEMBER, 1913**

---

**PUBLISHED BY THE KILOWATT PUBLISHING CO., LTD., 203-206, TEMPLE CHAMBERS,  
TEMPLE AVENUE, LONDON, E.C.**





# INDEX TO "ELECTRICAL ENGINEERING"

VOL. IX. 1913.

	PAGE		PAGE
GENERAL INDEX .....	iii	QUESTIONS AND ANSWERS BY PRACTICAL MEN...	vii
ELECTRICAL ENGINEERING IN THE MINING AND		PATENTS .....	viii
METAL INDUSTRIES .....	v	LOCAL NOTES (including "Tenders Invited and Prospective Business," and "Tenders Received and Accepted")	ix
REVIEWS .....	v	COMPANIES' DIVIDENDS, REPORTS, MEETINGS, ETC.	xi
ELECTRIC TRACTION .....	vi	NEW COMPANIES .....	xi
TELEPHONY AND TELEGRAPHY (Including Wireless)	vii		

## GENERAL INDEX

- Accidents: Explosions, (Bray), 27, 543; (Hebburn), 228, 252, 295, 519, 597, 658; (New York), 602, 630; Fires 16, 140, 296, 369, 441, 466, 496, 589, 724; Interruptions to Supply, (Ashton-under-Lyne), 67; (Brighton), 25; (Charing Cross and City), 589; (Dundee), 692, 710; (Exeter), 609; (Fife), 473; (Leicester), 95; (Manchester), 88; (Met. Elec. Sup.), 590, 607; (New Brighton), 435; (Salford), 9; Shocks, 72, 252, 382, 512, 520, 575, 628; Miscellaneous, 275, 312, 403, 610
- Accrington Elec. Works, 488, 510, 587
- Advertising (Associated Municipal Elec. Engineers), 672; (B.T.H.), 72; (Ediswan), 598; (G.E.C.), 595, 690, 731; [PALMER], 99; (Siemens), 656
- Agriculture [PRIESTLEY], 603
- Air Filters (Balcke), 442; [CHRISTIE], 373, 397
- Air Pumps (Willans & Robinson), 545
- Ambulances, 685, 719
- Arc Lamps, 525
- Assoc. of Consulting Engineers, 205, 423
- Assoc. of Elec. Station Engineers, 90, 170
- Assoc. of Engineers-in-Charge, 566
- Asylum, 321
- Atmosphere [RUTHERFORD], 272
- Ball Bearings [GOODMAN], 724
- Bankruptcies, 16, 28, 110, 124, 180, 196, 210, 282, 312, 388, 438, 462, 474, 610, 658, 691, 709, 734
- Baths, 630, 683
- Batti-Wallahs', 30, 100, 151, 179, 227, 445
- Berlin Distribution System 513
- Birmingham and District Club, 719
- Blackburn Elec. Works, 61
- Blackpool Elec. Works, 246
- Boilers [JACKSON], 631
- Boiler Tubes (Cowper-Coles), 534
- Bombay Mills (Westinghouse), 260, 286
- Boycott, Prague, 52, 116, 172
- Bradford Elec. Works, 443
- Brick Works (Westinghouse), 174
- British Assoc., 156, 296, 390; (Birmingham Meeting), 523
- British Electrical and Allied Manufacturers' Assoc., 60, 258, 322, 727
- British Westinghouse Club, 98
- Bulkhead Glands (Metal Jointing Co.), 308
- Cable Casings (Jennings), 669, 689, 708
- Cable Explosions Committee, 684
- Cables (B.A.Co.), 68; Damage, 602; (Henley), 407, 656; (Macintosh Works), 598; Paris, 168; Prices, 284; (Siemens), 653
- Calcutta, Elec. Supply, 661
- Callender's Hospital and Distress Fund, 64
- Canada, Trade with, 416
- Canvassers, 173
- Chester Water Power, 579, 734
- Chicago Street Lighting, 479
- China, Trade with (G.E.C.), 343
- Chingford Reservoir Pumping, 343
- Cinematograph: Regulations, 345; Targets, 284
- Circuit-Breakers (Igranic), 688; (Switchgear and Cowans), 640
- City of London, Engineer's Report, 452
- Clocks, Synchronic, 641
- Coal Sampler (Sturtevant), 459
- Coal Specification, 263
- "Cold Light," 262; [WALKER], 271
- Comb (Simplex), 708
- Companies Struck off Register, 124, 268, 510, 624, 724, 734
- Competition, 700; (Lundberg), 404, 438, 459, 624
- Concrete, Preserving, 52
- Condensing Plant, [DEXTER], 62; Leeds, 229
- Conduits and Accessories (G.E.C.), 658; (Simplex), 118, 444; (Smith & Davis), 504
- Conduit Wiring [TAYLOR], 118
- Construction Work, 171
- Cooking (*see also* Heating Irons, &c.), Brighton, 198, 639; (Dowsing), 561; (G.E.C.), 50; [MILNS], 594; [MORRIS], 523; (Simplex), 260, 273; ("Tricity"), 322; West Ham, 284
- Copper, 72, 190
- Corrosion Preventing (Cumberland), 362; (Cowper-Coles), 536
- Country House Installation, 477
- Cows, Milking, 529
- Defiance Pistol, 432, 450
- Defrauding Supply Co., 452
- Deptford Generating Station, 335
- Derby Corp. Bill, 247
- Development of Elec. Engng. [HOPKINSON], 581
- Dielectric Fatigue [HOLTUM], 408
- Diesel Engines [SANKEY], 203
- Dimmers (Adams), 204
- Drying [WALKER], 23
- Dundee, Laboratories, 584
- Earthing Neutrals [FEDDEN], 8; [PECK], 8
- Ebonite [PATERSON, RAYNER and KINNES], 173
- Eckstein, Heap & Co., New Works, 49
- Edison Battery Cars, 320, 377, 618, 677, 695
- Eggs Fried on Ice, 627
- Elec. Contractors Assoc., 362
- Elec. Trades Benevolent Inst., 11, 49, 105, 112, 151, 164, 228, 258, 324, 543, 599, 660, 714; [JUSTUS ECK], 390; [LUNDBERG], 364
- Elec. Trades Union, 610, 660
- Electric Automobiles [WATSON and MITCHELL], 377
- Electric Traction [KAPP], 523
- Electrical Co., 687
- Electro-Harmonic Soc., 30
- Electrostatic Power Measurement [PATERSON, RAYNER and KINNES], 257
- Engineers' Club, 626
- Engng. Standards' Committee, 388
- Evershed & Vignoles *v.* Paul, 578
- Exhibitions: Airdrie, 549; Anglo-American, 690; Barcelona 528, 726, 734; Building, 215; Cinematograph, 328; Commercial Vehicle, 431; Earl's Court, 365, 610; Gas, 568; Ghent, 321, 344, 423, 428, 550, 584, 598; Glasgow, 168, 216, 384, 603, 617, 642; I.M.E.A., 356; Ideal Home, 566, 581; Model Engng., 568, 578; Motor Car, 629; Motor Cycle, 684; Physical Soc., 617, 695, 715; San Francisco, 261, 407, 464, 727; Sheffield, 529, 609; Shipping and Machinery, 322, 528, 730; Southampton, 235; Supply to Olympia, 137.
- Exposure Tests of Metals [WILSON], 525
- Factories and Workshops' Report, 391
- Factory Regulations, 227, 464; Prosecutions under, 585
- Fans (G.E.C.), 164, 320, 345; (Wilson-Wolf), 262
- Faraday House O.S.A., 190, 599
- Feeders [CUNLIFFE], 10; [SAYERS], 117
- Finsbury Technical College O.S.A., 219, 238, 600, 683
- Fire-Alarms [MOORE], 420; (Siemens), 479
- Fire: Escapes, 88, 104; Extinguishers ("Clou"), 706; Risk, 93
- Fittings, Lighting (*see also* Conduits, Shades, &c.), (B.T.H.), 150, 291, 642, 731; (Benjamin), 554; (Simplex), 528; (Wardle), 118
- Flexible Wires (Siemens), 134
- Floating Power House, 416
- Flour Mills [CREAK], 602
- Forging and Stamping Plant [SPENCER], 694
- Fuel [BURSTALL], 523
- Fuses (G.E.C.), 22, 322; Kartret, 504; (Reyrolle), 64; (Siemens), 104; (Simplex), 606
- Gearing (Scholey), 671; (Silvertown), 654; (Terry), 708
- General Conditions, 476
- General Electric Co.'s Conversazione, 158
- Generators, Large, 210
- German Soc. of Illuminating Engineers, 11, 714
- Glare, 464
- Glasgow: Condensing Plant (Mirlees-Watson), 324 Police, 216
- Glass, Sealing Wires in [ANDERSON], 525
- Goods Clearing House, 431
- Greenwich Power House Equipment, 117, 254, 449, 515, 543, 672
- Grinders (Wilson-Wolf), 150; (Witton-Kramer), 594

# INDEX TO "ELECTRICAL ENGINEERING"

## GENERAL INDEX (continued).

- "Half-Watt" Lamps, 416, 567; (B.T.-H.), 487, 503; (G.E.C.), 512 [LANGMUIR and ORANGE], 646; [PROCTOR], 600; (Siemens), 477, 709, 721
- Hand Lamps, Defective, 663
- Heating (*see also* Cooking, Irons, &c.), (Bastian), 721 (B.E. Transformer), 62; (Belling), 331, 384; (Calor), 491; (Dowsing), 25, 561; (Edison & Swan), 514, 618; (Redglo), 653; (Simplex), 528; (Westinghouse), 640; (Wilkinson), 602
- Heating and Cooking: 407; [HILLS], 165; [ROLES], 189; [WILMSHURST], 161; Tariffs Conference, 10
- Holophane Co., 390
- Hornsey Elec. Works, 89
- Hunting of Alternators [EVEREST], 103
- Ice Plant (Westinghouse), 259
- Illumination, 10; [GASTER], 174; Decorations (Siemens), 654
- Illuminating Engng. Soc., 343
- Incorporated Municipal Elec. Assoc., 27, 44, 58, 182, 298, 520; Bill, 343; London Convention, 332, 351, 373; (Ann. Gen. Mtg.), 381; (Exhibition), 356; Elec. Vehicle Committee, 543, 694, 726; Standardising Plugs, 648
- Induction Motors [ALDOUS], 101; [DRIVER], 71; [NICHOLSON], 617; [SMITH], 727
- Inspection Lamps (Simplex), 262
- Inst. of Civil Engineers, 238, 592
- Inst. of Elec. Engineers: Ann. Dinner, 89; Ann. Mtg., 321; Ann. Report, 284; Building Fund, 645; Conversazione, 397; Council, 183, 202, 224; [Woonhouse], 224; Examinations, 203; Industrial Committee, 9; Journal, 158; Library, 60; (Lighting), 165; Local Sections (Calcutta), 123; (Manchester), 134, 236, 259; (Newcastle), 7, 275, 726; (Scottish), 52, 218, 286, 716; (Western), 72, 140, 573; (Yorkshire), 116, 291; New Members and Transfers, 32, 61, 110, 151, 214, 246, 320, 678, 696, 698; Paris Mtg., 203, 254, 286; (Report), 299, 484; Premiums, 276; Programme, 619; Research Committee, 684; Students' Sections, 48, 89, 162, 229, 233, 286, 345, 443, 694
- Inst. of Mech. Engineers, 210
- Inst. of Municipal Engineers, 662
- Instruments and Meters (Evershed and Vignoles), 276; (Record), 21; (Siemens), 720
- Insulation Resistance [EVERSHED], 663, 678
- Insulators, 546
- Internal Combustion Engines [Cox], 116
- International Congress of Consulting Engineers, 133
- International Electrotechnical Commission, 18, 71, 440, 512, 528, 554
- International Engineering Congress (San Francisco), 361, 407, 464, 727
- International Illumination Commission, 507
- Interpoles [ALLEN], 228
- Iron and Steel Institute, 207, 466
- Iron, Magnetic Qualities, 529
- Irons (G.E.C.), 28, 90, 134
- Italian Electrotechnical Assoc., 627
- "Job Line" Wire, 466, 569
- Johnson Billington Meters, 212
- Junior Inst. of Engineers, 272
- Kelvin Memorial, 383, 406
- Kingston Elec. Works, 552
- Lamp Lowering Gear (Lond. Elec. Firm), 11, 492, 670
- Lamp Switching (Lundberg), 50
- Lamps, Incandescent (*see also* "Half-Watt" Lamps, Lighting and Metal Filament Lamps) (B.T.-H.), 218, 392, 468, 576; (Cooper-Hewitt), 231; (Ediswan), 618, 642; (Osram), 222; (Stearns), 150, 183; (Sunbeam), 474; Bulb Obscuring (Siemens), 308; Daylight (Ediswan), 568; (Siemens), 466; Manufacture (Siemens), 164; Tests, 133, 298; Reduction in Prices, 536; 231; Metal Filament Lamp, 16, 121, 156, 231, 308, 390, 520, 604, 624, 627, 648, 669, 683, 688, 726; "Paragon" Transmission, 432; (U.S.A.), 38, 93, 133, 170, 487; Van Raden & Metz, 260
- Petrol Elec. Tract. [TIERNEY], 184
- Phase Advancing [KAPP], 239; [MILES WALKER], 31
- Phasing Out [HACKING], 32
- Platinum Alloy, 528
- "Point Fives," 62, 246, 312, 321, 357, 600; [SEABROOK], 262
- Poplar Elec. Works, 331
- Post Office: Power in [GUSTON], 714, 727; Tube, 121, 325, 367, 416, 434, 714
- Power Supply on the Rand [HADLEY], 159, 183, 272
- Pressure Rises (Brighton), 647; [DUDDELL], 647
- Prices for Power: Limerick, 369; [SIMPSON], 360
- Prime Movers [FERRANTI], 353, 382
- Printing Trade [PHILLIPS], 724
- Pumps and Blowers (Merryweather), 545, 618; (Roto-plunge), 72; (Silvertown), 606
- Railway Contracts, 480
- Reflectors (B.T.-H.), 246, 544; (Benjamin), 641; (G.E.C.), 529
- Remuneration [MARCHANT], 612
- Repairs, Defective, 628
- Research Laboratory, 432
- Restaurants, Elec.: American Opinion on, 32; "B. & K.," 255, 390; "Tricity House, 19
- Rjukan Railway, 440
- Rotary Converters, 190
- Royal Institution, 165, 700
- Royal Society of Arts, 401, 635
- Salford, Bulk Supply, 88, 100
- Salt Works (Westinghouse), 544
- San Francisco Congress, 361, 407, 464, 727
- Scaffold (Heathman), 64
- Sealing-wax Heaters (Simplex), 230
- Self-Synchronising Machines [ROSENBERG], 225
- Shades, Glass (B.T.-H.), 514
- Ship Cleaning (Torpedo Submarine Ship Cleaning Co.), 705
- Ship Propulsion [GRACIE], 692; [HIRD], 177; [MAVOR], 591; [REID and MAVOR], 420
- Ships, Elec. Equipment in, 365
- Showrooms: (B.T.-H.), 722; (Ediswan), 590, 724; (Sterling), 594
- Shop Window Lighting [AUSTIN], 465
- Signs (B.T.-H.), 641; (Ediswan-Zenith), 731; (G.E.C.), 275; (Simplex), 594; (Sun), 722; Regulations (L.C.C.), 606
- Smoke Abatement, 696
- Society of Engineers, 2, 64
- South American Enterprises, 364
- Southgate, Lighting, 113, 126
- Standardisation (B.E.A.M.A.), 285; [EVEREST], 726
- Stepney and the B.E.A.M.A., 263
- Sterilization, 276, 466
- Stoke-on-Trent Supply, 199
- Storage Batteries (Naylor), 526; Testing [EVANS], 285
- Stoves, Rly. Classification, 283
- Street Lighting, 525; (B.T.-H.), 134, 670; "Brighton" System (Siemens), 230; City of London, 20; Fittings (Siemens), 408; Manchester, 141, 162, 198, 203, 281; Marylebone, 660, 683, 694; Reflectors (B.T.-H.), 544; Southgate, 113, 126; Specification [TROTTER], 98, 202, 215, 259; Westminster, 109
- Strikes and Disputes: Aberdeen, 212; Brown, 167; Belfast, 95, 126; Dick, Kerr, 236; Evershed & Vignoles, 98, 138; L.C.C., 400; Leeds, 369, 692, 715, 727; Leicester, 270, 312; London, 486, 512, 696, 717; Manchester, 549, 609, 623, 635
- Stroboscope [ROBERTSON], 177
- Students' "Rag," 665, 684
- Suction Cleaner (Simplex), 504
- Supplies (Drake & Gorham), 669
- Notes Relating to (B.T.-H.), 72, 312, 468, 490, 706; (Ediswan), 604; (G.E.C.), 82, 170, 203, 260, 330, 392, 400, 407, 506, 520, 534, 595; (Pope), 536, 596, 610; (Siemens), 362, 462; (Westinghouse), 138
- Lampholders (Day), 22
- Law Suits, Pending, 207, 578
- Leadizing, 721
- Libel Action, 311
- Lift Controller (Adams), 295
- Lighting (*see also* Lamps, Incandescent) (B.T.-H.), 90, 104, 118, 190, 231, 254, 406, 418, 423, 433, 444, 584, 641, 654, 688; (E.E. & E.), 64, 640; (Ediswan), 593; (G.E.C.), 218, 293, 418, 570; [Dow and MACKINNEY], 662; Factory, 46, 322; Industrial, 504; Schools and Libraries, 440; [OGLEY], 628, 648; Shop Window [AUSTIN], 465; Temple, 729
- Lightning Arresters, 578
- Liquidations, 16, 96, 110, 222, 253, 282, 296, 312, 328, 388, 414, 450, 510, 610, 638, 657, 691, 709, 734
- Load Factors of Stations, 403
- Loans, L.C.C. Periods, 562
- Loetschberg and Simplon Traction, 569
- Lots Road Power House, 341
- Machine Tests [COOPER], 524
- Magnets: A.C. [WILSON], 164; Lifting (Witton-Kramer), 546, 656; Magnetising (G.E.C.), 407; Permanent [THOMPSON], 312; Susceptibility Meter [MURDOCH], 525
- Manchester Electro-Harmonic Soc., 60, 112, 168, 191
- Manchester: Lighting Battery [WHY-SALL], 59, 89; Street Lighting, 162, 281; [PEARCE and RATCLIFFE], 141, 162, 203
- Marylebone: Elec. Accounts, 15, 43; Extensions, 37, 151, 675
- Mercury Vapour Lamps, 545, 547; [ANDERSON], 525
- Metal Filament Lamps (*see also* Incandescent Lamps and Patents) [HANDCOCK], 23; [SIEMENS], 173; Effect on Eyes, 626; Influence of Globes on Life [SUNDEN], 498
- Metal Filaments, 219; [LEDERER], 648
- Meter Dispute, 128, 158
- Meters: Approved, 178, 198, 259, 401, 712; B.O.T. Regulations, 384; Specifications [HOLDEN], 626, 721
- Meters, &c. Control of [HANDCOCK, DYKES, and DUDDELL], 101
- Met. Elec. Sup. Staff Dinner, 236
- Mississippi Power, 467, 506
- Motor Controllers (*see also* Switchgear) (B.I. & H.), 50; (G.E.C.), 90, 529, 687; (Igranie), 593, 668, 721; [MOULD], 170; (Switchgear & Cowans), 421
- Motors (G.E.C.), 639; (Newton's), 456; Hiring, 536; S.P. Commutator [RICHARDS and DUNHAM], 314
- Myriawatt, 61
- Nat. Physical Lab., 270, 390
- Nat. Illumination Committee, 712
- "Northampton" Past Day Students' Assoc., 50
- Norway, Elec. Power in, 49
- Obituary: Aron, 512, 602; Bright, 222; Chamberlain, 598; Crawford, 82; de Laval, 82; Diesel, 564, 588; Gadsby, 9; Giles, 607; Hunter, 628; Howden, 660, 683; Mould, 592; Preece, 628; Slaby, 222; Tyer, 9; Waterhouse, 271; Wilkins, 730
- Ohm, Ampere, Volt [GLAZEBROOK], 127
- Old Centralians, 72, 100, 284
- Oscillograph [Ho and Koto], 644
- Osram & Robertson Staff Dinner, 184
- Overhead Wires (B.O.T.), 309
- Ozonisers, 510
- Panama Canal, 60
- Paint Sprayers (Crane), 406
- Pan-Russian Conference, 10
- Partnerships, 28, 68, 124, 328, 564, 638
- Patents (*see also* Patents Index), Report,

Supply Companies: Bills for Municipal Purchase, 685; Dispute, 117, 207  
 Supply, Elec.: Berlin, 190; Calcutta, 661; Denmark, 716; Germany, 649; Italy, 650; [KLINGENBERG], 512, 695; [LACKIE], 606; Lancashire, 314; London, 113, 450, 672, 692, 695, 712, 715, 726; [BAILEY], 215; Linking up Areas under 1908 Act, 212, 284; Municipal v. Co. [BAKER], 573; [PAGE], 116; [ROBERTSON], 649; S. P. Rly. [SPARKS], 486; [SPENCER-PHILLIPS], 651; Yorkshire, 685  
 Swansea Docks, 85  
 Switch-Holder, Chain-Pull (B.T.-H.), 90  
 Switches: Motor-Car (B.T.-H.), 528; Rotary Snap (B.T.-H.), 490  
 Switchgear (see also Motor Controllers, &c.), (Adams), 204; (Ferranti), 590; (G.E.C.), 37, 150, 174, 276, 526; [GOTT], 600; (Reyrolle), 274, 324, 640; (Westinghouse), 104, 442  
 Table Lamps, Glass (B.T.-H.), 606  
 Tariffs [PERRY], 649, 662  
 Tea Making (G.E.C.), 38

Telephone Relays, 715  
 Telephone Transmission [ALDRIDGE], 363  
 Temperature Measurements [WHIPPLE], 466  
 Terminals (Gibson), 546  
 Textile Factory Driving, 271  
 The Outlook [HARRISS], 651  
 Theft, 312  
 Train Lighting (Inrig), 219, 230  
 Tramways & Light Rlys. Assoc. (Blackpool Congress), 361  
 Tramway Feeders [CUNLIFFE], 10  
 Transformers: Oil [MICHIE], 273; Pressure (Reyrolle), 529  
 Transmission: Lines, 72; Schemes (European), 22  
 Tube Cleaners (Witton-Kramer), 204  
 Tungsten Lamp Assoc., 56  
 Turbines [FERRANTI], 47; [GOULDEN], 88  
 Turbo-Converter [CREEDY], 8  
 Turbo-Generators, 522, 570; [CHITTENDEN], 37  
 University and Technical College Announcements, 10, 49, 50, 230, 247, 261,

272, 365, 409, 430, 440, 464, 492, 506, 510, 512, 522, 536, 568, 590, 630, 700, 726  
 Wall Plugs, 648; (Reyrolle), 722  
 Walsall Elec. Works, 321  
 Warships [HYNE], 172  
 Washington Property Convention, 348  
 Waste [VERNIER], 601; [WOODHOUSE], 633  
 Water-Power: 503; American, 183, 363, 362, 467; Canadian, 173, 430, 477; Finnish, 134; Mississippi, 467; Swiss, 262  
 Weaving Shed (Emsley), 645, 660  
 Weighbridge (Avery), 37  
 Welding [BUCHER], 7  
 West Ham Elec. Works, 339  
 West Hartlepool Elec. Works, 417  
 Window Display (G.E.C.), 670  
 Wiring (Henley), 178, 604, 708; Municipal (Edinburgh), 55; (Newcastle-on-Tyne), 710; (Sheffield), 43, 49, 78; (Worcester), 43  
 Woodworking (Adams), 48, 104  
 Works Driving [MILNS], 228

## ELECTRICAL ENGINEERING IN THE MINING AND METAL INDUSTRIES

Accidents: Fires, 244, 556, 679; Overwinding, 242; Shocks, 5, 74, 187, 244, 455, 502, 555, 616  
 Assoc. of Mining Elec. Engineers, 3, 6, 74, 131, 132, 187, 188, 242, 613, 614, 680  
 Bedwas Colliery [HANN], 614  
 Blasting, South Africa, 559  
 Cables [ANDERSON], 132; [SCOTT], 129; [WELBOURN], 394, 405  
 Canadian Mine Hoist, 318  
 Centrifugal Disintegrator (Oerlikon), 455  
 Certificates for Mining Elec. Engineers, 5  
 Coal-cutting [WALKER], 74  
 Coal Dust Explosions [THORNTON], 523, 556  
 Collieries and Electricity [ANDERSON], 614; [JENKINS], 614  
 Colliery Generating Plant [SHAW], 242  
 Conveyors [MAVOR], 318  
 Cornish Mines [HARDS], 613  
 Dover Colliery Pumping [HERZFELD], 73  
 Electricity in Mines: Abroad, 131, 559; [CLARK], 681; [NELSON], 74, 131; Reports, 6, 500, 555; Scotland, 243; [SOWWORTH], 241

Electricity in Mining (Siemens), 395  
 Electro-deposited Iron [CARPENTER], 501  
 Exhibition, Mining, 315  
 Gas Ignition by Incandescent Lamps, 455  
 Gate-end Box (G.E.C.), 243  
 Iron Smelting, 131, 242, 559  
 Locomotives at Harton Colliery, 396  
 Manners Colliery, 679  
 Metal Mill (Geo. Johnson), 453  
 Metal Mining, 187  
 Mining Assoc., 328  
 Motors: Explosion Proof, 185; For Mine Fans [CROSBY], 681  
 N.S.W. Mines, 614  
 Osram Lamps in Mines, 241  
 Patents (see also Patents Index), 6, 75, 132, 188, 243, 318, 395, 456, 502, 559, 615, 682  
 Power Generation [SCOTT], 613  
 Prosecutions, 455, 501, 556, 615  
 Protective Arrangements [BOWEN], 76

Regulations: Belgian, 3; Home Office Mining, 74, 244, 395, 455, 556, 680  
 Rolling Mills: [LAMBERTON], 316; (Shelton Iron Co.), 4  
 Safety Lamps, 131, 244; Approved by Home Office, 555; (Ceag), 317; (Gray-Sussmann), 317; [MARKHAM], 616; [MAURICE], 185; (Oldham), 187, 317  
 Shaft Lighting, 242  
 Shot Firing (H. O. Order), 556  
 Signalling in Collieries [HEYES], 242; (Siemens), 557  
 Steel, Electric, 396; Furnaces, 557  
 Steel Refining [FRICK], 499, 559  
 Telephones, 616; Induction System (Reineke), 241, 555, 613; (Western Elec.), 186  
 Telpher Lines (Bleichert), 557  
 Thury System [WALKER], 241  
 Tin-Plate Works [THOMAS], 242  
 Trollhattan, Iron Smelting at, 73  
 Water Power, Mount Lyell Mines, 454  
 Winding [EWING], 3; Rand, 680; South Kennmuir [DUNN], 614  
 Zinc Smelting, 406

## REVIEWS

American Telegraph Practice [McNICOL], 538  
 Application of Electric Power to Mines and Heavy Industries [PATCHELL], 144  
 Arbitration Clause in Engineering and Building Contracts [RIMMER], 35  
 Astronomical Calculator [MCBEAN], 287  
 Batti-Wallahs' Journal, 407, 684  
 Baudot Printing Telegraph System [PENDRY], 147  
 Bells, Indicators, Telephones, Fire and Burglar Alarms, &c. [REDFERN and SAVIN], 290  
 "Central," 322, 534  
 Common Battery Telephony Simplified [ATKINS], 33  
 Commonwealth Engineer, 528  
 Descrizione di una Macchinetta Elettro-Magnetica, 290  
 Design and Construction of Steam Turbines [MARTIN], 146  
 Design of Alternating Current Machinery [BARR and ARCHIBALD], 144  
 Design of Elec. Machinery [RYAN], 34

Design of Polyphase Generators and Motors [HOBART], 144  
 Deutscher Kalender für Elektrotechniker (1913), 35; (1914), 704  
 Dynamo and Motor Attendants and their Machines [BROADBENT], 704  
 Dynamo Laboratory Outlines for Students in Electrical Engineering [WILSON], 540  
 Dynamo Lighting for Motor-Cars [COBB], 541  
 Electric Circuit Theory and Calculations [MAYCOCK], 703, 717  
 Electric Wiring [CLINTON], 537  
 Electrical Engineer's Diary, 1913, 55  
 Electrical Furnaces in the Iron and Steel Industry [RODENHAUSER and SCHOEN-AWA], 287  
 Electrical Machine Design [GRAY], 144  
 Electrical Meters [JANSKY], 702  
 Electrical Photometry and Illumination [BOULE], 145  
 Electrical Tables and Memoranda [THOMPSON], 541  
 Electricity and its Practical Applications [McLENNAN], 283  
 Electricity in the Service of Man [WALMESLEY], 564  
 Electricity Made Plain [PEERS], 290

Electroplating [BARCLAY and HAINSWORTH], 34  
 Elementary Manual on Applied Mechanics [JAMIESON], 147  
 Engineering as a Profession [FLEMING and BAILEY], 542  
 Essentials of Electricity—Direct Currents [TIMBLE], 147  
 Fairbrother on Patents, 542  
 Faraday House Journal, 361, 584  
 Finsbury O.S.A. Magazine, 148, 487  
 First Book of Electricity and Magnetism [MAYCOCK], 147  
 Foundations and Machinery Fixing [DAVIES], 146  
 Freileitungsbau: Ortsnetzbau [KAPPER], 538  
 Funkentelegraphie [TURN], 147  
 Gas, Petrol, and Oil Engine [CLERK and BURLS], 145  
 Handbook of Wireless Telegraphy [ERSKINE MURRAY], 147  
 Hazell's Annual for 1913, 35  
 High- and Low-Tension Switchgear Design [COLLIS], 537  
 Hilfsbuch für die Elektrotechnik [SCHRECKE], 34

# INDEX TO "ELECTRICAL ENGINEERING"

## REVIEWS (continued).

- Ideal Code Condenser [KOLKENBECK], 542  
Introductory Electricity and Magnetism [HANSEL], 289  
Iron and Steel [HUDSON], 290  
Krankheiten des Stationären Elektrischen Blei-Akkumulators [KRETZSCHMAR], 35  
Laboratory Manual of Alternating Currents [MORECROFT], 289  
Law Relating to Electric Lighting, Power, and Traction [WILL], 143  
Lighting Journal and Engineer, 562  
Logarithms for Beginners [PICKWORTH], 444  
Magnet Magazine, 443  
Management of Public Electric Supply Undertakings [SEABROOK], 701  
Manual of Wireless Telegraphy and Telephony [COLLINS], 289  
Mathematical Physics, Vol. I., Electricity and Magnetism [BARLOW], 540  
Mazda House News, 585, 689  
"Mechanical World" Electrical Pocket Book for 1914, 704  
"Mechanical World" Pocket Diary and Year Book for 1914, 704  
Methods of Measuring Electrical Resistance [NORTHROP], 290  
Mica; its History, Production, and Utilisation [ZEITLER], 568  
Modern Electrical Theory [CAMPBELL], 542  
Molesworth's Pocket Book, 541  
Motor Manual, 290  
National Electric Light Assoc. of America, Convention Proceedings, 148  
National Sources of Energy [GIBSON], 704  
New Publications, 33, 143, 287, 503, 537, 701  
New Steam Tables [SMITH and WARREN], 146  
Northampton Gazette, 2, 569  
Northampton Institute Magazine, 228, 452  
Notes on the Materials of Motor-Car Construction [BERRIMAN], 55  
Overhead Electric Power Transmission [STILL], 703  
Pocket Glossary of Eng.-German and German-Eng. Technical Terms [HORNER and HOLTZMANN], 542  
Poems [HILL], 34  
Practical Alternating Currents and Alternating Current Testing [SMITH], 540  
Practical Electrician's Pocket Book for 1913, 35  
Practical Telephone Handbook [POOLE], 53  
Practice of Electrical Wiring [MUNRO], 74  
Present Law and Practice Relating to Letters Patent for Inventions [FLETCHER MOULTON], 288  
Principles of Applied Electrochemistry [ALLMAND], 34  
Principles of Setting Out: Securing and Tooling Operations [PARR], 542  
Principles of the Application of Power to Road Transport [WIMPERIS], 703  
Principles of Thermodynamics [GOODENOUGH], 540  
Proceedings of the Optical Convention, 1912, Vol. II., 542  
Psychology and Industrial Efficiency [MÜNSTERBERG], 290  
Queen's Engineering Works Magazine, 90  
Reports of the Committee on Electrical Standards, 145  
Researches in Magneto-Optics [ZEEMAN], 542  
Resuscitation from Electric Shock, Traumatic Shock, Drowning, Asphyxiation from Any Cause [LAUFFER], 464  
Science of Illumination [BLOCH], 33  
Simple Electric Cookery [LITTLE], 540  
Single-Phase Commutator Motors (Part 1) [CREEDEY], 288  
Spannungsabfall des synchronen Drehstrom-Generators [STOKVIS], 35  
Spon's Architects' and Builders' Pocket Price Book, 148  
Statistik über Starkstromanlagen, 704  
Storage Batteries [MORSE], 289  
Switch Connections [MAYCOCK], 173  
Switches and Switchgear [EHLER], 702  
Switchgear and the Control of Electric Light and Power Circuits [COLLIS], 703  
Taschenbuch für Monteure Elektrischer Beleuchtungsanlagen [LUX and MICHALKE], 542  
Teaching of Electric Light Switching (Lundberg), 589  
Technical Electricity [DAVIDGE and HUTCHISON], 34  
Télégraphie et Téléphonie Simultanées [BERGER], 147  
Telephone Erection and Maintenance [WHITE], 538  
Text-book of Physics [WILLOWS], 542  
Theory and Calculation of Electric Currents [LA COUR and BRAGSTAD], 287  
Universal Electrical Directory, 148  
Veranschlagung elektrischer Licht- und Kraft-Anlagen [JACOBI], 35  
Wireless Telegraphy [FORTESCUE], 540  
Wireless Telegraphy and How to Make the Apparatus (Cassell), 541  
Wireless Telegraphy and Telephony without Wires [GIBSON], 703  
Wiring Diagrams of Electrical Apparatus and Installations, 464  
Worm Gearing [THOMAS], 290  
Year Book of Wireless Telegraphy and Telephony, 1913, 444  
Aberdare, 595  
Aberdeen, 493, 509  
Accidents: Interruptions to Supply, 65, 160, 193, 219, 672; Rly., 13, 65, 385, 424, 530, 665, 667; Miscellaneous, 219, 385, 517  
Assessments, 219, 411, 447, 459  
Auckland Trams, 574  
B.E.T., 325, 367  
B.O.T. Inspectors, 13, 399, 401  
Barnsley and Mexborough, 633  
Belfast, 279, 685  
Berlin, 40, 92, 107, 193, 247, 531, 730  
Birmingham, 293, 399, 531, 574  
Bournemouth, 53  
Bradford, 531  
Bristol, 24, 107, 517, 531  
Brussels, 447  
Buenos Aires Trams, 574  
Bury, 233  
Butte Anaconda and Pacific Rly., 447  
Canada, 179, 233, 471, 607  
Cape Colony, 595  
Channel Tunnel [D'ERLANGER and FOX], 547  
Chicago, Milwaukee, & Puget Sound Rly., 92  
Colwyn Bay, 493  
Constantinople Trams, 483  
Controllers (B.O.T.), 719  
Coventry, 367  
Croydon, 574  
Dewsbury, 509, 551  
Douglas (I.O.M.), Wayleaves, 493  
Dublin and Blessington Lgt. Rly., 485  
East Ham and Barking Trams, 178  
Electric Traction [KAPP], 523  
Electric Vehicle Assoc., 495  
Electric Vehicle Committee (I.M.E.A.), 543, 694, 726  
Feeders [CUNLIFFE], 10; [SAYERS], 117  
Folkestone, 24  
Frequency Changing, 507  
Glasgow, 424  
Greenock, 493, 574, 652  
Greenwich Power House (see also Accidents), 117, 254, 449, 515, 543, 672  
Guard Wires, 13, 293  
Hastings, 165, 233  
Heywood, 233  
Hong Kong Trams, 293  
Indian Rlys., 13  
Inst. of Rly. Signal Engineers, 135  
Italian Rlys., 92, 193, 293  
Kalgoorlie Power & Lgt., 367  
L.B. & S.C. Rly., 65, 293  
L.C.C. Trams, 121, 233, 327, 367, 385, 411, 424, 435, 595, 622, 633, 719  
L.N.W. Rly., 345, 480, 667; Lectures, 385  
L.S.W. Rly., 345, 480, 622, 653, 671  
Leeds, 279, 367  
Leicester, 178  
Lighting (see also Accidents), 165  
Lincoln, 345  
Liverpool, 53, 209, 509  
Locomotives [ALEXANDERSON], 585; (Durt-nall), 484; [LYDALL], 633  
Loetschberg, 509, 327, 399, 459, 569  
London Sub. Tract., 525, 345  
London Elec. Rlys., 65, 79, 107, 121, 165, 193, 233, 327, 411, 424, 425, 507, 520, 607, 685, 719  
Lowestoft, 107, 293  
Manchester, 153, 193, 263, 279, 293, 345, 507, 574  
Melbourne, 92, 153, 424  
Merthyr, 178  
Met. Assoc. of Elec. Tramway Managers, 633  
Midland Rly., 667  
Municipal Tramways Assoc., 517, 562, 719  
N.S.W., 295  
Nat. Elec. Constr. Co., 667  
New York, 193  
New York Cent. and Hudson River Rly., 719  
Newcastle, 509  
Newport, 493, 595  
Norfolk & Western Rly. (U.S.A.), 517, 550  
Obligations [GOODYER], 424  
Oldham, Ashton & Hyde Trams, 483  
Oxford, 24, 92, 399, 435, 633, 719  
Pantograph, 633  
Passenger Transportation in U.S.A. [SNYDER], 135  
Passengers' Liability, 79  
Petrol Electric Traction, 184, 209, 293, 325, 607  
Pietermaritzburg, 607  
Pittsburg and Butler Rly. (U.S.A.), 40  
Profits [EDWARDS], 361  
"Railophones," 622  
Railway Results, Extensions, &c., 92, 107  
Rjukan Railway, 441  
Rochdale, 233  
Rolling Stock [MACMAHON], 92  
Sheffield, 24, 424, 531  
Signalling [HORNBLOWER], 438  
Simplon Tunnel, 569

## ELECTRIC TRACTION

- Single-Phase Commutator Motor (Alex-  
anderson), 517  
South Shields, 345  
Southend, 459  
Split-phase Locomotives [ALEXANDERSON],  
585  
St. Paul's Bridge, 121  
St. Petersburg, 293, 449  
Stirling, 493, 507, 585, 611, 618, 677, 695;  
Stoke-on-Trent, 367  
Storage Battery Traction, 13, 40, 179, 209,  
279, 320, 377, 385, 411, 618, 677, 695;  
[WATSON and MITCHELL], 377  
Strikes: Ashton, 493, 517; Dublin, 493,  
509; Leeds, 715, 727  
Sunderland Trams, 325, 574, 633  
Swansea & Mumbles Rly., 531  
Switzerland, 92, 121, 153, 424, 595  
  
Torquay, 107  
Traction Systems, 698  
Traffic Board, 53, 247  
Traffic: Report on, 482; Station Capacity  
[BRECHT], 434  
  
Trailer Cars, L.C.C., 121, 327, 367, 595,  
633; York, 685  
Tramways: Activity of [FEARNLEY], 562;  
Tracks [BLAND], 361  
Tramways & Light Rlys. Assoc., 64, 168,  
263  
Triest-Opicina Rly., 40  
Trolley Omnibuses: B.O.T. and Routes,  
247; Legislation [ENGLAND], 361; Local  
Veto, 263, 309, 327; Wear of Roads, 253  
Trolley Omnibuses in Aberdare, 53, 595;  
Aberdeen, 65, 135; America, 40;  
Bournemouth, 269; Bradford, 53;  
Brighton and Hove, 40, 92, 345, 562,  
592, 667, 719, 730; Chesterfield, 233;  
Dundee, 53; Hythe, 79; Keighley, 247;  
M.E.T., 92, 121, 178, 247, 263, 425;  
Mexborough and Swinton, 385; N.E.  
Rly., 667; Newport, 585; Pietermaritz-  
burg, 607; Ramsbottom, 483; Southport,  
219; Stockport, 153  
Tube Rlys. (see also London Elec. Rlys.),  
Glasgow, 471, 574; I.O.W., 327, 667;  
N. and S. Shields, 633, 667; N.S.W.,  
595; Post Office, 121, 325, 367, 416, 434,  
471, 483; Strand-Crystal Palace, 471,  
685  
Tyneside Trams, 471  
  
United Elec. Car, 531  
Urban Passenger Transport [HAMILTON],  
562  
  
Vienna Stadtbahn, 40  
  
Walthamstow, 483  
Washington Rly. & Elec. Co., 178  
West Ham, 434  
Wiesenthal Rly., 633  
Wimbledon & Sutton Rly., 233  
Winter-Eichberg Motor Patents, 193  
[LATOUR], 224  
Wireless (Wirth), 483  
  
York, 509, 685

## TELEPHONY AND TELEGRAPHY (Including Wireless)

- Aerials and Aircraft, 573  
American Wireless Patents, 309  
Australian Wireless, 179, 294, 411, 517  
Automatic Telephone Mfg. Co., 193  
Automatic Telephony [AITKEN], 65; Aus-  
tralia, 231; (Betulander), 217; France,  
155; Great Britain, 231, 345, 517, 573,  
652; (Lorimer), 435, 573; N.Z., 93, 517  
  
Bouthillon Wireless, 447  
Bristol, 730  
British Assoc. Wireless Committee, 533  
  
Canada, 165, 265, 507  
Constantinople, 231, 719  
Coventry, 730  
  
Direct Spanish Telegr. Co., 547  
Directive Wireless [ADDEX], 79  
Disturbances, Wireless, 208  
  
Egypt, 719  
Epsom Telegraphs, 67  
Exchanges, New Telephone, 573, 607  
Explosions, Wireless (Ulivi), 484  
  
Heterodyne Wireless Receivers [HOGAN],  
447  
Hull, 107, 277, 480, 685, 730  
  
Imperial Wireless, 13, 24, 41, 53, 65, 79,  
92, 107, 120, 165, 179, 193, 208, 219, 231,  
250, 265, 277, 279, 309, 325, 345, 367,  
399, 411, 425, 435, 447, 461, 471, 482  
Intercommunication Telephones (G.E.C.),  
418  
International Conference on Safety at Sea,  
573, 607  
International Wireless Commission, 607  
  
Leclanche Cells [SOLOMON], 547  
Licences, Wireless, 411, 562, 607  
  
Liverpool Wireless Assoc., 279, 459, 482,  
547, 562  
London Wireless Convention, 345  
London Wireless Society, 547, 633, 667  
  
Marconi Wireless, 25, 53, 367, 385, 473,  
482, 493, 533, 549, 562, 573, 595, 607;  
Patents (Australia), 179, 411, 507;  
(France), 13, 107; (Helsby Wireless  
Telegr. Co.), 425  
Marconigraph, 93  
Measurements [ERLANG], 632  
Mercantile Wireless, 13, 411, 573, 585,  
719  
  
Nat. Tel. Co.: Arbitration, 40, 92, 165,  
219, 385, 399, 411; Journal, 107; Staff,  
231; Surplus Assets, 435, 595, 730  
Newfoundland, 367  
  
Pacific Cable Board, 517  
Panama Canal, 585  
Parliamentary Telephone Committee, 47  
Phantom Working, 53  
Post Office: Employment Inquiry, 482;  
  
Report, 250, 631; Telephone Factory, 193;  
Wireless Handbook, 459  
Regulations, Wireless, 279  
Relays, Telephone, 713  
Reception of Wireless [LEIMER], 93  
Research, P.O. Committee, 633  
River Plate, 294  
Rural Telephone Lines, 195  
  
Schools for Wireless, 482  
Scotland, Service in, 41, 53, 165, 193, 425  
Strikes, Wireless, 533  
Submarine Cables: Gotts' Telegraph Sys-  
tem, 120, 193; Internat. Conference,  
345, 531, 573  
  
Switchboards, Telephone (Peel-Conner),  
656; (Western Elec.), 423  
  
T.N.F., 53  
Telefunken Equipment (Siemens), 325  
Telefunken Zeitung, 67, 294, 473, 493  
Telegraph Cables and Lines, 41, 79, 473,  
547  
Telegraphphone, 404  
Telephone (Brown), 729  
Telephone Cables and Lines, [HARVEY  
SMITH], 730; New, American, 53, 208,  
425; Anglo-Dutch, 345; Anglo-Irish,  
622; Canadian, 480; Italian, 585; Mar-  
seilles-Algiers, 294; Zurich-Basle, 93  
Telephone Meter (G.P.O.), 729  
Telephone Service, 482; [MOIR], 607  
Telephone Transmission [ALDRIDGE], 363  
Telephony, Anglo-German, 685  
Telephone Troubles on Rykan Rly., 441  
Telephones, Development of, 411  
Telewriter, 652, 667  
Time Signals, Wireless (Germany), 493;  
[HORE-JONES], 432, 622; (Horophone),  
385, 421  
Trunk Calls, 493  
Turin Congress, 385  
  
Weather Forecasts, 507  
Wireless Stations: List of, 135; Germany,  
482; New, 41, 93, 121, 165, 193, 195,  
279, 309, 345, 367, 399, 425, 435, 447,  
549, 562, 698; American, 93, 107, 120,  
309, 367, 425, 493; Australian, 93, 367  
Wireless Telegraphy [ECCLES], 531;  
[HOWE], 531; [MARCHANT], 531;  
[PLETTIS], 632, 652, 667, 685, 698, 719;  
[TAYLOR], 549  
Wireless Telephony: Japan, 471, 493;  
Telefunken, 447  
Wireless Transmission, 93, 179, 195, 294,  
473, 585, 595, 633, 652, 719  
Wireless World, 208

## QUESTIONS AND ANSWERS BY PRACTICAL MEN

(Including Answers to Correspondents.)

- A.C. Generating Station and  
Feeder Breakdowns, 445  
A.C. Power Circuits, 307  
Answers to Correspondents,  
11, 63, 105, 177, 191, 275,  
383, 397, 445, 459, 471, 479,  
545, 684, 700  
Aron Meters, 11  
  
Booster Rotaries, 245  
Brake Magnets, 133  
Burglar Alarms, 229, 262, 291  
Cable Testing, 397  
  
Circuit-Breakers, 457  
  
Dimmers, 561  
Dynamos, 91, 605  
  
Factory Driving, 491, 507  
  
Gearing, 149  
  
Indicating Lamp for Motor,  
344  
Indirect Lighting, 261  
Induction Motors, 63, 516  
Isolating Switches, 478  
  
Lifts, 651  
Lightning: Arresters, 571;  
Effects, 700  
  
Merz-Price Protection, 205  
Mines, Electricity in, 217  
Mining Rules, 323, 365  
  
Petrol-Electric Cars, 664  
Planing Machines, 583  
Private Generating Plant, 51  
  
Rolling Mills, 527  
Rotary Converters, 175  
  
Saw Mill, 716  
Single-Phase Meters, 383  
Single-Phase Motors, 77  
Storage Battery Testing, 433  
Synchronous Motors, 39, 52  
  
Telephone Cables, 505  
Trains, Through Running, 105  
Transformers, 409, 545, 729  
Turbines, 684  
Two-Phase Meters, 163  
  
Wireless, 119, 469  
Wiring, 619



## PATENTS

- Arc Lamps:** Angold, 366; Boardman, 398; Crompton, 136, 386; Okun, 666; Quinn, 66; Rogers and Rowe, 326; Roubal, 508; Spencer and Johnson & Phillips, 718; (Electrodes), B.T.-H., 176, 252, 620; Herwig, 458
- Distributing Systems, Cables and Wires, Insulating Materials, &c.:** Ashton, 410; B.T.-H., 206, 232; B.T.-H. and Wedmore, 166, 176; B.T.-H., Garton, and Watson, 666; B.T.-H. and McCarthy-Jones, 682; B.T.-H., Taylor, Whittaker, and Spörborg, 42; Becker, 560; Bergmann, 166; Booth, 572; Brown, 620; Brown, Boveri, 608; Dreger, 606; Franz, 532; Leitner, 386; Olmstead, 650; Plohl, 346, 508; Soc du Temple, 636; Taylor, 136, 422; Waters, 366, 728; (Cables, Insulators, &c.), B.T.-H., 560; Beaver and Claremont, 686; Callender's Cable Co. and Pipkin, 248; Chubb, 481; Donders and Winterer, 366; Fellenberg, 206; Ford, 686; Frenkel, 398; Hepburn, 243; Kallmann, 42; Löwenthal, 494; Siemens, 106; Soc. des Forges et Acieries, 682; W.E., 310, 326; (Motor Control), B.T.-H., 532, 560, 616, 620; Eckmann, 366, 470; Krupp, 615; Peck and Eckmann, 75; Routin, 620; Siemens, 75, 326, 436, 616; (Vehicle Lighting), B.T.-H. and Garton, 94, 106; Berdon, 560; de Coster, 699; Foster and Pocklington, 152
- Dynamos, Motors, and Transformers:** A.E.G., 608; Ateliers de Constr. Elec., 560; B.T.-H., 152, 436, 481, 636; B.T.-H. and Whittaker, 728; Bergmann, 42; Brown, Boveri, 136, 176, 278, 686; Bullock, 532; Crompton and Burge, 572; Crompton, Macfarlane, and Burge, 232; Déri, 410; Dubilier, 458; Ellison, 636; Elec. Constr. and Pensabene, 446; Heyland, 152; Kettering, 220; Leitner, 494; Le Carbone, 422; Ljungström, 458; Mower and Hale, 292; Oerlikon, 192; Petersen, 136; Polkey, 326; Plaisant, 666; Price, 608, 620; Rolfe, 582; Rosenberg, 94, 278; Rouzet, 560; Ryder, 666; Scott, 292; Schlick, 26; Siemens, 80, 176, 366, 446, 582; Siemens and Howard, 398; Siemens and Taylor, 666; Shaw and Sharp, 206; Submersible Motors and Poynder, 310; Tattersall, 220; Vandervell and Midgley, 410; Vedovelli, Priestley, 636; Zabriskie, 12
- Electrometallurgy and Electrochemistry:** Ashcroft, 75; Deutsche Gold and Silber-Scheider, 559; Gibbs, 395; Guiterman, 572; Helbronner, von Recklinghausen and Henri, 248; Henderson, 582; Héroult, 456; Mackay, 26; Marino, 560; Michaud and Delasson, 456; Nodon, 456; Peacock, 166; Perreux-Lloyd, 682; Plauson and Tistschenko, 188; Steynis, 582; Stobie, 456; Tischenko, 132, 243; (Furnaces), Bally, 75, 188, 616; Bocuze, 132; Cie pour le Traitement des Métaux, 682; Cornthwaite, 132; Gomet, 132; Helfenstein, 243; Héroult, 502; Hiorth, 395; Holroyd, 682; Jössingfjord, 318; Morgan Crucible Co. and Spiers, 616; Patents Purchasing Co., 318; Rennerfelt, 132; Scott, 458; Simpson, 54; Soc des Nitrures, 75, 682; Stobie, 75; Testrup and Rigby, 75; Ubbelohde, 243; Wile, 26
- Heating and Cooking:** Albrecht, 560; Arpin, 728; B.T.-H., 686; Bally, 80, 94; Belling, 264, 518; Berry, 650, 686; Cooper, 152, 346; Digby, 560; Downe, 192; E. & O.A., Morrison and Davies, 310; Grundy, 458; Harrison, 456; Haskell, 470; Jung, 728; Kendrick, 206; Kercher, 548; Kirkwood, 292; Löfquist, 292; Mann, 106, 220, 548; Martin, 366; Michie and Paget, 718; Middlecoat, 470; Nash, 620; Nathan, 572; Perry, 166; Piper and Bridgewater, 518; Rives, 572, 596; Ruthenburg, 596; Schenberg, 122; Simplex Conduits and Taylor, 666; Simplex Conduits, Waterhouse and Birkett, 410; Slater's and Allensby, 166; Smith, 446; Townshend, 66; Unit Engng. and Brown, 728; Venner, 620; von Hentzel, 422; Weaving and Ferranti, 560
- Ignition:** Bauer and Eckmeier, 80; Brooks and Holt, 206, 422; Chapman, 494; Cook and Westwood, 398; Eisenmann, 494; Entz, 508; Heyl and Baker, 686; J.B.M. Co., 518; Keith, 80; Leitner, 136; Nehmer, 458; Scott, 546; Thompson, 220; Vandervell and Midgley, 503
- Incandescent Lamps:** A.E.G., 508, 532; B.T.-H., 136, 326, 410, 532, 560, 596, 699; Baum, 278; Bailey and Plews, 94; Beuttell and Manners-Smith, 136; Chemische Fabrik von Heyden, 666; Deutsche Gasglühlicht, 278; du Moulin, 156; Farkas, 136, 422; Fisher, 264; Gladitz, 386; Godin, 458; Hansen and Mohr, 310, 422; Harrison, 508; Herrmann, 470; Kast, 650; Leiser, 608; Ludecke and Brimsdown Lamp Works, 481; Lusted, 94; Naamloze Vennootschap Philip's, 686; Pakenham, 446; Pintsch, 386, 456, 446; Plechati, 728; Pope's Lamp Co., 620; Quain, 718; Schaller, 582; Schwarzkopf and Burgstaller, 572; Scouler and Dick, Kerr, 278; Sidon, 326; Stillman, 136; Truss, 446; Weisse, 26; Westinghouse, 26, 278, 292, 436, 532; Wolframlampen, 192, 572; (Vapour Lamps) B.T.-H., 458, 518; Bonissou and Guesnier, 94; Darmon and Leblanc, 546; Triquet, 346
- Instruments and Meters:** B.T.-H. and Holden, 620; B.T.-H. and Young, 398; Cooper, 470; Coplans, 532; Davis and Hunter, 422; Denny and Edgcombe, 220; Holden and Chamberlain & Hookham, 548; Irwin, 650; Schnippsier, 42
- Storage Batteries:** Cie Int. des Acc. Vedeka, 12; Fuller, 596; Galloway, 596; Niblett, 94; Porscke and Achenbach, 326; Sedneff, 582; Sokal, 456
- Switchgear, Fuses, and Fittings:** Abbatecola, 470; B.T.-H., 232, 292, 532, 666; B.T.-H. and Garton, 106; B.T.-H. and Young, 54; Berry, 366; Boutard, 582; Broadbent, 410; Brown, Boveri, 42; Byng and Taylor, 152; Clatworthy, 206; Coates and Reyrolle, 508; Cottier and Downes, 572; Edwards, 398; Elec. Conduits and Hemming, 470; Green, 572; Hancock, Dykes and Duddell, 508; Harriman and Reyrolle, 422; Hatfield, 220; Hunter and Shand, 346; Jackson, 650; Lee and Brame, 410; Lyhne, 106; Middleton, Baker, Farndon and Morris, 728; Moffett and Rosher, 232; Moller, 220, 582; Müller, 94; Nicholson, 346; Perl, 326; Pollak, 532; Roothan and Ferranti, 494; Sachsische Gruppenwechsel-schaft, 152; Siemens, 582; Siemens and Bolton, 532; Suter, 572; Thierry, 94; Tirrill, 518; Turner, 54; Vicars and Creffield, 94; Watson, 54; Wessel and Gysler, 80; Westinghouse, 518; Whyman, 66; Wyne, 292
- Telephony and Telegraphy:** B.T.-H., 220; Becker, 80, 310, 458; Brown, 166, 366, 620; Cossor and Stenning, 26; Degenhardt, 366; Gott, 176, 346; Gottschalk, 596; Heurtley, 398; Jensen, 508; Lagus, 481; Majorana, 518; Prance, 326; Raymond Barker, 248; Schiessler, 166; Signal Ges., 458; Siemens, 582, 650; Soc. des Téléphones, 80; Stille, 106, 481; Stern, 456; Western Elec., 278; (Wireless) Balsillie, 650; Brown, 636; Chambers, 220; Cie Radiotélégraphique, 422; Des Ordon, 718; Ditcham and Grindell-Matthews, 366; Drahtlose Telegr., 232, 326, 608; Dubilier, 310, 481; Galletti, 510; Girardeau, 386, 650; Goldschmidt, 510; Grahame-White and Fothergill, 548; Heinicke and Jasper, 42; Jamieson, 264; Lodge, 718; Majorana, 666; Marconi and Franklin, 66, 699; Marconi and Prince, 66; Marconi and Round, 42; Merton, 366; Moretti, 470; Muirhead, 42; Nat. W.T. and T., 80; Peake, 94; Plohl, 346, 508; Rottgardt, 248; Rouzet, 248; Sahaika, 326; Schow, 518; Shephard and McKechnie, 518; Sibley, 518; Signal Ges., 560; Torikata, Yokoyama and Kitamura, 192; Watkins, 532; Williams, 518; Zaharia and Rothlander, 326
- Traction:** Cross, 548; Dawson and Lucas, 106; Deschamps, 152; Gradenwitz, 481; Hartford, 650; Haworth and Thomas Transmission, 422; Holmes, 636; Leitner, 292; Marino, 66; Morrison, 596; Oerlikon, 80; Pieper, 106, 122, 136; Purvis and Gritman, 560; Siemens, Lydall, and Fairburn, 636; Thomas and Thomas Transmission, 470, 494; Throde, 54; Wulferding, 582; (Signalling) Duccellier and Guillon, 470; Firth and Leake, 494; Handcock, Dykes and Duddell, 596; Holliday, 206; Mimick, 122; Page, 94; Pearson, 518; Siemens and Lydall, 136; Stockdale, 446; Strachan and Henshaw, 264; von Kramer, 552; Ward, 608; Westinghouse and Brown, 12; Westinghouse and Peter, 12
- Miscellaneous:** Adam Hilger and Bellingham, 598; Allison and Lindsay, 686; B.T.-H., 42, 326, 398, 436, 699; Bates, Kelly and Corbin, 66; Beldiman, 206; Bennett and Fosbrooke, 26; Bruckwicki, 122; Bundgens, 508; Dawson and Buckham, 548; Dussaud, 598; Elders and Fettes, 494; Gaiffe, 176; Graham, 188, 456; Guasco, 183; Harris, 278; Helbronner, 80; Jack, 42; Johnson, 699; Krupp, 366; Lake, 470; Laycock and Hicks, 106; McNab, 552; Maccord, 192; Maurice and Byng, 456; Magnet-Werk, 481; Martin, 596; Morgan, 458; Otis, 656; Philip and Steele, 243; Schanzbach and Knapp, 548; Schuler, 481; Siemens & Halske, 481; Soc. Courtaud, 54; Tufiaoff and Domanewsky, 508; Turpin and Robinson, 666; Van Daalen and Schreiber, 264; Villiers, 718; Weber, 94; Weigert-Sterne, 66; Whitehead, 699; Willmott, 508; Wortmann, 560; (Mining), Cahuitwerke Nürnberg, 632; Close, 559; Fabrik Elek. Zunder, 502; Field, 318; Hoodley and Knight, 75, 395; Kahler and Junker, 502; Kessler and Berger, 188; Lamour, 318; London, 552; Nelson, 682; Schaffer, 682; Son, 243; Sterling Telephone, 132, 456; Thomson, 682; Watts, 188; (Safety Lamps), Dickie, 76; Farber, 615; Gordon and Wright, 559; Greanoff, 6; Hailwood, 456; Hanson Langston and E.P.S., 615; Heaton, 615; Hudson, 502; Hunte, 152; Joel, 188, 518; Joris, 559; Morrison, 6; Odham, 615; Paxton, 502; Sparkes, 76; Thompson and Rothwell, 456; Worsnop, 188; (Separators), Elektromagnetische, 75; Kraus and Oppen, 6; Krupp, 54, 66, 502; Maschinenbau-Anstalt Humboldt, 456; Nathorst, 682; Pollard and Emmott, 682; Ulrich, 75

## Expired Patents

- Arc Lamps:** Bremer, 422, 608
- Distributing Systems, Cables and Wires, Insulating Materials, &c.:** Albion Clay and Lawton, 572; Edmunds, 436; Stone, 264
- Dynamos, Motors, and Transformers:** de Kanda, 494; Highfield, 26; Hollick, 536; Inray, 192; Rowntree, 728
- Heating and Cooking:** Dowsing, 106
- Incandescent Lamps:** Conmentry-Four-chambault, 572, 603; Moore Elec., 650; Swan, 446
- Instruments and Meters:** Aron, 192, 596; Fraser and Elphinstone, 220
- Storage Batteries:** Junger, 206

**Switchgear, Fuses, and Fittings:** Aldridge, 586; Browne, 122; de Kandó, 494; Guett, 494; Holmes, 122  
**Telephony and Telegraphy:** Abolard, 176; Brown, 42, 508; Dearlove and Brown, 699; Frampton and Muirhead, 718; Higgins, 166; Kingsbury, 699; Muirhead, 26, 206; Pollak, Virag, Egger and Silberstein, 152; Siemens & Halske, 26; (Wireless), Braun, 54, 608; Marconi, 152, 176, 718  
**Traction:** Barreau, 386; Cantono, 410; Sprague, 192; Westinghouse, 122; (Signalling), Deakin and Roberts, 248; Ferreira, 12  
**Miscellaneous:** Dufton, 650; Heinrich, 176; Otto, 176; Rowntree, 608, 728; Sprague, Bowles and Hill, 636

## Amendments and Oppositions

**Arc Lamps:** Blondel, 718; Körting & Mathieson, 292; Siemens, 582

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** Rushmore, 560; Taylor, 446; Zickler and Czepek, 26  
**Dynamos, Motors, and Transformers:** Price, 728; Spinelli, 386; Vandervell and Midgley, 366  
**Electrometallurgy and Electrochemistry:** Du Bois, 596; Stobie, 106, 264  
**Ignition:** Bartschi, 596; Brooks and Holt, 582; Longford and Clark, 26, 42  
**Incandescent Lamps:** Abel, 264; B.T.H., 122; Fischer, 398; Hyde, 136; Leiser, 728; Pintsch, 481; Schwarzkopf and Burgstaller, 686; Westinghouse, 636; Wolfgram-Lampen, 686  
**Switchgear, Fuses, and Fittings:** Earl, 446, 608; Statler, 636; U.S. Lgt. & Htg., 54; Van Raden and Metz, 260; Wallwin, 278; Wilson and Caudolite, 192, 636  
**Telephony and Telegraphy:** Brown, 80; Dubilier, 470, 596; Graham and Rickets,

596; Jamieson, 398; Jensen, 458; Kingsbury, 310, 446; Leuch, 232, 410; Rouzet, 620; Steljes, 278  
**Traction:** Arnold, 122; Deschamps, 292; Oerlikon, 192, 432, 446; Struble, 718; Whitfield and Cowan, 718  
**Miscellaneous:** B.T.H., 608; Clarke and Chadburn's Teleg., 386, 398, 699, 718, 728; Davies, 636; Keppie and Maddick, 248, 718; Le Maître, 136, 166, 446, 494; McNab, 636; Richon, 248; Sperry, 481; Wills, 122, 248

## Restorations, &c.

**Switchgear, Fuses, and Fittings:** Hubbell, 166, 481  
**Telegraphy and Telephony (including Wireless):** Brown, 80; Poulsen, 232, 248, 404; Ritchie, 310, 436, 652, 666, 667  
**Traction:** Reid, 686  
**Miscellaneous:** Close, 650; Hawley and Jones, 608; Merrick, 608; Murday, 232, 458

# LOCAL NOTES, including "Tenders Invited and Prospective Business," and "Tenders Received and Accepted"

Abercairn, 327  
Aberdare, 109, 437, 484  
Aberdeen, 25, 55, 81, 95, 110, 123, 209, 251, 267, 328, 399, 473, 495, 496, 509, 574, 635, 671, 692, 723, 734  
Aboyne, 563  
Abercrombie, 25, 27, 81, 153, 209, 221, 461, 509, 510, 587, 672, 691  
Acton, 597  
Airdrie, 549  
Aldershot, 387, 637  
Aldington, 473  
Altrincham, 41  
Antwerp, 632, 731  
Ardsley, 575  
Argentine, 312, 510  
Ashford, 15  
Ashton-under-Lyne, 67, 168, 296, 691, 723  
Atherton, 15, 327  
Australia, 27, 67, 123, 196, 209, 221, 267, 281, 347, 388, 413, 414, 462, 496, 509, 510, 520, 533, 534, 549, 575, 588, 638, 657, 671, 691, 709  
Aylesbury, 137, 671  
Ayr, 67, 167, 597  
Azores, 311  
Bacup, 519, 520, 563  
Balderton, 16  
Ballater, 462, 637  
Ballyconnell, 533  
Banbridge, 209, 235, 598  
Bangor, 587  
Barbados, 671  
Barking, 55, 81, 137, 155, 574  
Barnes, 251, 609  
Barnsley, 657, 672  
Barrow-in-Furness, 167  
Barton, 235  
Basingstoke, 15, 267, 295, 483, 657  
Bath, 27, 123, 124, 483, 658  
Batley, 25, 387, 483, 519, 723  
Bavaria, 46  
Beckenham, 68, 461  
Bedford, 81, 123, 196, 210, 296, 347, 387, 437, 597, 691, 723  
Bedworth, 369, 400  
Belfast, 25, 41, 68, 95, 96, 109, 153, 167, 179, 180, 196, 235, 281, 282, 296, 312, 347, 348, 400, 413, 414, 450, 473, 483, 509  
Bexhill, 387, 533  
Bexley, 267, 710  
Bingley, 123, 167, 179, 483, 509  
Birkenhead, 156, 564, 657  
Birmingham, 15, 27, 109, 138,

221, 267, 279, 296, 348, 400, 597  
Bispham, 137, 167, 327, 635  
Bitterne, 597  
Blackburn, 96, 235, 251, 269, 327, 427  
Blackpool, 167, 311, 387, 576  
Blackrock, 41, 67  
Bloemfontein, 428  
Bognor, 153, 251, 509, 623  
Bolton, 15, 55, 81, 155, 167, 328, 400, 449, 609  
Bombay, 137, 281  
Bootle, 209, 311, 413, 575  
Boston, 473  
Bournemouth, 624, 723  
Bradford, 209, 267, 369, 413, 449, 576, 609, 657, 670, 723  
Braintree, 519, 637  
Bray, 281  
Brazil, 167, 496  
Bridgend, 137  
Bridlington, 15, 168, 235, 267, 295, 413, 474, 563  
Brighton, 15, 25, 44, 55, 67, 123, 267, 328, 369, 370, 399, 672  
Bristol, 27, 68, 155, 312, 369, 437, 462, 563, 574, 637, 653, 732  
Brixham, 734  
Bromley, 495, 609  
Buenos Aires, 16  
Bulgaria, 281, 567  
Burnham, 597  
Burnley, 195, 474, 563, 575, 709  
Burton, 533  
Burton-on-Trent, 167, 311, 347, 462, 483  
Bury, 347, 449, 473, 563, 724  
Bury St. Edmunds, 295  
Buxton, 155  
Canada, 44, 96, 167, 179, 235, 295, 311, 414  
Cardiff, 413, 437, 483, 519, 549, 576  
Carlisle, 179, 221, 312, 519, 533, 549, 563, 610, 709, 731  
Chatham, 55, 137  
Chelmsford, 461  
Cheltenham, 153, 155  
Cheshire, 124  
Chester, 195, 387, 449, 734  
Chesterfield, 709  
Chichester, 155, 195  
Chile, 15, 27, 167, 180, 281  
China, 282  
Chiswick, 235, 692  
Chobham, 563  
Chorley, 461

Christchurch, 427  
Clacton-on-Sea, 55, 196  
Cleckheaton, 327  
Cleethorpes, 598, 671, 691  
Clonakilty, 509, 576  
Clones, 387  
Colchester, 155, 210, 387  
Colne, 399  
Colwyn Bay, 43, 124, 221  
Coniston, 609  
Consett, 658  
Cornwall, 657  
Costa Rica, 387  
Coventry, 155, 209, 235, 268, 327, 691  
Criccieth, 575  
Cromer, 25, 55, 109, 123, 311, 399, 437, 563  
Crowley, 587  
Croydon, 109, 347  
Cuba, 509  
Cwmaman, 261

Dalgetty, 327  
Dalkey, 413  
Darlington, 15, 81, 109, 153, 155, 195, 623, 691  
Darwen, 15, 137, 311, 413, 503  
Dawlish, 637  
Denmark, 388  
Derby, 81, 95, 267, 564, 587, 635  
Devizes, 15, 638  
Devonport, 295, 312, 723  
Dewsbury, 495, 623, 724  
Doncaster, 27, 195, 449  
Dorchester, 67  
Dorset, 153  
Douglas, 43, 96  
Dover, 295, 597  
Dromore, 235, 347, 574  
Dublin, 41, 179, 209, 221, 222, 347, 449, 473, 564, 574, 597, 588, 624, 710  
Dudley, 81, 251, 267, 369, 413, 495, 609, 658  
Dundalk, 221, 267, 281, 510  
Dundee, 15, 41, 67, 95, 109, 137, 167, 180, 235, 281, 295, 327, 520, 549, 574, 671, 672, 692, 710  
Dungarvan, 267, 437  
Durban, 179, 221, 347  
Durham, 413

Earlston, 209  
Eastbourne, 82, 282, 369, 519  
Eastwood, 533  
Eccles, 27  
Edinburgh, 41, 55, 123, 124,

167, 235, 427, 449, 483, 564, 574, 587, 609, 658  
Egypt, 67, 137, 311, 462, 597  
Eland, 637  
Ellesmere Port, 27  
Ellon, 575, 597  
Emms, 43  
Epsom, 82  
Erith, 67  
Essex, 25  
Eton, 137  
Exeter, 327, 473, 609  
Falkirk, 267, 450, 474  
Farnworth, 15  
Felixstowe, 153, 251, 311, 347, 449, 473  
Fife, 195, 473  
Finchley, 123, 623  
Fleetwood, 137, 235, 597, 609  
Flintshire, 549  
Foleshill, 483  
Friern Barnet, 692

Galashiels, 1, 23, 137, 179, 311, 509, 623, 724  
Gillingham, 55, 623  
Glasgow, 15, 67, 95, 124, 167, 235, 251, 461, 495, 575, 576, 598, 609, 610  
Gloucester, 179, 473  
Govan, 44, 328  
Grange-on-Sands, 623  
Gravesend, 43, 109, 295, 483  
Great Harwood, 575  
Greece, 520  
Greenock, 16, 473, 495  
Grimsby, 55, 68, 123, 179, 180, 221, 235, 251, 327, 399, 428, 549, 609, 624, 671, 731

Halifax, 109, 155, 209, 222, 327, 347, 473, 587, 623  
Hamilton, 15, 251, 413, 437  
Handsworth, 95  
Harrogate, 110, 251, 312, 533, 623  
Harwich, 16, 281  
Haslingden, 137, 196, 509, 563, 692  
Hastings, 137, 347, 437, 519  
Hayward's Heath, 180  
Hazel Grove, 235  
Hebburn, 295, 519, 597, 658  
Hebden Bridge, 327, 400  
Hereford, 96, 155, 167, 387, 437, 657  
Hessle, 281  
Heston and Isleworth, 158, 196  
Heywood, 56, 251, 427, 473, 483, 533, 610, 623, 731

# INDEX TO "ELECTRICAL ENGINEERING"

## LOCAL NOTES—(continued).

- Hinckley, 734  
 Hindley, 597, 709  
 Holmfirth, 167, 637, 723  
 Hong Kong, 510  
 Hornsey, 109, 179, 180, 196, 311, 509, 623, 731  
 Hove, 41, 55, 95, 167, 399, 461, 563, 658, 672, 710  
 Hoylake, 55, 251  
 Hoyland, 623, 691  
 Huddersfield, 109, 137, 624, 709  
 Hull, 27, 153, 347, 427, 533  
 Ilford, 96, 369, 563, 635  
 Ilkley, 281, 519, 637  
 India, 43, 123, 587, 597  
 Indo-China, 282  
 Ingleton, 564  
 Ipswich, 295, 400, 638  
 Italy, 510  
 Keighley, 44, 56, 267, 399, 400, 549, 709, 723  
 Kenilworth, 597  
 Kettering, 311, 387, 427  
 Kettlewell, 15, 387  
 Kilmarnock, 267  
 King's Lynn, 109, 221, 251, 296, 519  
 Kingston-on-Thames, 449, 461  
 Kingstown, 267, 369, 427, 461  
 Kirkby Stephen, 723  
 Kirkcaldy, 462  
 Knaresborough, 509, 597  
 Knighton, 67  
 Kobe, 296  
 Launceston, 533  
 Leeds, 16, 56, 81, 155, 195, 209, 281, 295, 369, 400, 519, 563, 587, 658, 691, 692  
 Leek, 123, 519  
 Leicester, 95, 123, 196, 251, 311, 576, 609  
 Leith, 124  
 Limerick, 196, 311, 369, 462  
 Lincoln, 15, 43, 235, 347  
 Littleborough, 549, 709  
 Liverpool, 55, 81, 109, 123, 138, 251, 296, 348, 496, 587, 710  
 Llandaff, 709  
 Llandudno, 635  
 Llanelli, 623  
 Llanfairfechan, 609, 672  
 Llanidloes, 400, 533, 723  
 London: 55, 137, 138, 168, 450, 461, 549, 588, 732; *Buttress*, 56, 81, 95, 123, 210, 222, 251, 413, 575, 709; *Bermondsey*, 221, 437; *Bethnal Green*, 427; *Fulham*, 109, 196; *G.P.O.*, 268, 638; *Hackney*, 43, 44, 55, 155, 267, 388, 400, 550, 576, 609, 657; *Hammer-smith*, 56, 138, 168, 221, 311, 312, 327, 413, 414, 427, 449, 474, 496, 533, 549, 588, 624, 635, 691, 723, 731; *Hampstead*, 109, 137, 222, 268, 413, 438; *Islington*, 16, 137, 155, 168, 710; *L.C.C.*, 16, 27, 56, 68, 95, 96, 109, 110, 123, 137, 138, 155, 222, 235, 252, 268, 281, 328, 347, 348, 399, 400, 413, 449, 450, 483, 588, 672, 691, 732; *Lewisham*, 263; *Marylebone*, 15, 43, 81, 82, 123, 327, 413, 575, 657, 672; *Office of Works*, 56, 388, 470, 588; *Poplar*, 437, 575, 587; *Shoreditch*, 55, 95, 427, 587, 623, 657, 691; *Southwark*, 327, 370, 731; *St. Pancras*, 82, 347, 388, 400, 437, 610, 624; *Stepney*, 27, 56, 95, 347, 348, 370, 387, 400, 520, 671; *Stoke Newington*, 387, 732; *Westminster*, 109; *Woolwich*, 25, 81, 123, 370, 587, 710  
 Londonderry, 195, 387  
 Long Eaton, 56, 235, 449  
 Lossiemouth, 235, 609  
 Loughborough, 123, 387, 413, 427, 474, 587, 657, 658  
 Louth, 483  
 Lowestoft, 67, 167, 296, 723  
 Lurgan, 462, 519, 623, 637  
 Lynn, 387  
 Lytham, 167, 221, 267, 461, 609, 637, 658, 709  
 Macclesfield, 209, 427, 483, 623  
 Maidstone, 27, 95, 473, 597, 623  
 Malta, 414  
 Malvern, 709  
 Manchester, 67, 82, 96, 155, 156, 180, 196, 209, 222, 235, 281, 282, 327, 347, 348, 359, 413, 473, 520, 549, 563, 564, 576, 587, 597, 609, 623, 635, 638, 692, 709, 710  
 Mansfield, 437  
 Market Weighton, 549, 635  
 Mexborough, 209  
 Middlesbrough, 449  
 Middleton, 413, 437, 519, 575  
 Minehead, 692  
 Moffat, 67, 251, 549, 597  
 Monmouth, 723  
 Montevideo, 638  
 Morecambe, 496  
 Morocco, 691  
 Motherwell, 672  
 Musselburgh, 44  
 Navan, 495  
 Neath, 109, 671  
 Nelson, 43, 156, 295  
 New Brighton, 483  
 New Zealand, 27, 167, 180, 281, 282, 462, 520, 549, 575, 576, 597, 609, 657, 691, 709  
 Newcastle-on-Tyne, 96, 123, 576, 710  
 Newcastle-under-Lyme, 96, 155, 209, 370, 413, 658  
 Newport, 110, 137, 209, 210, 221, 328, 369, 387, 413, 483, 495, 509, 576, 597, 734  
 Northampton, 692, 732, 734  
 Northwood, 450  
 Norway, 15, 235, 388  
 Norwich, 295, 311, 437, 597, 732  
 Nottingham, 25, 137, 281, 295, 587  
 Nova Scotia, 370  
 Nuneaton, 437, 449  
 Oldham, 27, 43, 81, 95, 231, 311, 533  
 Orkney, 400  
 Ormskirk, 609  
 Oulton Broad, 473  
 Pembroke, 167, 311, 327  
 Penwortham, 496  
 Perth, 533  
 Peterborough, 95, 155, 180, 196, 251, 268, 295, 347, 413, 414, 520  
 Pickering, 597  
 Plymouth, 27, 267, 369, 483, 509, 519, 657, 723  
 Pocklington, 67  
 Pontypridd, 110, 597  
 Port Elizabeth, 123, 519  
 Port Glasgow, 251, 575  
 Portishead, 155, 509  
 Portrush, 221, 473, 533  
 Portslade, 483  
 Portsmouth, 311, 519, 723  
 Preston, 68, 549  
 Radcliffe, 281, 295, 657  
 Railways: Cal., 709; Can., 709; North., 709; G.C., 109; G.W., 564; L. & S.W., 496; Metro., 638, 709; N.E., 27, 638; N.L., 27  
 Ramsbottom, 44  
 Ramsgate, 124  
 Rangoon, 638  
 Rathmines, 597, 635, 671  
 Rawtenstall, 311, 549, 597, 732  
 Reading, 221, 428  
 Redditch, 195, 281, 519, 587, 692  
 Rhodesia, 510  
 Rhondda, 16, 281  
 Rhyl, 43, 123, 597  
 Richmond, 235  
 Riga, 533  
 Rochdale, 96, 138, 196, 251, 281, 347, 413, 473, 732  
 Roscrea, 251, 400  
 Rosyth, 267  
 Rotherham, 474, 510, 671  
 Rothsay, 295, 549  
 Royton, 519  
 Rushden, 95, 658  
 Russia, 167, 509, 510, 598, 638  
 Sale, 587, 723  
 Salford, 43, 44, 55, 96, 109, 110, 180, 196, 251, 267, 519, 533, 549, 576, 609  
 San Paulo, 13  
 Scarborough, 55, 95, 221, 597  
 Sedburgh, 635  
 Serbia, 312  
 Shaldon, 124  
 Shanghai, 56, 124, 167, 575  
 Sheffield, 43, 123, 209, 221, 268, 295, 296, 413, 414, 427, 483, 509, 609  
 Shipley, 110, 137, 267, 413  
 Sidmouth, 155  
 Sileby, 509  
 Skegness, 387  
 South Africa, 15, 27, 68, 156, 281, 282, 312, 348, 428, 450, 510, 520, 563, 564, 575, 598, 638, 657, 671, 691, 723  
 South Shields, 138, 413, 423, 437, 563, 623  
 South Wales, 110, 328  
 Southampton, 67, 110, 155, 235, 251, 327, 496, 563, 638, 710, 724  
 Southend, 68, 155, 222, 437, 671, 732  
 Southport, 635  
 Spain, 282, 588, 734  
 St. Annes, 427, 437, 519  
 St. Andrews, 221  
 St. Helens, 609  
 Staffordshire, 156  
 Stalybridge, 27, 68, 167, 196, 251, 400, 427, 563  
 Stapleford, 691  
 Stirling, 68, 495, 509, 519, 549, 587  
 Stockport, 235, 474  
 Stockton-on-Tees, 95, 209  
 Stoke-on-Trent, 15, 81, 155, 209, 221, 413, 449, 563, 575  
 Stretford, 587  
 Stroud, 15, 155  
 Sturry, 533  
 Suffolk, 25, 55  
 Sunderland, 137, 167, 296, 400, 413, 428, 658, 709  
 Swanage, 110, 437, 483  
 Swansea, 15, 155, 221, 427, 563, 710  
 Sweden, 348  
 Swindon, 109, 370  
 Swinton, 137, 138, 236, 251, 281, 597, 723  
 Tasmania, 123, 210, 597  
 Taunton, 168, 427, 437, 635, 732  
 Teignmouth, 519, 609, 623, 658, 724  
 Tilbury, 484  
 Tempo, 387  
 Todmorden, 427, 609  
 Tollesbury, 43  
 Toronto, 281  
 Torpoint, 520  
 Torquay, 55  
 Tottenham, 413  
 Troon, 295, 658  
 Trowbridge, 597  
 Truro, 155, 195, 533, 724  
 Tullamore, 196, 281, 327  
 Tunbridge Wells, 43, 95, 483  
 Tyldesley, 509, 549  
 Tynemouth, 672  
 Uruguay, 281  
 Wallasey, 56, 156, 327, 427, 657  
 Walsall, 95, 109, 155, 295, 312, 370, 587, 723, 732, 734  
 Walthamstow, 110, 210, 549  
 Warrenpoint, 588  
 Warrington, 110, 251, 369, 437, 509, 519, 563, 597, 691, 709  
 Waterford, 81, 167, 180, 221, 251, 281, 370, 427, 496, 588, 609  
 Watford, 43, 67, 597  
 Wednesbury, 81  
 West Africa, 155  
 West Bridgford, 724  
 West Bromwich, 483  
 West Ham, 27, 124, 156, 267, 327, 347, 348, 369, 387, 449, 462, 597, 671, 709  
 West Hartlepool, 43, 44, 222, 327, 414, 427, 519, 671  
 West Wickham, 387  
 Weston-super-Mare, 400, 413, 658  
 Weymouth, 387  
 Whitehaven, 56, 168, 221, 495  
 Whitstable, 609, 724  
 Whitworth, 387, 609  
 Widnes, 692  
 Wigan, 109, 155, 168, 348, 519, 549, 623, 723  
 Willesden, 400, 449  
 Wimbledon, 110, 483, 576, 623, 638  
 Windsor, 156  
 Wisbech, 635  
 Wishaw, 533  
 Withersea, 623  
 Witney, 483  
 Wolverhampton, 55, 221, 222, 251, 312, 427, 437, 519, 588, 638, 657, 723  
 Wood Green, 81, 123  
 Woodford, 180, 235  
 Worcester, 43, 44, 156, 348, 369, 519  
 Worksop, 461  
 Worthing, 267, 296, 327, 348, 475, 549, 587  
 Wrexham, 81, 123, 196  
 Yarmouth, 295, 369  
 Yeovil, 533  
 York, 81, 109, 137, 210, 255, 268, 311, 327, 413, 461, 533, 575, 635, 691, 709  
 Yorkshire, 624, 671, 709

## COMPANIES' DIVIDENDS, REPORTS, MEETINGS, Etc.

- Aron, 370, 388, 401  
 Auto. Tel., 231  
 B.E. Trans., 124, 138  
 B.I. & H., 156, 180  
 B. & K. Sup., 462  
 B.T.H., 296  
 Babcock & Wilcox, 236  
 Bombay Sup., 450  
 Brentford Sup., 236  
 Bristol Trams., 438  
 British Aluminium, 180  
 Brit. Elec. Trans., 520  
 Brit. Westinghouse, 268, 550, 564, 692  
 Bromley Lgt., 222  
 Bruce Peebles, 124, 138  
 Brush, 450, 462  
 Callender's, 282, 576  
 Cape Town Gas, 296  
 Central Sup., 110  
 Charing X. Sup., 124, 450  
 Chelsea Sup., 110, 168, 462  
 Chloride, 96, 282, 610, 692  
 City of Lond. Ltg., 110, 168, 462  
 Cleveland and Durham, 328, 576, 610  
 Clyde Valley Power, 168, 520  
 Consolidated Diesel, 576, 692  
 County of Durham Power, 168, 564  
 Cork Trams. & Ltg., 236  
 County of London, 138, 450  
 Crompton, 388, 401, 550  
 Derby & Notts Power, 268  
 Dick, Kerr, 576, 588  
 Drake & Gorham, 576, 598  
 Durham Collieries, 252  
 E.C.C., 414, 438  
 E.P.S., 564  
 Edison Acc., 576  
 Edison & Swan, 328, 348, 388, 635  
 Edmundson's, 414, 428  
 Elec. & Gen. Invest., 370  
 Elec. & Indus. Invest., 252  
 Elec. Distn. Yorks., 156  
 Ericsson, 156, 180  
 G.E.C., 414, 428  
 Glover's, 180  
 Henley's, 96, 124, 138, 484  
 Hove Ltg., 576  
 India Rubber, 710  
 Johnson & Phillips, 236, 252  
 Kensington & Knightsbridge Ltg., 110, 462  
 L.B. & S.C. Rly., 124  
 Lancashire Dynamo, 210  
 Lancashire Elec. Power, 236  
 Lond. Sup. Corp., 96, 124  
 Manaos Trams. & Lgt., 474  
 Marconi, 25, 367, 370, 385, 473, 482, 493, 573, 595, 607, 731  
 M.E.T., 233  
 Metallic Tube, 598  
 Met. Sup., 156, 450  
 Mid. Power, 236  
 Nairobi Power, 268  
 Nat. Tel., 28  
 Newcastle Ltg., 496  
 Newcastle Sup., 124, 168, 428, 588  
 North Met. Sup., 236, 252  
 Northampton Lgt. & Power, 474  
 Notting Hill Ltg., 110  
 Oldham Trams., 233  
 Oxford Elec., 474  
 Portarlinton Lgt., 692  
 Premier Elec. & Hardware, 709  
 S.W. Power, 180, 222  
 St. James's & Pall Mall, 96  
 Swansea Trams., 233  
 Trams., Lgt. & Power, 724  
 Urban Elec. Sup., 328  
 Vickers, 156  
 Victoria Falls, 534, 564  
 Waste Heat, 138, 474  
 Waygood, 388, 401, 428  
 Westinghouse, 268, 550, 564, 692  
 Westminster Sup., 96, 462  
 White, J. G., 388  
 Willans, 28, 37, 282  
 Wireless Lgt., 598  
 York Power, 96, 124, 438, 534

## NEW COMPANIES

- Ardwick Regulator, 180  
 Atmospheric Nitrates, 534  
 Bentham Sup., 610  
 Betulander, 496  
 British Arc Weld., 734  
 British Elec. Heater, 180  
 "Ceag" Safety Lamp, 282  
 Central Argentine Lgt. & Power, 450  
 Chinnerys, 724  
 Clonakilty Lgt. & Power, 550  
 Clones Lgt. & Power, 496  
 Continuity Joint & Tube, 610  
 Credenda Conduits, 44  
 Cumberland Waste Heat, 658  
 East. Spain Develop., 428  
 Eckstein Heap, 44  
 Edison Acc., 474  
 Edison & Swan (India), 724  
 Elec. Apparatus, 438  
 Elec. Engng. & Motor, 428  
 Elec. Ltg. & Engng., 638  
 Elec. Motor and Stove Hiring, 534  
 Elec. Works (Miller), 724  
 Elec. Zinc, 196  
 Electricals, 724  
 Enfield Cable, 658  
 Farringdon Elec. Lgt., 44  
 Forward Elec., 610  
 Fuller Acc., 638  
 Galashiels Elec. Sup., 428  
 General Telautograph, 180  
 Hydraulic Power, 450  
 Hydro-Elec. Concessions, 44  
 I.L. Syndicate, 534  
 Igranic, 484, 610  
 Jackson Stove, 438  
 Las Palmas Water & Power, 180  
 Leyburn Sup., 474  
 Lisnaskea Lgt., 496  
 Liverpool Welding, 534  
 Llanidloes Lgtng., 724  
 Macintosh Cable, 438  
 Mitchelite Ltg., 484  
 Moscow Elec., 168  
 N.B. Diesel, 180  
 Ostra Lgt., 610  
 Parsons, C. A., 168  
 Parsons, W., 496  
 Pernambuco Trams., 180  
 Portarlinton Lgt. & Power, 496  
 Reincke's Wireless, 484  
 Robin Elec. Lamp, 44  
 Rushden Elec. Sup., 44  
 Sandbanks Railless, 550  
 Sevenoaks Elec., 450  
 Somerby Lgt., 724  
 Southern Brazil, 196  
 Standard Meter, 724  
 Stolz Electrophone, 282  
 Strode, 168  
 Thermo-Elec. Ore, 44  
 Trams., Lgt. & Power, 44  
 Wensleydale, 610  
 Wescoscope, 724  
 Wireless Lgt., 428  
 Wireless Telephones, 428  
 Woodbridge Lgt., 180



# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

NO. 314 [VOL. IX., NO. 1]  
*All rights reserved.*

THURSDAY, JANUARY 2, 1913.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES AND TECHNICAL COLLEGE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

*Other Advertisement Rates on Application.*

#### Latest Times for Receiving

Letters for Insertion, Tuesday first post.

Small Advertisements and Official Announcements, Wednesday first post.

Displayed Advertisements, Tuesday first post.

Corrections in Standing Advertisements, Monday first post.

All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 202-206, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Circling, Fleet, London." Telephone No.: 5509 Holborn.

Cheques to be made payable to THE NEWLAW PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## CONTENTS

	PAGE
SUMMARY	1
ELECTRICAL ENGINEERING IN THE MINING AND METAL INDUSTRIES.	
Electric Winding in the Rand Mines	3
Belgian Electric Mining Rules	3
An Electric Rolling Mill Installation	4
Electricity in Mines: Home Office Report	5
Electrical Mining Patents of December	6
Examinations for Mining Engineers in South Africa	6
Electric Resistance Welding	7
The Turbo-Converter	8
The Earthing of Neutrals on Three-phase Systems	8
Correspondence	8
The Fire at the Salford Electricity Works	9
The I.E.E. Industrial Committee	9
Catalogues and Pamphlets Received	9
Calendars and Souvenirs for 1913	9
Tramway Feeders	10
Questions and Answers by Practical Men	11
Arc Lamp Lowering Gear	11
Patent Record	12
Telephony and Telegraphy (Including Wireless)	13
Electric Traction Notes	13
Local Notes	15
Tenders Invited and Prospective Business	15
Tenders Received and Accepted	16
Miscellaneous Business Notes	16

## SUMMARY

OUR special section on "Electrical Engineering in the Mining and Metal Industries," which will be published on the first Thursday of each month, contains this week an interesting Paper on electric winding in the Rand mines by S. E. T. Ewing, information as to

some new safety regulations issued for the safe use of electricity in Belgian mines, a description of an important electric rolling-mill installation at the works of the Shelton Iron, Steel & Coal Co., an abstract of the belated Home Office report on the use of electricity in mines in 1911, particulars of patents relating to electricity in mines issued last month, and the rules for the conduct of examinations for mechanical and electrical engineers' certificates of competency under the South African Mines and Works Act. (Pp. 1-6.)

A PAPER by P. Bucher on electric welding, and the discussion on it at Manchester last month, brought out some useful and practical points both in the Paper itself and the discussion. (Page 7.)

MR. F. CREEDY'S Paper on the turbo-converter was further discussed at a recent meeting of the Scottish Local Section of the Institution of Electrical Engineers. (Page 8.)

A DIVERSITY of views on the subject of earthed v. unearthed neutrals on alternating-current systems was set forth in the discussion on Mr. Peck's Paper on this subject, which was read recently before the Newcastle Local Section of the Institution of Electrical Engineers. (Page 8.)

A LETTER from Mr. S. E. Fedden comments on the recent discussion on the earthing of neutrals, and describes the protective arrangements in use at Sheffield. (Page 8.)

WE publish further particulars as to the cause of the serious fire at the Salford electricity works reported in our last issue. It appears that the discharge from the battery considerably augmented the short-circuit current at the switchboard. (Page 9.)

WE publish further details of the function which will be performed by the I.E.E. Industrial Committee. The "Committee for the Protection of Electrical Interests" has been dissolved, its work having been taken over by the Industrial Committee. (Page 9.)

A PAPER by Messrs. J. G. and R. G. Cunliffe, read recently at the Manchester Local Section of the Institution of Electrical Engineers, went into the arrangement of feeders for heavily loaded tramway systems, recommending the extensive adoption of boosters. (Page 10.)

THE testing of Aron meters is dealt with in our "Questions and Answers" columns. (Page 11.)

A "HALF-LYRE" pattern of arc-lamp suspension with lowering gear, to diminish shadows, is described. (Page 11.)

A PATENT for lock and block signalling, taken out by L. de M. G. Ferreira and H. J. Pryce, expires during the current week after a life of fourteen years. Among the specifications published last week by the Patent Office are two for railway track signalling, one by the Westinghouse Brake Co. and H. G. Brown, and the other by the same Company and B. H. Peter.



The Compagnie Internationale des Accumulateurs Vedeka are protecting a high-capacity lead storage cell. (Page 12.)

COL. SIR H. A. YORKE, Chief Inspecting Officer of Railways to the Board of Trade, recommends all railway companies to adopt electricity for train lighting. Our "Traction Notes" also contain references to the question of guard-wires on tramways, a new type of storage-battery car on the New York Railways, and the accidents in the London Tube and District Railways this week. (Page 13.)

THE French Marconi Co. has obtained an important judgment against three French firms for infringement of patents. It is stated that these companies had supplied all the wireless installations to the French Government. (Page 13.)

HIGH candle-power metal filament lamps are displacing arc lamps for street lighting at Farnworth.—The credit balance for the June quarter on the Marylebone electricity undertaking shows a considerable reduction compared with last year.—Great satisfaction is being expressed with the flame arc lighting at Dundee.—Further particulars are given of the series lighting at Brighton. (Page 15.)

TWO large generating sets are required at Glasgow; further generating machinery, mains, &c., are required at Darlington, Bridlington, and at several places in South Africa. A 10,000-volt electric power scheme is to be constructed in Norway. Switchboards are required at Atherton; generating set at Ashford; and street lighting equipment at Islington. The Birmingham Electric Supply Committee have finally sanctioned the construction of a new power station at Saltley. (Page 15.)

"The Northampton Gazette."—The December number of the official publication of the Northampton Past Day-Students' Association has a larger number of pages than its predecessors, and gives, besides news of the doings of those connected with the Northampton Institute (Clerkenwell), articles on pulsatory direct currents and other matters, reviews of books, and various notes, which will be appreciated by those to whom it is addressed.

## ARRANGEMENTS FOR THE WEEK

SATURDAY, JANUARY 4TH.

*Association of Mining Electrical Engineers.*

5.30 p.m. Warwick and South Staffs Branch. Imperial Hotel, Birmingham. (1) "Speed Control of Three-phase Motors," by S. A. Simon. (2) "Underground Haulage Signals," by Mr. Beadsmore.

MONDAY, JANUARY 6TH.

*Institution of Electrical Engineers: Newcastle Students' Section.*

7.30 p.m. At Armstrong College. "Phasing out of Alternating-current Apparatus," by J. Hacking.

TUESDAY, JANUARY 7TH.

*Institution of Electrical Engineers: Manchester Students' Section.*

7.30 p.m. At Municipal School of Technology. "Automatic Circuit Breakers," by A. N. Howarth.

*Institution of Electrical Engineers: Glasgow Students' Section.*

8 p.m. At Royal Technical College, Glasgow. Discussion evening.

*Rugby Engineering Society.*

8 p.m. At Benn Buildings. "Large Steam Turbo Units," by J. P. Chittenden.

WEDNESDAY, JANUARY 8TH.

*Institution of Electrical Engineers: Birmingham Section.*

7.30 p.m. At University. "Parallel Operation of Alternators," by A. R. Everest.

THURSDAY, JANUARY 9TH.

*Institution of Electrical Engineers.*

8 p.m. "Design of Apparatus for Improving the Power Factor of Alternating-current Systems," by Prof. Miles Walker.

*Institution of Electrical Engineers: Dublin Section.*

8 p.m. At Royal College of Science. "Notes on Self-propelled Cars for Light Railway Work," by J. P. Tierney.

FRIDAY, JANUARY 10TH.

*Electro Harmonic Society.*

8 p.m. Smoking Concert, Holborn Restaurant.

**Society of Engineers Status Prize.**—The Council of the Society of Engineers will award in 1913 a premium of books or instruments to the value of ten guineas for an approved essay on "A scheme for the registration of Engineers, including particulars concerning the registration of Engineers in British Colonies and foreign countries." The competition is open to all, and detailed particulars may be obtained from the Secretary, 17 Victoria Street, Westminster. The last date for receiving essays is May 31st, 1913.



A HAPPY NEW YEAR.

## ELECTRICAL ENGINEERING IN THE MINING AND METAL INDUSTRIES

### ELECTRIC WINDING IN THE RAND MINES

A RECENT issue of the Transactions of the South African Institute of Electrical Engineers contains a paper relating to electric winding, by Mr. S. E. T. Ewing, who remarks that electric winding from deep shafts has come into very general use on the Rand during the past three years. He referred to an example from a shaft from which an average of 45,000 tons of rock were raised per month from a depth of 3,825 feet, in addition to men and equipment. This is equipped with two winders, one on the Ward-Leonard system, and the other a plain three-phase machine, both rated at 1,400 h.p. The efficiencies during winding time only have been shown to average 60.1 per cent. for the Ward-Leonard and 51.3 per cent. for the three-phase equipment. Regarding the total units per hour, at 12.5 trips per hour the consumption is the same; below this frequency the three-phase set has the advantage and above it the Ward-Leonard. At the normal winding frequency of 25 trips per hour the Ward-Leonard winder shows a saving of 80 units per hour. The winding costs for the shaft (including power, wages, repairs, maintenance, &c.) work out at 9.39d. per ton of rock hoisted (but not including interest or depreciation), of which 43 per cent. of the total is the cost of power. The author points out the difficulties in the conditions which prevent a reliable comparison being made with the cost of steam winding, but quotes a case where steam winding raised 816 foot-tons per one penny while 960 foot-tons were raised by electric winding.

The paper passed on to a consideration of safety devices, including those which provide against failure of power supply and those which render harmless mistakes on the part of the driver. The first class usually consists of a solenoid placed across the stator supply leads in the case of a three-phaser, or across the exciter bus bars in the case of a Ward-Leonard engine. Failure of supply releasing the core operates, through a trigger, a heavy weight, the fall of which simultaneously applies the brakes through a retarding arrangement, and either opens the supply switch for a three-phaser or opens the field circuit of the generator in a Ward-Leonard. An overload in the generator and winding motor armature circuit is usually arranged to operate the same device by means of a relay.

Considerable varieties of the second class exist, and they are generally worked from, or in conjunction with, the overwinding gear on the depth indicator. This may be of the dial form, or more often consist of two vertical screws rotated by chains driven from the drum shaft. The position of two nuts on these screws indicates the position of the cages in the shaft. In the limiting position the travelling nuts release a trigger, the power is cut off, and the brakes applied through the medium of a strong coiled spring or a heavy weight operating the safety device before-mentioned which takes care of failures of current. In another design two large cams are employed, one revolution or less of which corresponds to the full travel of the skip. The position of the control lever is limited by the shape of the profile of these cams, thereby limiting the acceleration at the beginning of the wind to a reasonable amount, and ensuring proper retardation at the end of the trip, together with release of the safety device and application of brakes in case of an overwind. Failure on the part of the driver to reduce speed when nearing the bank is taken care of in several ways. One very excellent device consists of a ball governor chain driven from the drum shaft which throws forward a catch to engage the upcoming nut on the depth indicator screw, which represents the rising cage. If the speed is high enough, the gear is tripped. Thus security is given that if the speed exceeds a definite limit at a pre-determined point below the shaft collar, the control is taken out of the driver's hands and the engine stopped. Further, the same centrifugal ball governor regulates, by means of a sliding sleeve, the position of the point at which the overwinding gear comes into action. That is to say, the higher the speed at which the bank is approached, the lower the point of automatic stoppage. In fact, electric control lends itself very readily to the applica-

tion of these and similar devices. Electric winders are as a rule fitted with more automatic safeguards than steam winders, and inherently these safeguards may be said to be simple and very reliable. The use of tail ropes with electric winders is very advantageous, and, as is well known, the trouble due to swaying in the shaft, which is a drawback to their use with steam engines, disappears with the perfectly even turning movement of the electric motor.

Experience so far goes to show that the liability of electric power supply to sudden failure introduces no element of risk into winding when properly designed appliances are used. The conditions of shaft sinking, however, call for special precautions against the possibility of stoppage during the time that elapses between the signal to start up and the drawing away of the bucket with the miners from the bottom. The provision of sufficient stored energy in a rotating flywheel to draw the bucket at least a few hundred feet away from the shaft bottom is the only method in use known to the writer. The flywheel may be an integral part of the motor generator in a Ward-Leonard engine, or be driven by a synchronous motor, which, on failure of the main supply, becomes a generator driven by the stored flywheel energy, and drives the winding motor in the case of a three-phase winder.

### BELGIAN ELECTRICAL MINING RULES

RECENTLY introduced regulations of the Ministry of Industry and Labour, published in the *Annales des Mines de Belgique*, and abstracted in the *Colliery Guardian*, forbid the use of electrical coal-cutters in fiery mines of "Class 3" in Belgium. In mines of less fiery nature, Classes 1 and 2, they are allowed under the following conditions:—Three-phase squirrel-cage motors only may be used, with voltage between phases not exceeding 250 volts. All motors are to be completely enclosed, and trailing cables, which are to have a minimum insulation resistance of 500 megohms, must be sheathed strongly and contain an earth conductor. The contacts connecting the trailing cables with the mains must be fitted with circuit-breakers, and arranged in such a way that they cannot be connected or disconnected until the current has been turned off. The circuit-breakers must be mounted in metal casings, filled with oil. The working of the cutting machines must be suspended directly if firedamp appears in any part of the working place. The taking of high-tension cables down intake airways for working coal-cutters through transformers is permitted, provided that the transformers are placed in well-ventilated fire-proof chambers, are oil immersed, contained in earthed metal cases, and provided with circuit-breakers on both the primary and secondary sides. There are also certain regulations regarding junction boxes and the cables connecting the transformers with the trailing cables. In another rule the direct and permanent earthing of the neutral point of star-connected three-phase installations is prohibited, except in case of lightning arresters and similar apparatus.

**South Wales Branch of the Association of Mining Electrical Engineers.**—At a recent meeting of the South Wales Branch of the Western Section of the Association at Swansea, it was decided to form a separate West Wales Branch, of which Mr. M. H. Clarke was elected Hon. Secretary. A Paper by Mr. L. Tukes on the parallel running of alternators was read at the same meeting.

**North of England Branch of the Association of Mining Electrical Engineers.**—The arrangements for the remainder of the session include a smoking concert during January, and the following meetings: January 15th (Paper by Mr. W. Baxter on "Induction Motor Details"), February 19th (Paper by Mr. R. Nelson [H.M. Electrical Inspector of Mines]), March 19th (Paper by Mr. F. Milburn), April 9th (Paper by Mr. W. J. Fisher), April 30th (Paper by Mr. C. P. Palmer on "The Installation of Gas-driven Ventilating Plant at Felling Colliery"). There will also be some visits to works. All communications should be addressed to the Hon. Secretary, Mr. Leslie Robson, Milburn House, Newcastle-on-Tyne.

## AN ELECTRICAL ROLLING MILL INSTALLATION

THE undertaking of the Shelton Iron, Steel & Coal Co., Ltd., of Stoke-on-Trent, is of considerable extent, and includes mines, collieries, coke ovens, blast furnaces, and rolling mills. The main works is situated at Etruria, and the auxiliary works includes a forge at Shelton. The whole works are being gradually converted to electric drive, and owing to the courtesy of the British Westinghouse Electric & Manufacturing Co. we are able to describe some of these developments.

The Shelton works contains a forge and four mills, which were until recently steam driven partly from boilers using waste heat. By substituting electric drive for two of the smaller mills and the auxiliary machinery, it was estimated that a considerable financial benefit would result. An economical source of power is available in the exhaust steam from the reversing rolling mill engines at Etruria. The whole of the exhaust steam from these and four small auxiliary engines is passed through a grease separator, and a 36 in. riveted steel pipe, to a heat accumulator constructed to the design of Mr. P. J. Mitchell. This is capable of supplying steam to the turbine when running at full load, for periods of one minute during cessation in the supply

sq. in. section, supported by creosoted timber ordinary poles, and steel terminal poles, and provided with a galvanised steel wire cradling. Multiple gap lightning arresters are provided at each end of the line.

The condenser is of the Leblanc surface type, with a cooling surface of 5,500 sq. ft. A "Conqueror" centrifugal pump, made by W. H. Allen, Son & Co. (Bedford), driven by a 72-B.H.P. Westinghouse motor at 600 r.p.m., circulates the condensing water, and passes off to a Zylba natural draught cooling tower. The dry vacuum pump is of the Leblanc rotary valveless type, and is driven by a 24-h.p. Westinghouse motor at 720 r.p.m. The pump motors are controlled by Westinghouse Admiralty type control pillars.

The motors installed at the Etruria works are of various types and sizes, and perform many arduous duties, including the driving of the feed rolls, skids, and raising gear appertaining to the 32-in. mill, the main engines of which supply the steam for the mixed-pressure turbine. Other motors are applied to the driving of saws, cranes, drills, shears, pumps, &c. It is unnecessary to particularise all these. Railway-type motors are employed for the feed rolls and in similar situations. The Bowling saw, by which the finished stock is cut off to the desired lengths, is now driven by a 55-h.p. motor, shown in Fig. 2, which replaces a steam engine.

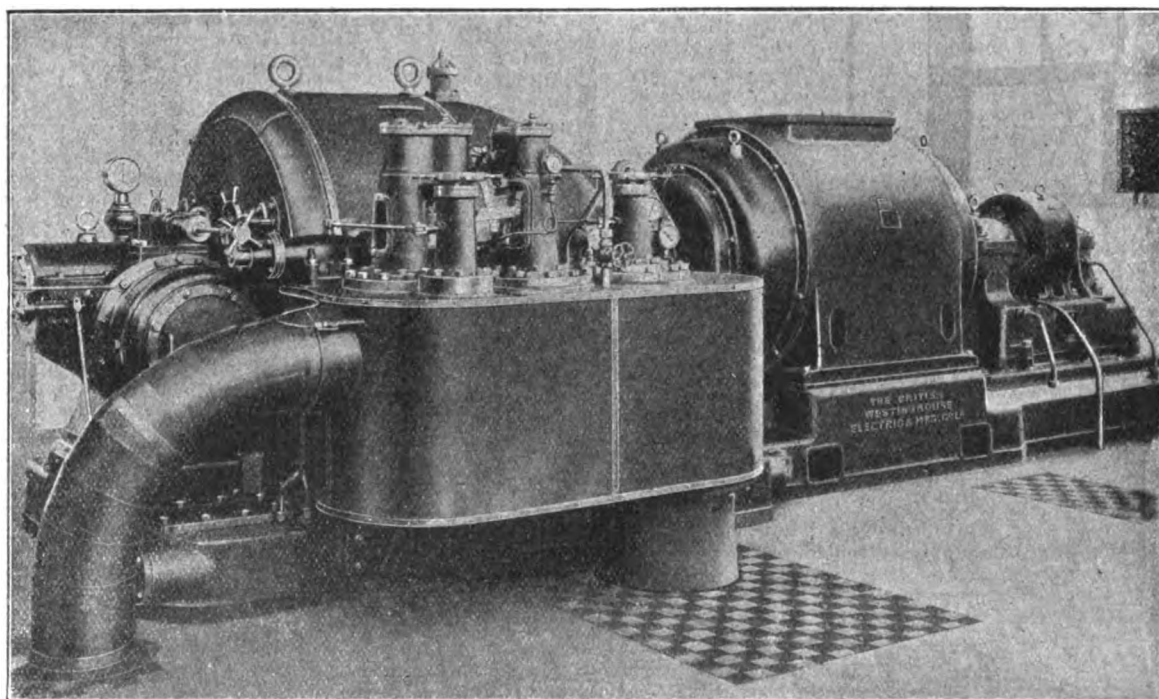


FIG. 1.—1,000-kw. MIXED PRESSURE WESTINGHOUSE IMPULSE TURBINE, AND 3-PHASE 50-CYCLE, 5,500-VOLT ALTERNATOR.

of exhaust steam from the mill engines. Steam from the accumulator is also supplied to a Wright's heater-softener. Since the supply of exhaust steam is very erratic, it often happens that the full demand of the turbine and the capacity of the accumulator are exceeded, when much steam would blow to waste. This is prevented as much as possible by some of the surplus steam being utilised to heat the feed water.

In the power house is a 1,000-kw. mixed pressure Westinghouse impulse turbine, running at 3,000 r.p.m., and driving a three-phase 50-cycle, 5,500-volt pipe-ventilated alternator, with a direct connected exciter having a radial commutator. The set is clearly shown in the photograph reproduced in Fig. 1. The alternator is fitted with muslin air filters arranged so that one can be cleaned whilst the other remains in place. The generator supplies current to the 8-panel black enamelled slate switchboard, through a three-core paper-insulated double-armoured cable. The voltage is kept steady by a Tirrill regulator. The high-tension switchgear is contained in cubicles in the basement, and is mechanically operated from the switchboard in the turbine room. The various 500-volt D.C. motors in the Etruria works are supplied with current from the 610-kw. 5,500/500-550-volt transformer and a 500-kw. 750-r.p.m. 500-volt rotary converter, provided with an exciter and A.C. booster mounted on the same shaft.

The high-tension alternating current is transmitted to a substation at the Shelton works, and the transmission line is composed of bare stranded aluminium conductors of 0.2

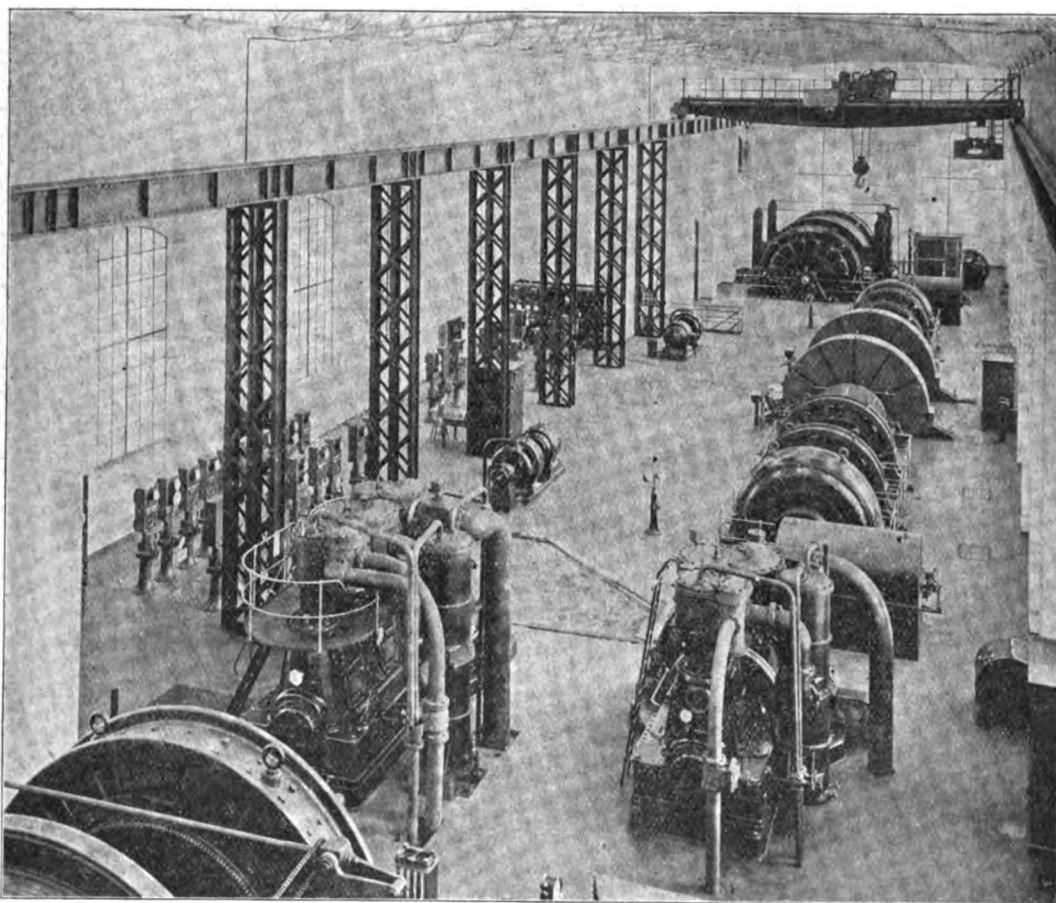
Other motors drive a girder-straightening press, and a three-spindle girder drill, and a further application of electric drive is presented by a  $\frac{1}{4}$ -mile ropeway, by which dirt from the washing and screening house for the coal for the coking plant is conveyed away. The coke oven gas is used to advantage in a gas-engine-driven electric-power plant. The gas has to be well washed, and is forced through coolers, tar extractors, and purifiers by two Bryan Donkin rotary blowers, driven at 95 r.p.m. through double reduction gearing made by the Power Plant Co., by two 20-h.p. Westinghouse motors running at 600 r.p.m.

The latest addition to the hydraulic plant equipment is a Mather & Platt centrifugal pump driven by a 72-B.H.P. Westinghouse compound-wound motor, running at speeds from 600 and 1,000 r.p.m. The refuse from an old forge tip is discharged by tip waggons hauled by an endless cable receiving its motion from a 20-h.p. Westinghouse motor, driving through reduction gear to the drum outside the shed, around which the haulage cable is taken.

At the Shelton works a substation receives the incoming three-phase, 50-cycle, 5,500-volt lines from the power house. The feeder cables are taken to a 7-panel switchboard, from which connections are made through a 500-kw. step-down transformer to a 500-kw. 500-volt. compound-wound Westinghouse rotary-converter running at 750 r.p.m. This is provided with a liquid starter for starting up from the D.C. side. The rotor of this machine is so designed that the rotor of the power-house converter can be put in its

# SIEMENS

## ELECTRIC WINDING ENGINES



TWO 4000 H.P. ELECTRIC WINDING ENGINES  
TWO SIEMENS-ILGNER FLYWHEEL CONVERTER SETS  
ONE 10,000 VOLT AND ONE 3000 VOLT SWITCHBOARD.

INSTALLED AT A COLLIERY IN SOUTH WALES.

### SIEMENS BROTHERS DYNAMO WORKS LIMITED.

#### Head Office:

QAXTON HOUSE, WESTMINSTER, S.W.  
Telephone: GERRARD 860  
Telegrams: "SIEMBRALOS VIC LONDON."

#### Supplies Dept. & Stores:

38 & 39, UPPER THAMES STREET, E.C.  
Telephone: LONDON WALL 8270.  
Telegrams: "SIEMOTOR CENT LONDON."

#### "Tantalum" Lamps & Fittings:

TYSSON STREET, DALSTON, N.E.  
Telephones: CENTRAL 8387/9 & DALSTON 2440.  
Telegrams: "SIEMODYN KINLAND LONDON."

#### Works: STAFFORD.

#### BRANCHES:

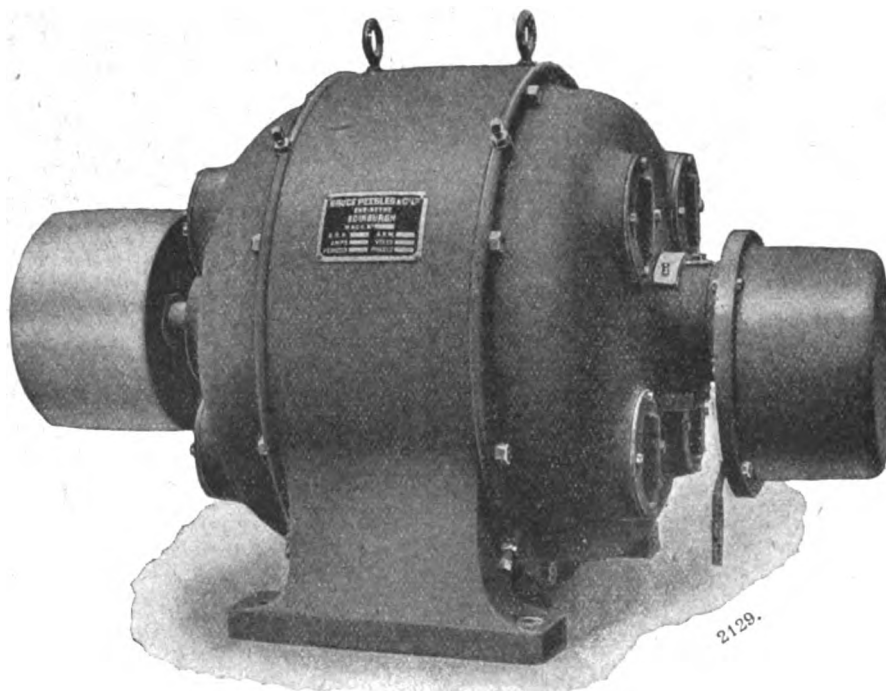
AUCKLAND (N.Z.)	CALCUTTA	DURBAN	MANCHESTER	OSAKA	SHANGHAI	TOKYO
BIRMINGHAM	CAPE TOWN	GLASGOW	MELBOURNE	PEKIN	SHEFFIELD	TORONTO
BOMBAY	CARDIFF	HONG KONG	MEXICO	PENANG	SINGAPORE	VALPARAISO
BRISTOL	DELHI	JOHANNESBURG	MONTREAL	RANGOON	SOUTHAMPTON	WELLINGTON (N.Z.)
BUENOS AYRES	DUNEDIN (N.Z.)	MADRAS	NEWCASTLE	RIO DE JANEIRO	SYDNEY	WINNIPEG

When corresponding with Advertisers, please mention "Electrical Engineering."

# PEEBLES— — MINING PLANT.

A.C. & D.C. MOTORS to suit

the Home Office requirements for FIERY or NON-FIERY MINES



Peebles Standard Totally Enclosed Slip-Ring Induction Motor.

## **BRUCE PEEBLES & CO. LTD.**

**ENGINEERS**

**EDINBURGH**

LONDON: Hastings House, Norfolk Street, Strand, W.C.

BIRMINGHAM: Exchange Buildings, Stephenson Place.

MANCHESTER: 30, Cross Street.

WHEN CORRESPONDING WITH ADVERTISERS, PLEASE MENTION "ELECTRICAL ENGINEERING."



place in case of a breakdown. The machine is capable of a 25 per cent. overload for two hours, and usually runs from Monday mornings to Saturday afternoons without a stop. In the substation is also a 350-B.H.P., 500-volt, 450 to 720 r.p.m. compound-wound variable-speed D.C. motor, which drives the 10-in. mill. The motor shaft is provided with three bearings, and carries a 3-ft. 6-in. rope pulley for 12 1½-in. cotton ropes. A liquid starter placed outside the building is provided for the motor, and the speed is variable by a shunt field rheostat. The rope flywheel of the mill is 10 ft. 6 in. in diameter, and weighs 10 tons, the speed being 150 to 240 r.p.m. The mill has two three-high stands, and two stands of two-high rolls, and produces chiefly light stock and notched steel bars, such as are used in ferro-concrete work. The rope drive is completely closed off from the interior of the substation by steel plate guards, so that none of the fluffy matter from the cotton ropes can get into the windings. The power required to run the 10-in. mill light is 50 to 90 kilowatts. The motor driving the 12-in. mill is similar to the above machine, except that it is fitted

## EXAMINATIONS FOR MINING ELECTRICAL ENGINEERS' CERTIFICATES IN SOUTH AFRICA

THE rules for the conduct of examinations for mechanical and electrical engineers' certificates of competency under the South African Mines and Works Act, 1911, are printed in the Transactions of the South African Institute of Electrical Engineers. These examinations are held periodically, at Johannesburg or elsewhere, and application forms can be obtained from the Secretary to the Commission of Examiners, P.O. Box 1182 Johannesburg. Candidates must be over twenty-five years of age. A fee of £3 is required, a proof of good character and apprenticeship or equivalent experience. The examination is partly oral and partly in writing, and in the case of electrical engineers to take charge of machinery in mines embraces the following subjects:—Legal knowledge (certain portions of the Mines and Works Act and Regulations thereunder), strength of materials, power plant, driven machinery and mechanical appliances (including shop equipment and machine tools, lifting and conveying machinery,

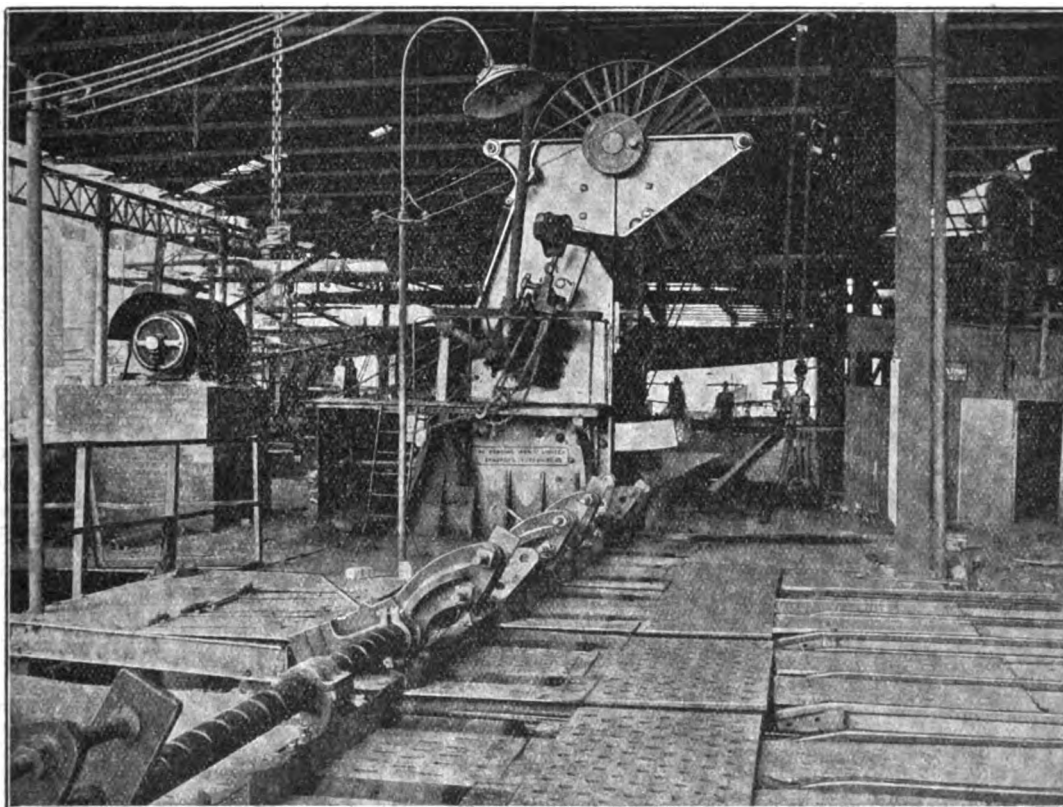


FIG. 2.—HOT SAW DRIVEN BY 55-H.P. WESTINGHOUSE MOTOR; ALSO FINISHING ROLLS, FEED ROLLS, SKIDS, &C., OF 32-IN. MILL, ALL OF WHICH ARE MOTOR DRIVEN.

with a 36-in. pulley. This drives the crankshaft of the displaced engine by 12 ropes, the rope pulley on the engine crankshaft being 14 ft. 6 in. in diameter, and weighing 7 tons. The engine flywheel is left in place, and weighs 15 tons, all that is disconnected being the connecting rod big end and the eccentric strap. The engine shaft is driven at 90 to 150 r.p.m., and operates one stand of three high bolting rolls, and one stand of finishing rolls which may be worked either two or three high. The power required to run the 12-in. mill light is 45 to 80 kilowatts. The adoption of the rope drive keeps down the cost of the equipment, owing to the high speed of the motor, and the two motors can thus be interchangeable. There are a number of small Westinghouse motors scattered about the Shelton works, running on the 500-volt. D.C. circuit. These replace steam drives in the majority of cases in which they are supplied to such machines as saws, shears, hoists, and pumps.

The cost per unit of electricity generated, over a period of six months working, are as follows: Wages, 0.0331d.; stores, 0.0137d.; fuel, 0.0638d.; repairs, nil; total, 0.1106d. These figures are exclusive of interest on capital charges and depreciation. The cost for fuel is based on the average time which the turbine ran on live steam alone. The total number of units generated in this period was 2,080,000, so that the operating costs for the 1,000-kw. set may be taken at being approximately £1928.66 per annum.

pumping plant and mechanical power transmission), advanced electrotechnics (including practical electrical units, properties of conducting and insulating materials, generation of electricity, measurements and measuring instruments, primary and secondary batteries, transmission, transformation and distribution, application of electricity to power, lighting, signalling and other requirements), mining plant (including winding plant and ropes, production and use of compressed air, mine ventilation and metallurgical plant).

**A Prosecution under the Special Rules.**—An appeal was heard by the Lord Chief Justice and Lords Justices Coleridge and Rowlatt, on December 16th, against a decision of the Gateshead magistrates. The case before the magistrates was reported in ELECTRICAL ENGINEERING IN MINES, August 1st last, page XLV., and was brought by Mr. J. B. Atkinson (Inspector of Mines) against Mr. H. M. Imrie, Manager of Chopwell Colliery, who was charged with neglecting to earth a switch-box as required by the Rules. A man has received a fatal shock from the switch-cover. The magistrates had refused to convict, and the present appeal was brought by the Inspector. The case turns on the interpretation of the Rules, which are not enforceable as regards construction until 1920. The prosecution argue that earthing the switch is not construction, and does not come under this exemption; but the respondent holds that the earthing, which would entail running a new cable to the surface, is "construction," and cannot be enforced before 1920. Their lordships reserved judgment.



**THE**  
**UNION CABLE**  
**COMPANY, LTD.**  
**for**  
**BITUMEN**  
**INSULATED**  
**CABLES**  
**DAGENHAM DOCK,**  
**ESSEX.**

### ELECTRICITY IN MINES: HOME OFFICE REPORT

**PART II.** of the General Report on Mines and Quarries for 1911, by the Chief Inspector of Mines, which has only just been issued, includes a report by Mr. R. Nelson (H.M. Electrical Inspector of Mines). It is to be regretted that there should be so much delay in issuing these reports to the public.

Electricity was newly introduced into 46 mines during 1911, as compared with 40 in 1910. Scotland was responsible for 20 and South Wales for 13, while in the York and North Midland, and the Manchester and Ireland districts, there were no new installations. The particulars available show that the high-pressure A.C. system was introduced into five mines, the medium-pressure A.C. system into 11, the medium-pressure D.C. system into 13, and the low-pressure D.C. system into four. In the latter case, the current was used for lighting only.

**The Possible Use of Wireless Telegraphy.**—The report states that "the possibility of the application of wireless telegraphy to mines opens out an interesting field for speculation, and it is obvious that it might prove a valuable aid during rescue operations." In the most recent experiments between the surface and a depth of 800 ft., carried out by the Helsby Wireless Telegraph Co. and their representatives, Messrs. Sharman and Webb, there was not the slightest difficulty in hearing the Morse code at either end. The apparatus is to be further experimented with.

**Fatal Accidents.**—During the year 1911 there were 12 accidents, resulting in 12 deaths, directly attributable to the use of electricity in and about mines, whereas in 1910 there were 21 accidents, causing 21 deaths. Of the 12 fatal accidents in 1911, 11 were due to shock and one to an ignition of fire-damp in a motor room. It is thought that the last-mentioned was due to some temporary derangement of the ventilation (the leaving open of a door), causing an accumulation of gas in the motor room, which was near some old workings, and that this gas was ignited by the arcing at the surface of a liquid controller. Of the shock accidents, two took place on the surface and nine below ground. One of those on the surface was on a low and the other on a 500-volt lighting circuit, and in the latter case there is "no doubt that the deceased was either himself arranging a practical joke or that he had been the victim of one." All the underground accidents occurred on medium-pressure systems, two being on direct current. No less than six were caused by contact with outer coverings of apparatus live through the absence of, or an inefficient, earth

connection, and three were the result of defective insulation of the cable system. Since January 1st, 1905, electric shock below ground has been responsible for 62 recorded accidents and 64 deaths. The percentage of accidents due to electricity is small, however, for during 1911 the fatal accidents from electricity were only one per cent. of the fatal accidents due to all causes. Of the accidents on low-pressure three-phase systems, four were on completely insulated systems and four on systems with the neutral point earthed.

**Non-fatal Accidents.**—As in 1910, there were three fires reported to have been due to electricity. In one case Mr. Nelson thinks the most likely place of origin was at a trifurcating box for a three-core, lead-sheathed, paper-insulated cable. The ends of the cable were taped, but not sealed, and neither the lead sheath nor the armouring was earthed. In another case, the fire was due to a skimpily-designed fuse box, which was safe if the fuse blew under a gradually increasing current, but not on the dead short which had occurred. The accidents due to shock numbered 41. In one instance the injured man recovered consciousness after the Sylvester method of artificial respiration had been continued for over three-quarters of an hour.

**Electric Safety Lamps.**—The number in use is given as 4,298, against 2,055 in 1910. The lead was taken by Durham with 2,073, while none were in use in the Midland and Southern District. Electric ignition of safety lamps increased from 310,457 in 1910 to 343,112 in 1911, the total number of lamps in use being 723,934.

**Coal-cutters.**—The total number of machines in use in 1911 was 998 driven by electricity, compared with 873 in 1910, and 1,148 driven by compressed air, compared with 1,086 in 1910.

**Shot-firing.**—Out of a total of over 44 million shots fired, nearly 20 million were fired electrically.

**Prosecutions.** There were nine prosecutions of owners and four convictions for offences relating to the installation and use of electricity. Nine workmen were also prosecuted for contravention of rules as to electricity, and all were convicted.

Further particulars under the various heads have already appeared in our columns from time to time, and in particular in the issues of August 1st, 1912, p. XLVI., and September 5th, 1912, p. LVII.

### ELECTRICAL MINING PATENTS OF DECEMBER

**T**HERE were only two Specifications published by the Patent Office during December which are of particular interest to mining electrical engineers, and both deal with miners' safety lamps. The first is No. 27,085/11, by G. Greanoff. The light is produced in the lower part of the lamp by two or more incandescent lamps fitted to the base of the accumulator box and enclosed by a glass cylinder. The ends of this cylinder are made airtight by washers, and the whole is held together by means of a hollow bolt in the centre of the cylinder. Air can be pumped into this space through a non-return valve on the lower end of the hollow bolt. Between the upper end of the bolt and the under side of the accumulator box is a rubber diaphragm on which is mounted a metal disc. The air pressure causes this disc to bridge across two metallic points in the lamp accumulator circuit, so that when the pressure falls by fracture of the cylinder or otherwise, the circuit is instantly interrupted. One figure. No. 28,420/11, by D. Morrison, describes an accumulator and lamp set suitable for mounting in existing safety lamps in place of the gauze, lamp and oil container. The accumulator takes the place of the gauze and the flame in existing lamps. The circuit is controlled through a safety switch. Four figures.

**The Association of Mining Electrical Engineers, West of Scotland Branch.**—The monthly meeting of this branch was held on December 14th in the Royal Technical College, Glasgow. The chair was occupied by Mr. Matthew Brown, President. An interesting Paper was read by Mr. S. A. Simon on "Variable Speed A.C. Motors." The author explained that one of the chief arguments raised against the more extended use of three-phase alternating current had been the difficulty of obtaining efficient speed control of the motors. He did not believe in the universal adoption of three-phase alternating current, knowing that there are many applications of electrical power for which direct current is undeniably superior. The Paper was illustrated by lantern slides, and gave rise to a discussion which was taken part in by Messrs. R. H. Willis, George Stevenson, the President, and others.

FOR STREET LIGHTING IN THE CITY OF  
**LONDON**  
 WE ARE DOING 325 SETS OF SPAN WIRE LOWERING GEAR.  
 THE LONDON ELECTRIC FIRM, CROYDON.

## ELECTRIC RESISTANCE WELDING

**A** PAPER on electric welding by the resistance method, by Mr. P. Bucher, was read and discussed at a meeting of the Manchester Local Section of the Institution of Electrical Engineers on Dec. 17th. The author pointed out various disadvantages of welding methods in which the heat is applied externally, such as by the blacksmith's fire, the electric arc and oxygen blowpipes, including risks of overheating, and, in the latter cases, the glare produced. In the resistance method, the heat is generated within the pieces themselves, and, as the point of highest resistance is the joint, the maximum temperature is attained just where it is wanted. As to the source of current, special arrangements, such as motor-generators, have to be adopted where single-phase mains are not available. When current is taken direct from public mains, the sudden variations required by large welders are apt to give trouble, so that the adoption of a regulating choking coil is advisable to avoid sudden rushes.

The current supplied is transformed down to about 2 volts, and the transformer in almost every case forms part of the machine. The secondary winding takes the form of a copper casting corresponding to a single turn, and is fitted with suitable means for transmitting the current to the pieces which are to be welded. In the case of butt or end-to-end welding they generally take the form of clamps with jaws, which are either left plain, for job or miscellaneous work, or are fashioned to suit the section of the stuff for repetition work. These clamps are locked on the pieces either by hand or power devices. In the case of spot-welding the electrodes take the shape of truncated cones, and the current is only passed through a small circular spot—that is, only through a small percentage of the total area in contact. The method of working is in all cases the same. The pieces to be joined are gripped in the clamps or placed between the electrodes and brought into contact. The primary circuit is closed either by an independent act of the attendant or automatically by the machine. The heavy current flowing through the joint heats it up at once, and welding temperature is reached very rapidly. Simultaneously with the interruption of current and the cessation of the heating comes the upsetting or shutting of the weld by continuing or increasing the mechanical pressure which was first used to bring the two parts into contact. This pressure in butt-welding raises a lump or burr. Large pieces which retain the heat sufficiently long can be taken out of the clamps and swaged down under the hammer. Small pieces cool down too quickly to allow of this, and the burr is either ground or filed off. There are, however, machines with a swaging device built in. A similar effect is produced in spot-welding, and some of the metal is extruded between the two sheets joined, driving them slightly apart. This means that spot-welding cannot be relied upon to make a water- or gas-tight joint. If that type of joint is required, then the cone-shaped electrode of the spot-welder must be replaced by the roller of the seam-welder.

The main field of resistance welding is not so much jobbing, where arc and hot-flame welding reign supreme, but repetition work, where it scores immensely by virtue of its simplicity, accuracy, reliability, speed, and economy. For example, No. 3 S.W.G. chain links have been welded at the rate of ten to fifteen per minute or thirty to forty thousand per week, with a consumption of 737 kw.-hour per week. Again, spot-welders on miscellaneous hollow-ware can make about thirty-five thousand welds per machine per week, using 1 to 1.5 kw.-hours per thousand welds.

Results of tests at the National Physical Laboratory have shown an average tensile strength, expressed in percentage of the tensile strength of unwelded material, of 89.2 and 93.4 per electrically welded iron and steel respectively, against 89.3 and 81.6 for corresponding hand-welded material. It was also found that more uniform results were obtained by electric welding. High carbon steel can be welded up to about 0.8 per cent. carbon, but the results are not so satisfactory as in mild steel. When high carbon wire is welded the heat of the weld is a very short one, and the bulk of the adjoining cold metal seems to have a quenching effect on the steel, so that the wire when taken from the machine is glass-hard at the joint and easily snaps. To overcome this the wire must be locally annealed, and this treatment weakens the wire. The strength of a welded high carbon wire is about 60 to 70 per cent. of the unwelded wire. Pure copper can be butt-welded satisfactorily, and so can most of the brasses unless the percentage of zinc in them is too high, when the weld becomes brittle. Nickel and most of its alloys weld well; so do aluminium, silver, gold, platinum, and iridium. Only iron and mild steel lend themselves to spot-welding.

With brass and aluminium the process is not very reliable nor economical on account of the heavy current required.

## DISCUSSION.

Prof. E. W. MARCHANT (Liverpool University) gave some particulars of tests he had made to determine the amount of energy expended in making welds in iron wire, which he found to vary from 0.33 kw.-hours per 1,000 welds for 5/32 in. wire to 3 kw.-hours for 5/16 in. wire. He thought the explanation of the rapid increase of energy consumed for the larger wires was to be found principally in the cooling effect of the vice-jaws. He thought regulation by a choking coil had the disadvantage of increasing the energy required to make a given weld. On a large system the rush of current would not be seriously objectionable.

Mr. A. E. MCKENZIE (Manchester Electricity Department) related his experience with electrically-welded superheater tubes. Desiring to increase the degree of superheat, and finding the cost of fitting entirely new tubes prohibitive, it was decided to experiment in the way of welding lengths on. Twelve sample welds were made, six being simple butt joints, and six joints made by scarfing the end of one tube into the other. These welds were carefully tested, and it was found that while the simple butt joints were practically perfect and gave tests almost as good as the solid tube, the scarfed joints gave breaking tests only about half as good. Acting on results of these sample welds, the tubes in one superheater were altered, involving 80 butt welds, each of which was tested at 1,000 lb. Only about one joint was found defective and required to be remade. After this superheater had been in service six months, three more were similarly altered, and they have now all been giving very satisfactory service for about two years.

Mr. W. CRAMP (Municipal Technical School, Manchester) suggested that, as the pressure required was only about 2 volts continuous current, welding might be carried out by a cheap form of homopolar generator running at a moderate speed. He wished to know whether any difference had been found between the strength of welds made by direct and alternating currents, as he suspected that some electrochemical action might take place. The energy increase with the size of the work was accounted for partly by the larger heat capacity.

Mr. K. M. FAYE-HANSEN (British Westinghouse Co.) mentioned that some makers preferred to use laminated strips for the heavy current coils of the welders instead of the castings mentioned.

Mr. R. G. CUNLIFFE (Manchester Corporation Tramways) drew attention to the method of welding tramway rails, in which use is made of direct current obtained from a portable motor-generator set, driven off the trolley wires. Plates of metal were welded to the rails under considerable pressure by the passage of the current. The joints so made were expected to give a conductivity equal to the solid rail.

Mr. J. FRITH pointed out that in chain welders the short circuit through the link must have the effect of increasing the energy consumption. For direct current welding he considered that the Rosenberg constant current generator was an excellent machine.

Mr. W. POLLARD DIGBY (communicated) sent several very interesting slides showing the micro-structure characteristic of certain welds by different methods. Each weld showed under the microscope such structural features as to make it possible to say which method of welding was employed. He referred to the long splintered fracture given by welded steel bars, and stated that with all processes they showed a certain amount of oxydation. Welds made by the "resistance" method, and oxy-acetylene welds did not exhibit such, but all arc welds showed it, and often as magnetic oxide, which gave a peculiar needle-like structure when examined under the microscope.

Dr. ROSENBERG, who presided, also spoke, and the author replied briefly.

### Annual Dinner of the Newcastle Local Section of the Institution of Electrical Engineers.

About 120 were present at this dinner, which was held on December 20th, with Mr. W. C. Mountain in the chair. In the course of a speech proposing the toast of the Lord Mayor, the Sheriff and the Corporation of Newcastle, Mr. C. Faraday Proctor gave some particulars of the development of the local supply company and mentioned that at least eight new industries were projected in the district, as a result of the available cheap supply of power. Waste heat was also being utilised to a very large extent, and he understood that the Cleveland and Durham Co. obtained no less than 90 per cent. of their power from this source. Mr. R. Nelson (H.M. Electrical Inspector of Mines) proposed the Institution, and Mr. W. Duddell (President), in his reply, sketched out the sphere of action of the new Research Committee and the Nomenclature Committee. A combined toast of the various Local Institutions, &c., was proposed by Mr. C. S. Vesey Brown and suitably responded to. The toast of the Newcastle Local Section was proposed by Mr. Judd and replied to by Mr. Mountain, who referred among other matters to the pioneering days of electricity in mines, and to the possibilities of waste heat power production.

## THE TURBO-CONVERTER

At the Meeting of the Scottish Local Section of the Institution of Electrical Engineers on Tuesday, Dec. 10th, 1912, with Mr. Wm. McWhirter presiding, the paper by Mr. F. Creedy on "The Turbo-generator: A High-speed Direct-current Unit" was read and discussed. A report of the proceedings at Manchester, where the paper was first read, will be found in *ELECTRICAL ENGINEERING*, Dec. 26th, 1912, p. 719.

Prof. F. G. BAILY (Heriott Watt College) referred to the excessive cost of installation. It might be advisable in general practice, he thought, to increase the size of the ordinary machine and to sacrifice the facilities for the more perfect commutation. To a certain extent the application of Mr. Mavor's spinner idea defeated its object by all its influence being applied on the same line, thus endeavouring to increase the circumference and reduce the speed, besides the loss of a great deal of commutator velocity.

Mr. J. A. ROBERTSON (Burgh Electrical Engineer, Greenock) mentioned a 1,000-kw. direct-current turbo-generator with armature and carbon brushes, which has been running for two years without the brushes requiring renewal once during that time.

Mr. F. A. NEWINGTON (City Electrical Engineer, Edinburgh) thought that reliability and convenience should be attained by methods of regulating electrical gearing in preference to mechanical gearing, especially for large-size machines.

Mr. BUNTING (Bruce, Peebles & Co.) asked if the contrivance had yet been manufactured and used commercially.

Mr. W. L. SPENCE (Glasgow) foresaw difficulties in oiling the bearings of the machine. The spinner idea, which is found in nearly all gears, is very seldom thoroughly satisfactory. He mentioned its use on lift gearing, where good efficiency was obtained, but the gearing was not a permanent success. He referred to his success with machine-cut gearing which worked quietly at high speeds due to the perfection in cutting and lubrication.

Mr. SAM MAVOR (Mavor and Coulson) preferred the spinner form of gearing to the other. The experienced builders of large marine turbines on the Clyde which his firm had communicated with all mentioned that in their turbine practice they had overcome mechanical difficulties much greater than were met with in this design.

Mr. CREEDY, in reply, said that he found mechanical engineers generally less conservative than electrical engineers, who sometimes failed to admit the utility of a device with which mechanical engineers are familiar. While gearing itself might be less expensive than the induction generator, there was a saving on the converter which was cheaper than the generator.

## THE EARTHING OF NEUTRALS IN THREE-PHASE SYSTEMS

THE following are the points brought out in the discussion on Mr. J. S. Peck's paper on "Earthed & Unearthed Neutrals on Alternating Current Systems," read before the Newcastle Local Section of the Institution of Electrical Engineers on Monday, Dec. 9th, 1912. The paper and the discussions in Manchester and London were abstracted in *ELECTRICAL ENGINEERING*, Dec. 5th, 1912, p. 677, and Dec. 19th, 1912, p. 706.

Mr. W. C. MOUNTAIN (Chairman) suggested that the discussion should be confined to the main object of the Paper, which applied to power-station work. From a colliery point of view, he was convinced that it was a mistake to earth the neutral, and he strongly objected to the provision of automatic devices which would have the effect of plunging the whole pit into darkness in the event of an earth occurring anywhere on the system. He thought that the resulting pandemonium would be worse than the effect of an earth which could be rectified at the first convenient opportunity. He considered that a simple leakage indicator was the best thing to instal.

Mr. C. VERNIER (Newcastle-on-Tyne Electric Supply Co.) was in favour of earthing the neutral. Disturbances on telephone circuits were almost entirely due to electrostatic induction, and with one phase earthed the whole electrostatic balance of the system was upset. For very high voltages—say between 80 and 120 kilovolts, it might be worth while to cut down the insulation to earth, especially where corona effects were present to take charge of pressure rises.

Prof. W. M. THORNTON (Armstrong College) put forward the suggestion with regard to surges that the real oscillations which break down the insulation of a system had their origin in the flame of the arc between phases, by reason of its capacity. He suggested that a choking coil was an ideal medium through which to earth generator neutrals, but perhaps considerations of cost made this impracticable. He had tested many wave forms in different power stations, but he had never come across two machines which had exactly the same wave shape, and the wave of any one machine varied with the excitation.

Mr. P. V. HUNTER (Merz & McLellan) thought that the ability to run with an insulated neutral tended to slow repair work.

It was better to have faulty feeders located immediately by protective devices and repaired promptly. The suggestion to earth through a choke coil had the objection that the cost was excessive; the iron core of the coil had to be very large in order to avoid running at anything near saturation, as this introduced a peaky wave form which was very undesirable in a fault to earth. "Horn" spark gaps were liable to produce high-voltage oscillations.

Mr. F. O. HUNT suggested that choke coils in the neutral would be in series with the whole capacity of the system, and that this might give rise to resonance.

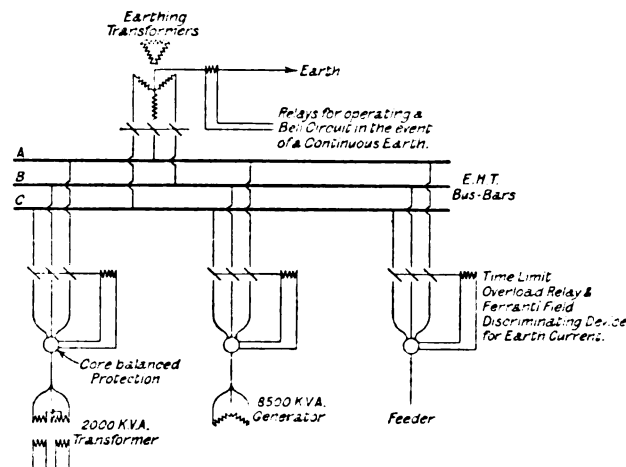
## CORRESPONDENCE

To the Editor of *ELECTRICAL ENGINEERING*.

SIR,—Mr. Peck's Paper upon earthed and unearthed neutrals on alternating-current systems has raised an interesting discussion. The majority of the speakers agree upon the question of earthing, but none of them appear to give reasons why the current should be limited or unlimited. The question of earthing, in Sheffield, had to be settled some eighteen months ago owing to the adoption of a three-phase supply, and I think the following information will be interesting to your readers.

The two- and three-phase systems are interconnected by Scott connected transformers, and the first point I had to decide was to provide an earth when the transformers were supplying three-phase current. The capacity of the transformers is 1,000 k.v.a. each, and at light loads they supplied three-phase current to several feeders. It was undesirable to earth the three-phase system through the neutral connections of the transformers, the chief reason being that, should an earth develop on any of the feeders, the overload relays on the transformers would operate, and thus cut off all the supply, including the earth connections without indicating the faulty feeder. Up to the present, earthing through a resistance on A.C. systems only follows a similar arrangement with a D.C. system at 500 volts.

The use of limiting devices now generally employed on E.H.T. three-phase systems causes an abnormal rise in pressure in



the neighbourhood of the fault. On the other hand, to allow 500 amperes to stray between the fault and the neutral point of the system is not beneficial either to gas, water and telephone companies' property or to the distribution system. It was therefore necessary to adopt some other method of overcoming these difficulties.

I give below the advantage of the arrangement that has been in use in Sheffield during the past eighteen months. The above diagram of connections is, I think, self-explanatory. The personal element of switching a working generator or transformer to earth is obviated. No expensive automatic selecting device is required. The earth current is limited to 51 amperes, which is sufficient current to trip the Ferranti-Field discriminating device. The earthing device was built by the British Electric Transformer Co., and is in the form of a transformer arranged with primary star connected and secondary delta connected. Having the secondary delta connected ensures that the neutral point on the primary is always at earth potential as proved by experiment. The earthing transformers are arranged to operate the trip coils of the respective switches in parallel with the overload and reverse relays. The units per hour taken by the earthing transformer are 1,250 watts. The capital cost is approximately £150.

Electric Supply Dept.,  
Sheffield, Dec. 21st, 1912.

Yours faithfully,  
S. E. FEDDEN,  
Manager.

## THE FIRE AT THE SALFORD ELECTRICITY WORKS

WE reported in our last issue the disastrous fire which caused serious interruption to the electrical supply at Salford, and was caused primarily by a spanner being dropped by a man working at the back of the traction switchboard and short-circuiting some of the connecting leads. The fire which actually resulted from this short was promptly extinguished by means of "Kyl-fyre" apparatus, and it was first thought the damage was slight. The traction-board runs down one side of the switchboard-room, the general board being on the other side. Between the two boards there is some iron grid work in the floor, down the centre of the room, and through this smoke and flames were observed to rise from the line room two or three minutes after the first fire was extinguished. This second fire grew rapidly and was the direct cause of the great damage done. Apparently the connecting cables between the two boards had caught fire as the result of the heavy short caused by the spanner, and in this way the whole switchboard-room became involved. The cables throughout were of "fire-resisting" type, consisting of a fireproof braiding over rubber insulation, and no doubt they would have withstood the heat had it been applied from without. As it was, however, it appears that the stranded conductors expanded outwards and burst the braiding, so exposing the rubber to the air, where, under the great heat from the conductors, it was set alight and burnt rapidly. No exact details are available as to the exact cause of the cables taking fire, but it would appear more likely that the bursting of them was caused by the severe mechanical stresses between neighbouring cables under the short-circuit, than that it was due simply to their expansion with the sudden application of heat.

It appears that the peak-load battery was on charge at the time, and that the whole time the fire was on it was discharging itself through the various shorts which developed and so fed the flames. The breakers cut out the machines and also a balancer set which was running at the far end of the station, so that the damage was confined to the switchboards.

Temporary connections have been made, and a supply is now being given as usual, but under considerable difficulty as regards the switching arrangements. New boards and connections will have to be installed, so that it will take some time before the damage is made good.

It has not yet been possible to obtain any definite official information as to the precise cause of the fire, but the above notes point to the most feasible explanation and accord with the sequence of events. In addition to the urgency for improvements in the lay-out and connection of switchboards, to which attention has already been drawn in our columns, two other lessons may be drawn from this accident: one, the necessity for definite interworking arrangements for power supply, and the other, that the safety tripping switchgear used with large accumulator batteries should be carefully examined and tested to see that it is capable of acting with absolute reliability on an emergency.

## THE I.E.E. INDUSTRIAL COMMITTEE

ON p. 650 of our issue of November 21st we reported that a formal announcement had been made of the appointment of an Industrial Committee of the Institution of Electrical Engineers, and we published a full list of the members nominated to it. We are now able to give more definitely the precise functions of this Committee, which were decided upon by the Council of the Institution as long ago as March 28th last, by the passing of the following resolutions:

(1) That an Industrial Committee be appointed by the Council to which there shall be referred, for consideration and report, all industrial matters coming before the Council, and whose business shall also be to report to the Council on any industrial matters which, in the opinion of the Committee, affect the electrical industry, and in respect of which the Institution might usefully take action.

(2) That the Committee consist of (a) 18 members drawn from the Members, Associate Members, and Associates of the Institution, at least six of whom shall be Members of the Council; (b) and, if so desired by the Council, other persons not exceeding six in number, connected with other organisations, and not necessarily members of the Institution.

(3) That the Chairman of the Committee be elected by the Council.

(4) That the Parliamentary Committee be merged into the Industrial Committee, and that the latter take over the work of the existing Parliamentary Committee.

(5) That, subject to the Council's approval on each occasion, the Committee arrange for special meetings of various branches of the electrical industry in the Institution building, at which

the chair shall be taken by a Chairman appointed by the Council.

(6) That the Council inform other bodies of the appointment and existence of the Committee and ask them to submit from time to time any matters which they consider should be taken up by the Institution.

Our readers will remember that some time ago, largely by the efforts of Mr. E. Garcke, a "Committee for the Protection of Electrical Interests" was formed, upon which were a number of leading men in the industry, and of which Mr. R. Borlase Matthews was appointed Honorary Secretary. The objects of this Committee were to deal with the more important commercial and industrial matters relating to the welfare of the industry, owing to the feeling which then existed that the Institution of Electrical Engineers was unable to deal with this aspect. Subsequently a suggestion was once more made to the Institution of Electrical Engineers that an industrial section or committee should be formed, and it will be seen that a number of the members of the older Committee have been nominated for the Industrial Committee of the Institution. The Committee for the Protection of Electrical Interests is now to be dissolved.

## CATALOGUES, PAMPHLETS, &c., RECEIVED

**STAGE PLUGS.**—A new design of ironclad waterproof 30-ampere stage plug is described in an illustrated leaflet from Tetley & Co. (Falcon Electrical Works, Salford). Among its special features are the screw boss for connecting up to the conduit. The plug is of metal, mica-insulated, and the current-carrying parts are mounted on fibre. The base is of porcelain, and the insulating brushes are screwed into the top.

*Readers desiring copies of catalogues or pamphlets should apply to the firms in question, referring to the notice in "Electrical Engineering."*

**RESISTANCE MATERIALS.**—The latest list of ribbon resistance alloys from the Schniewindt Electric Co. (40 and 41 Staniforth Street, Birmingham), gives prices of a large number of sizes and qualities, stocks of which are held at the above address. The Schniewindt Co. inform us that they will be pleased to send the list to those of our readers who are interested, and to quote their lowest prices upon receipt of inquiries. Deliveries of all sizes of nickel-chrome heating wire at low prices can be made from stock.

## CALENDARS AND SOUVENIRS FOR 1913

We are very pleased to receive a neat, useful desk calendar from the General Electric Co., Ltd. (67 Queen Victoria Street, E.C.). Each day is on a separate sheet, like an ordinary "tear-off" calendar, but the sheets can be turned over instead of being torn off, so that back dates can afterwards be consulted. Each sheet has space for memoranda, and as forward dates are also accessible by turning over the leaves, the block may be employed as an engagement book also.

A fine coloured view in Derbyshire is reproduced on the wall calendar for 1913 which we are very pleased to receive from the D.P. Battery Co., Ltd. (Bakewell, Derbyshire).

A strong and useful blotting pad has been sent us by the Hart Accumulator Co., Ltd. (Marshgate Lane, Stratford, E.).

Messrs. C. H. Blume, makers of insulating varnish, the White Building, Fitzalan Square, Sheffield, have sent us a very artistic hanging calendar, and also a neat memorandum book and diary of very convenient shape, made particularly thin for the pocket.

A pretty little pencil with a box of lead refills has been received from the Sun Electrical Co., Ltd., 118-120 Charing Cross Road, W.C. They tell us that they have sent one of these to all their friends, but if for any reason any of those sent have gone astray, they will be happy to forward another on application.

A neat morocco-bound pocket diary for 1913 is being presented to their friends by the Electric Construction Co., Wolverhampton.

Venner and Co. (6 Old Queen Street, Westminster), who always show originality at Christmas, have given us a Venner key-chain, which, to use their own words, "welcomes the coming and speeds the parting key."

The Armorduct Manufacturing Co., Ltd. (Farringdon Avenue, E.C.), have presented us with a bright blue office blotting-pad.

We have received a particularly pretty little table calendar decorated with a forget-me-not design from the St. Helen's Cable & Rubber Co., Ltd.

**Obituary.**—We regret to announce the death of Mr. Edward Tyer, one of the pioneers of the telegraph industry. His particular energies were devoted to improving railway telegraphs, and his method of electrically controlling railway signals is in extensive use all over the world.

The death has also taken place, at the early age of 46, of Mr. C. H. Gadsby, consulting electrical engineer.

## TRAMWAY FEEDERS

A PAPER by Messrs. J. G. and R. G. Cunliffe (Manchester Corporation Tramways Dept.), entitled "Some Problems in Traction Development—Tramway Feeding Networks," was read and discussed at a meeting of the Manchester Local Section of the Institution of Electrical Engineers on Dec. 3rd. The authors called attention to the increasing intensity of electric loading in kilowatts per mile in city tramways, and pointed out that the governing factor in feeder design is thus changed from overheating to pressure drop of an amount necessitating boosting. General arrangements of positive feeders were described, suitable to different conditions and degrees of loading. With light loading and few supply stations feeders may be supported by distributors, perhaps graded in size, but the simple feeding system without distributors is employed where there are several stations (as at Manchester and Liverpool). As the intensity of electrical loading increases, the length of the feeding section rapidly diminishes, and with very heavy loading, owing to the reluctance of engineers to employ feeders much larger than 1 sq. in. in cross-section, the simple feeder system of feeding is universally adopted, although, in many cases, with modifications, as at Chicago, where the feeder is continued throughout the whole length of the section and tapped on to the trolley wires at intervals of from three to six spans.

Little relief can be afforded long feeders by overcompounding, and likewise it is unsafe to operate a group of separate feeders from a common booster owing to the risk of abnormal pressure rise at the feed point of a temporarily lightly loaded section. For satisfactory operation a separate booster ought to be installed in each long and heavily loaded feeder. It is often advantageous to employ several short sub-feeders to each main feeder and to compensate the pressure drop in the main feeder alone by the booster.

With negative feeding it is impossible to divide the rails into definite feeding sections as is done in the case of the "line," and all negative feeders from any station must be operated in parallel, the difficulties encountered arising from the resulting lack of exact control of the load distribution in the rails. There can only be one point in the track on each side of the supply station at which there is no current flow. The balance point between the two sections thus formed can, for fixed loading conditions, be moved to some extent nearer to, or farther from, the station by increasing the resistance of the shorter negative feeders or by reducing that of the longer ones.

By the use of negative boosters the track may be divided into definite feeding sections almost as perfectly as is the line, and the flow of current in the rails may be controlled in a manner which is almost ideal, and the authors proceed to set forth their ideas of the correct principles of negative feeding. For a given rail drop the vagabond current should be proportional roughly to the square of the length of sub-section, so that it is of importance that such length should be a minimum. The ideal conditions attainable by the use of negative boosters are uniform absolute potential at the negative feed points, and hence no interchange of vagabond current, and minimum length of sub-section, and hence minimum vagabond current. The problem is—knowing the maximum and average intensities of loading at all points along the routes—to divide each route into negative feeding sections, each of such length that its own current flowing to its selected feed point shall split it up into two sub-sections having equal rail drop opposed in direction. The application of the negative booster is not likely to become sufficiently general to permit of the attainment of the ideal conditions, but the latter should be kept in mind. In the most general cases a booster is required either occasionally or continuously to operate a long negative feeder in parallel with shorter ones, and gives satisfaction provided the permissible maximum rail drop is not exceeded.

With regard to legislation, the authors hold that mere limitation of actual rail drop does not effect the desired object, but that there are two regulations in particular which would effectually prevent the use of the ideal system of negative boosting, viz., the British limit of 9 amperes per sq. in. in current density in the rails, and the present Chicago limit of steepness of potential gradient in the rails, which must not exceed 1 volt per 1,000 ft. in the down town sections and 1 volt per 700 ft. in other places. In conclusion, they say that legislation alone cannot provide complete protection against electrolysis. It must be assisted by careful construction. Metallic structures must not approach within 3 ft. of the rails (the German Commission recommends 1 metre), and in new construction or reconstruction care must be taken to

reduce to a minimum the number of poles which require to be bonded to the rails, as these pass down amongst the pipes beneath the footpath. Guard wires ought to be insulated from the poles and "earthed" by means of insulated cables passing down the interior of the poles to the rails, and poles carrying gas-lamps ought to have triple insulation rather than to be bonded to the track, as the latter is equivalent to bonding the pipes themselves to the track, which is bad practice.

### DISCUSSION.

Mr. B. WELBOURN (British Insulated & Helsby Cables, Ltd.) suggested that the expense in both positive and negative feeders would be much decreased by raising the pressure on the trolley wire, and that this would entail other advantages, including reduction in the number of substations necessary.

Mr. S. L. PEARCE (Chief Electrical Engineer, Manchester Corporation) said that the feeding problem was not of such vital importance in Manchester as in some other places, owing to the large number of substations. Again, boosting was not so necessary in mixed systems as in plain D.C. systems. With regard to the possibility of shifting the balance point between two sections, he thought that the effect of increasing the resistance of a short negative feeder and reducing that of a longer one would shift the balance point in the same direction. He did not think that extra copper should be put in parallel with the rails; it should rather be put into the feeders. The authors had set forth the advantages to be gained from the general use of negative boosters, and it seems that the strongest point for their use, apart from the ease of load distribution, was the fact that the pressure loss in the negative feeders was no longer subtracted from the negative section.

Mr. J. S. PECK (British Westinghouse Co.) spoke of the limited attention that had been paid to boosting in America, and suggested that a higher rail drop might be allowed by keeping all water pipes, &c., further from the rails.

Mr. H. A. RATCLIFFE (Manchester Electricity Department) pointed out some of the advantages of inserting resistance in short negative feeders.

Mr. E. M. HOLLINGSWORTH (Chief Electrical Engineer, St. Helens) had used negative boosting with success, and mentioned some trouble due to guard wires.

Mr. C. C. AITCHISON (Chief Electrical Engineer, Rochdale) spoke in favour of ammeters in the negative feeder circuits, and preferred separate feeders for a busy area to radiating sub-feeders.

Mr. A. G. COOPER (Chief Electrical Engineer, Colne) thought that the remedy lay rather with heavier rails than heavier feeders, as steel was relatively cheaper than copper.

Mr. R. ROWLANDS and Mr. C. G. L. PREECE also spoke, and Dr. E. ROSENBERG referred to the better efficiency of boosting over the resistance method. A communication was also read from Mr. H. E. YERBURY, and the authors replied briefly to some of the points raised.

**Conference on Heating and Cooking Tariffs.**—With reference to the note on page 725 of our last issue dealing with this matter, we are able to state that the scheme reported upon is an endeavour to arrange more or less level tariffs for heating and cooking purposes in the north-east corner of England. The electrical section of the Newcastle Chamber of Commerce took the matter up after the Newcastle Exhibition, and the towns concerned are Middlesbrough, Darlington, Stockton, West Hartlepool, and the supply authorities of Tees Side. These have been formed into two sections, north and south, who will discuss the matter from their own standpoints, and a combined meeting will then be held to arrange definite details. Up to the present not much progress has been made, but the movement is certainly one in the right direction.

**Pan-Russian Electrical Congress.**—The seventh Pan-Russian electrical conference is to be held in Moscow from January 8th to 18th.

**Illumination.**—An interesting Paper on the theory and practice of electrical illumination by Mr. J. G. A. Gerrits was read at a recent meeting of the Northampton Polytechnic Engineering Society. The author explained the relation between the units of candle-power, flux, and flux density, showed how the total watts necessary for the satisfactory illumination of a given room could be estimated, and dealt with the general functions of globes, reflectors, and shades.

**Lectures on Induction Motors.**—A special course of six advanced lectures dealing with induction motors will be given by Mr. J. K. Catterson Smith at the Finsbury Technical College (Leonard Street, City Road, E.C.) on Monday evenings, commencing January 27th. The syllabus covers both design and control, while demonstrations, testing, and experimental work, embracing the subjects dealt with in the lectures, will be arranged for in the laboratories. The fee for the course is 6s. Subsequent Monday evenings will extend the subject to other kinds of electric motors.



## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelopes.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,320.

A 3-phase, 500-volt, 50-cycle system of about 1,000 k.v.a. has a power factor of about 0.7, which it is desired to improve by installing a rotary condenser. Can any of your readers tell me the smallest possible size of synchronous motor which can be put in to bring the power factor of the whole system up to 0.9? I should also like to have a method of calculating this.

—Cos θ.

(Replies must be received not later than first post, Jan. 9th.)

### ANSWERS TO No. 1,318.

Describe the best and shortest method of testing Aron meters, and explain, if possible, why two meters of the Aron type, 2,000 amps, 550 volts, working on a traction load varying from 0 to 1,500 amps., show a difference between them when on the switchboard from 3 to 8 per cent. (from daily records), but when tested in the test room under constant load they are found to be correct to within  $1\frac{1}{2}$  per cent. It has also been found that when tested on 760 amps. constant load they both read 1.6 per cent. fast, whilst on 600 amps. both read slow. The meters when on the board were tried for stray fields, and found not to be affected.—N. P.

The first award (10s.) is made to CROMWELL for the reply given below in slightly abbreviated form:—

Aron meters reverse the current in the pressure winding periodically. As this would reverse the registration, the throw-over is arranged to insert an additional wheel in the registration gearing at the same time as it reverses the current; this causes the meter to continue to register in a forward direction. This is done to prevent the meter registering, due to a slightly incorrect adjustment of the pendulums, when no current is passing through the series coils of the meter and the pressure circuit is excited. Any forward registration over a period would, of course, be balanced by an equal backward registration during the following period—a "period" being the time taken from one reversal to the next. For this reason the tests must be taken over an even number of periods, otherwise any registration due to incorrect adjustment of the pendulum will be added to or subtracted from the units registered. Although over a sufficiently long period this would be negligible, it may cause a considerable percentage error when testing over a short period with a comparatively small number of units registered. The Aron Co. recommend a minimum registration of five revolutions of the first dial for any test. Most modern Aron meters have a period of ten minutes, i.e., the test must be taken over a period of twenty, or some multiple of twenty, minutes. It is not practicable to test these meters other than by the registering dials, so the shortest way is to run them at the various loads for the shortest even number of periods which will pass sufficient energy to give at least five revolutions of the first dial. Apart from these considerations, the same hints apply in the case of Aron clock meters as any other make of watt-hour meters.

With regard to the second part of the question, presumably the meters will be of the shunted type, and these meters have a fair temperature coefficient (about 0.15 per cent. per

degree F.); this may account for some of the difference if the meters are not working in the same temperature. Another possible source of error is the rapidly varying load. Reference to the behaviour of these meters on such a load will be found in Prof. D. Robertson's paper on electrical meters (*Journal of the I.E.E.*, Vol. 49, No. 215, p. 507), where he obtains some startling results, although, as he points out, the conditions are hardly likely to obtain in practice. A more probable source of error than either of these is to be found in the connections from the shunt to the meter, and the series circuit inside the meter. The series coils are wound on the pendulums in the shunted type, and this involves a number of connections; in the later types of meter these connections are soldered to avoid contact troubles. The full-load drop in the shunt is only about 0.2 volt, so a loose contact in any part of the shunted circuit is certain to cause serious errors. As the constant heating and cooling of parts may easily slacken some of the clamping screws it is advisable either to solder all connections in the shunted circuits or to tighten them all periodically. Another source of trouble is dirt getting between the commutator segments; this shunts a portion of the volt coil current and causes the meter to read low. It may easily be removed by a piece of sharpened peg-wood or a match stalk.

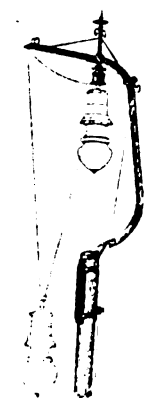
The second award (5s.) is made to M. M. who suggests substantially the same reasons.

## ANSWERS TO CORRESPONDENTS

J. W. MARTIN.—As you are over sixteen years of age and receive a weekly wage, you will come under the compulsory clause of the National Insurance Act. We are not aware of any approved society in connection with the electrical industry.

## ARC LAMP LOWERING GEAR

WE illustrate here an arc lamp carrier which is being put on the market by the London Electric Firm (George Street, Croydon). This is of the shadowless or "half-lyre" pattern and is designed to supersede at less cost the jibs and swan-necks, and old-time ladders and climbing irons, &c., for the lighting of railways, docks, harbours, quays, works, &c., &c. It is an adaptation of the firm's well-known patent "Lyre" shaped centre carrier and is adaptable for any size or kind of pole, wood, iron or concrete. It is provided with their automatic connector, and patent suspender; or, if a cheaper arrangement is desired, with their patent safety catch only, either plan ensuring that the weight of the lamp is positively taken by the carrier and not left on the hauling rope when in the burning position. In designing this new carrier attention has been paid to the desirability of obviating excessive swinging of the lamp in exposed positions during windy weather, and an efficient limiting device can be provided when necessary. The



winch used is of the firm's well-known patent self-sustaining type.

We are asked to state that the firm will send copies of their large catalogue of lamp-lowering and suspension equipment and self-sustaining winches for lamps, or other light weights, to any of our readers on request.

**Electrical Trades Benevolent Institution.**—This Institution will hold a Whist Drive at Slater's Restaurant, 50 Cannon Street, E.C., on Friday, January 17th, at 7 o'clock for 7.30. Tickets price 2s. 6d. each (inclusive of refreshment) may be obtained from Mr. C. H. Champion, of the Union Electric Co., Ltd., Park Street, Southwark, S.E.; Mr. B. E. Crowe, of the Sterling Telephone and Electric Co., Ltd., 200 Upper Thames Street, E.C.; Mr. A. J. Williams, of the General Electric Co., Ltd.; or from the Secretary, Mr. F. B. O. Hawes, 18 Park Mansions, Vauxhall Park, South Lambeth Road, S.W.

**New German Society of Illuminating Engineers.**—According to the *Elektrotechnische Zeitschrift*, it has been decided to found a Society of Illuminating Engineers in Berlin. A committee has been formed, and includes the following prominent members: Prof. E. Warburg, Chairman; Dr. Brodhun, of Berlin; Prof. H. Bunte, of Karlsruhe; Mr. G. Dettmar, Secretary of the Verband Deutscher Elektrotechniker; Prof. E. Hagen, Director of a Department of the Reichsanstalt; and Prof. Liebenthal, of Berlin. The first meeting of the new Society will be held next month.

## "ELECTRICAL ENGINEERING" PATENT RECORD

*(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)*

### Specifications Published Dec. 27, 1912

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications. Names in italics indicate communicators of inventions from abroad.

27,275/11. **Railway Signalling.** WESTINGHOUSE BRAKE CO., LTD., and H. G. BROWN. The signal indications are given by means of two or more lamps of different colours, or else they are arranged behind differently coloured screens or lenses. Alternating or pulsating current is used. The lamps giving the "danger" signal are permanently in circuit, with which is included one circuit of a controlling mechanism, another circuit of which is so inductively related to the first that the action of the latter, when energised, as regards permitting current to pass through the permanently connected indicating arrangements of the apparatus, is neutralised or otherwise rendered ineffective. Two figures.

27,276/11. **Railway Signalling.** WESTINGHOUSE BRAKE CO., LTD., and B. H. PETER. Current is supplied to a circuit constituted by the track rails, divided into block sections, a regulating resistance with a positive temperature coefficient being put in series with the source of supply or in series or parallel with a controlling relay connected across the track rails. As the signalling current is kept constant, a comparatively large decrease in the E.M.F. results between the track rails for a small decrease in the resistance between them due to the presence of a train in the block section. Moreover, an excessive current is not drawn from the current source when a block section is occupied.

29,318/11. **Storage Batteries.** W. CLARK (*Compagnie Internationale des Accumulateurs Vedeke*). Cells of high capacity and light weight are made by supporting the active material by a foraminous structure of insulating material provided with conducting wires for distributing the current throughout the mass of active material. Each electrode is enveloped in a pyroxylin porous sheath, foraminous separators being interposed between adjacent plates of opposite polarity. The whole assemblage of plates and separators is maintained under yielding pressure applied normal to the contiguous surfaces of the electrodes and separators. The construction of the active parts of the plates is described, and in order to increase the mechanical strength, nitrated cotton threads treated with acetone may be embedded in them, about 5 per cent. of caustic soda or potash is added, and a treatment with ammonia to get porous lead, yet of increased hardness, is applied. Five figures.

13,487/12. **A.C. Commutator Motor.** H. L. ZABRISKIE. A controller is arranged within the motor casing, and is actuated by a projecting handle. The motor is of the A.C. series commutating type. The field-magnet coils are each divided into main and auxiliary sections. The controller comprises a number of independent series of circularly arranged fixed contact studs, the corresponding studs of each series being bridged by a brush on an oscillatory controller arm. The auxiliary windings are connected to the contact studs so that corresponding sections are simultaneously thrown into and out of the field-magnet circuit. Arcing is prevented by putting the contact studs under the magnetic influence of the poles. The controller lever also actuates a spring-pressed brake lever, which acts on the driving pulley. Five figures.

### Specifications Published To-day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, E.C., at the price of 8d. each, post free. Summaries of some of the more important of these patents will appear in our next issue.

**Arc Lamps:** JANDUS ARC LAMP & ELECTRIC CO., and JONES [Means for transmitting rotary motion] 27,840/11; BURKITT, 4,417/12; LOW [Electrodes] 17,678/12.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** TAYLOR [Clearing faults on A.C. systems] 27,560/11; FODOR [Apparatus for connecting cables] 5,554/12; BULLERS, LTD., and TWISS [Insulators] 6,286/12.

**Dynamos and Motors:** SIEMENS BROS. DYNAMO WORKS, LTD. (*Siemens Schuckertwerke-Ges.*) [Speed regulation] 27,588/11; SCHLICK [Dynamos for vehicle lamps] 3,650/11; PODLESAN [Inductor alternator] 6,988/12.

**Electrometallurgy and Electrochemistry:** TESTRUP and RIGBY [Furnaces] 19,923/11; LOWY and MÜLLER [Non-porous deposits on metal sheets] 2,423/12; KNIPS [Sterilising water by ultra-violet light] 5,635/12.

**Ignition:** COWCHER, 29,326/11.

**Incandescent Lamps:** WEISSE [with bipartite bulbs] 8,058/12; WESTINGHOUSE METALLFADEN GLÜHLAMPENFABRIK GES. [Treatment of metals or alloys to render them ductile and malleable] 12,869/12; SMITH [Portable battery] 13,534/12.

**Instruments and Meters:** NORDFELDT [Prepayment attachments for current limiting] 27,801/11; SIEMENS BROS. & Co. (*Siemens & Halske Akt.-Ges.*) [Ohmmeters] 15,362/12.

**Switchgear, Fuses, and Fittings:** OLIVER [Automatic switch for lamps] 23,789/11; RANKIN and CHLORIDE ELECTRICAL STORAGE CO. [Regulating and equalising] 28,913/11; ANDERSON and FRITTS [Cable terminals] 13,111/12.

**Telephony and Telegraphy:** STELJES [Type-printing telegraphs] 20,106/11; [Typographic receivers] 20,107/11; NASH and WESTERN ELECTRIC CO. [Intercommunication telephones] 29,027/11; SCHNEIDER [Receiver for wireless] 18,086/12.

**Traction:** JONES [Indicating on vehicles their position on the route] 27,457/11; MALLOTT and MALLOTT [Safety gear for lifts, &c.] 5,611/12.

**Miscellaneous:** ARON and HARRISON [Clocks] 20,268/11; WILLS [Signalling or advertising] 21,734/11; PRIEST [Automatic fire-extinguishers] 27,163/11; LE MAITRE [Moving targets] 27,521/11; HOADLEY and KNIGHT [Mining] 28,388/11; A. C. COSSOR, LTD., and STENNING [Condenser] 6,987/12; BENNETT and FOSBROOKE [Signalling for screw-cutting lathes] 7,486/12; MOORE [Zinc for primary batteries] 8,767/12.

The following Specifications are open to Inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Arc Lamps:** KORTING & MATHIESEN AKT.-GES. [Solenoid coil for A.C.] 27,024/12.

**Dynamos and Motors:** CASE [Motor control] 27,837/12; Soc. S. T. A. R. (SYSTÈME DE TRACTION AUTO-REGULATEUR), 27,923/12.

**Ignition:** ROBERT BOSCH (FIRM OF) [Automatically adjusting time of] 24,665/12.

**Switchgear, &c.:** FUSS [Pressure regulators] 28,061/12.

**Telephony and Telegraphy:** BRUCE [Impulse transmitters] 24,409/12.

**Traction:** MIRAM [Electromagnetic crane] 27,922/12.

**Miscellaneous:** HENFELDT & KÜHNKE (FIRM OF) [Gyro-compasses] 27,739/12.

### Expiring and Expired Patents

The following Patent expires during the current week, after a life of fourteen years:—

214 of Jan. 4th, 1899. **Lock and Block Signalling.** L. DE M. G. FERREIRA and H. J. PRYCE. The following elements are employed in combination with a block instrument (preferably that described in specification No. 5,867/95), using reverse currents and with a lever by means of which the mechanical signals are operated; a special lock for the commutator handle of the block instrument; a polarised relay, the armature of which controls a local circuit; a tappet sliding in guides and connected with the signal lever, so as to move with it, and having a catch which forms the armature of an electromagnet in the local circuit controlled by the polarised relay; a commutator worked by the signal lever and a lock magnet; a contact upon the permanent way designed so that as a train passes over it it will close an electric circuit in which the commutator lock magnet is included. No signal can be cancelled without the simultaneous concurrence of the signalmen in both sections. There are nine claims and 27 figures.

The following are the more important Patents that have become void through non-payment of renewal fees.

**Arc Lamps:** SIEMENS BROS. DYNAMO WORKS and E. A. HOLMES [Turntable for searchlights] 20,201/07.

**Dynamos, Motors, and Transformers:** SIEMENS & HALSKE AKT.-GES. [Winding closed iron cores for transformers, &c.] 20,041/05.

**Electrometallurgy and Electrochemistry:** S. O. COWPER-COLES [To improve quality of electrically deposited copper, a little aluminium sulphate is added] 20,380/06.

**Incandescent Lamps:** A. LEDERER [Flashing process to indicate inequalities in cross section of squirted metallic filaments] 20,209/06; [Supports for metallic filaments] 20,210/06.

**Switchgear, Fuses, and Fittings:** J. A. J. HASLOP [Trueing-up or cleaning contacts] 20,460/07.

**Traction:** SIEMENS BROS. & Co. (*Siemens & Halske Akt.-Ges.*) [Electrically-controlled selecting signal rod or wire coupling] 20,312/06.

**Miscellaneous:** A. BLOCH [Burglar alarm] 20,456/06.

# ADAMS IGRANIC

Specialists in Electric Motor Starting and Control Gear

Adams M<sup>rs</sup> C. L. Balfour House, Finsbury Pavement, London, E.C. Works-Bedford.

## TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

The fact that the wireless equipment of the P. & O. liner *Narrung* was able to remain in operation throughout the exceptionally boisterous weather experienced in the Bay of Biscay on Saturday last, speaks volumes for the solidity of the mechanical and electrical construction, especially that of the aerial. We understand that the equipment is the standard of 1½ kw. emergency set supplied by the Marconi Co. The aerial is of the standard twin type and is 200 ft. long supported between the two masts.

In answer to a question in the House of Commons on Monday, the Postmaster-General stated that the reduction in rank of Mr. J. E. Taylor from staff engineer to assistant superintending engineer has been accompanied by a reduction in salary from £540 per annum to £500 per annum with £20 yearly increments.

An important judgment has been delivered in Paris declaring that the Marconi patents have been infringed by La Société Française Radio-Electrique, La Compagnie Générale Radio-Télégraphique, and La Société des Transports Maritimes à Vapeur. It is stated in the daily papers that these three companies have supplied all the wireless installations to all the French Government Departments, and also the equipment of the Eiffel Tower. The Court has ordered an investigation of accounts and the confiscation of all infringing apparatus.

The Eastern Telegraph Co. are sending Continental telegrams for China, Japan and the Philippines "via Kiachta" to avoid possible delay.—Communication with Bihe is restored. The Indo-European Co. repaired their lines while the direct line between Saigon and Bangkok was down on Siamese territory for a short while.—The Teheran-Meshed line was down and repaired on the 23rd ult.—The French Cable Co. lost the use of the Cayenne-Salinas section on Dec. 21st, and the Mexican Government stated that lines were down to Huajuapaz, Villahuita, Chapam, Arteaza, Aguililla, Coalcan, Coahuacan, Zapotiltic, Tonila, Penoles, Coyaz, Palomas, Ascension, Ojitos, Guadalupezalco and to all offices in the States of Colima and Guerrero except Taxco, Izula, Mexcala, Tlaxo and Ometepe.—The Servian Government advised that these offices were open to International service:—Terisovitch, Guilane, Gostivar, Kossovska, Kratovo, Kitchevo, Kriva-Palanka (Evruj-Palanka), Moumanovo (Komanova), Mitrovitza, Novi-Bazar, Padoujevo, Prechevo, Priboj (Preboi), Priepalji, Prileo, Pristina, Prizren (Prisrend), Scaplje (Uskub), Sjenitza, Tetovo, Veles (Kouprulu), Vout, Hiren, Bitolj (Monastir). Telegrams for these places must be sent via Servia.—The Montenegrin Government also notifies the opening of an office at Saint Jean de Medova (S. Giovanni de Medova).—On Dec 23rd the direct Saigon-Bangkok line was down again, traffic being sent via Pakse.—On Dec 24th messages between Indo-China and Siam were subject to great delay. The Bonny-Duala cable was down on the same day and telegrams for Kamerun had to be sent from Bonny by each postal opportunity.—On Christmas Eve the Eastern repaired the broken cables between Madras and Penang.—The Bulgarian office notifies the opening of an office at Slatina.—The Teheran-Meshed line was down again on Dec. 25th.—The Italian Administration announced on Dec. 27th the opening of offices at Agila, Azizia, Garian, Taxluma,

Tussabat, Zavia and Zuara in Tripoli.—Owing to recent storms it is believed that there are five Atlantic cables being attended to or requiring attention, the sufferers being the Anglo, Western Union and Direct Cos.—The Commercial Cable Co. had a broken cable at Christmas, but it is now restored.—The Bermuda route was restored on the 30th ult.

## ELECTRIC TRACTION NOTES

By a curious coincidence there were two slight mishaps on the London Underground Electric Railways early on Monday morning last. The more important was at 7.30 a.m. at Down Street Station on the Great Northern and Piccadilly Tube, when, by some means, a resistance on an east-bound train earthed, causing considerable arcing. The short-circuiting gear (a bar which is let down over the rails) was applied, but failed to open the breakers in the substation, so that the arcing was kept up until the substation switched off. The west-bound track was not affected and the complete service was resumed within an hour. The other accident occurred to a District train near Wimbledon about 8.30 a.m. It appears to have been entirely mechanical. A part of the carriage frame known as the equalising bar broke and fell on the positive rail. The train proceeded to the station and the defect was remedied as soon as it was possible to get at it. No trains could run for about an hour on this section.

Lieut.-Col. H. A. Yorke, Chief Inspecting Officer of Railways to the Board of Trade, has been knighted.

A new type of storage battery car, with no separate compartment for the motorman, has been introduced by the New York Railways Company. The car floor just clears the axles and a 10 in. step from the street to the car floor is attained. The forty-four lead cells are carried under the seats. They give 29,000 watt-hours at the four-hour rate on normal charge. The car weight without the battery is 360 lb. per seat, or 485 lb. with battery, the total weight with battery being 16,500 lb. There are two motors rated at 85 volts 40 amperes.

In connection with the deputation which recently waited upon the Postmaster-General, protesting against the necessity for putting up guard wires on tramway routes, the Postmaster-General has informed the secretary of the Tramways and Light Railways Association that he hopes very shortly to be able to lay certain proposals before the Association.

A company with a capital of £210,000 has been registered for working tramways in the City of Sao Paulo.

Mr. C. H. Merz, on his way home to England from Australia, where he has been advising in connection with the electrification of the Melbourne railways, will pay a visit to India with a view to reporting upon the conversion to electric traction of some of the Bombay railways.

Once again the danger of using gas on railway trains has been demonstrated. Lieut.-Col. Yorke, Chief Inspecting Officer of the Board of Trade, in the report (just issued) upon the railway disaster on the L. & N. W. Railway at Ditton Junction on Sept. 17th last, calls special attention to the fact that the burning of the carriages was due to five vehicles being lighted by gas. The London & North Western Railway Co., however, it should be pointed out, is increasing yearly the number of its coaches lighted by electricity. Colonel Yorke points out that the chief point upon which opinions differ as to the use of electricity and gas on trains is that of cost, but as, on the one hand, some responsible railway officers consider gas is the cheaper, and others believe that electricity is cheaper, the difference in cost cannot amount to much either way. So far as safety is concerned, concludes Colonel Yorke, there can hardly exist in anyone's mind a doubt that electricity is the better, and railway companies would be wise to recognise this fact and adopt electricity as the standard illuminant on all their main-line trains before they are compelled to do so by the pressure of public opinion.

## THE RECORD ELECTRICAL Co., Ltd.

LONDON OFFICE:  
CAXTON HOUSE,  
WESTMINSTER, S.W.

Telephone:  
3007 Victoria.  
Telegrams & Cablegrams:  
"Infusion,"  
London."

MEASURING  
INSTRUMENTS.

RECORD'S PATENT.

Write for Prices & Particulars.

WORKS:  
BROADHEATH,  
MANCHESTER.

Telephone:  
104 Altrincham.  
Telegrams & Cablegrams:  
"Infusion,"  
Altrincham."



## H. WEIDMANN, i. RAPPERSWIL, SWITZERLAND.



*Specialist in the Manufacture of—*  
**PRESSBOARD (Presspan)** in Sheets,  
Rolls and Tapes, Presspan-tubes and stampings.  
**BLACK PRESSPAN.**

**Amianite** (vulcanised Asbestos), **Coil  
Frames, Spools** for Dynamos, Motors, and  
Transformers; Boxes, etc.; Insulating Blocks;  
Tubes; Plates.

**Asbestos-Cement** in plates, arc shields  
for controllers, etc.

**Cornite** (high-tension material), Handles for  
Switch-gear and heating apparatus, controller  
insulation, moulded parts of all kinds.

**MICA & Substitutes.**  
**Japanese Paper** in rolls & tapes.  
**Insulating Pearls.**

*Artificial Leather Discs for friction drive.*  
**Oil-varnished Linen, Diagonal Tapes,**  
**Oil-varnished Silk & Paper.**  
**Transformer Spools.**

*Insulators for Electric Furnaces, Tramways,  
etc., etc.*



## DIE CAST *and* **FINISHED.**



Finished—that's the point.  
Finished surfaces, holes,  
slots, teeth, notches, screw-  
threads, etc., without  
machining. The accuracy  
of intricate parts is assured  
and will appeal to you  
no less than the substan-  
tial economies effected by

## "PRANA" DIE FINISHED CASTINGS.

Send for Booklet E.E.,  
mentioning this Paper, to

**AERATORS LTD., EDMONTON, LONDON.**

## ELECTRICAL PORCELAIN

OF  
HIGHEST QUALITY

APPLY TO

**JAMES MACINTYRE & CO., LTD.,**  
BURSLEM.

**PLATES  
MICANITE  
SEGMENTS**  
THE MICANITE & INSULATORS CO. LTD.  
OFFICES AND WORKS -  
WALTHAMSTOW, LONDON.E.

## BLAKE & INSULATING STAPLES

*Write for Samples and Prices.*

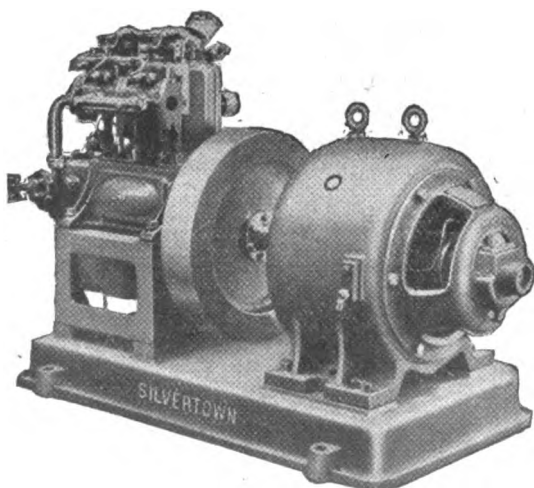
**MOSES & MITCHELL,**

Chiswell Works, 122-124, GOLDEN LANE, E.O.

**STEATITE  
INSULATORS**  
SUPPLIED  
FOR ALL KINDS OF  
ELECTRICAL WORK  
**WILLIAM SUGG & CO. LTD.**  
WESTMINSTER.

# SILVERTOWN

## PETROL-ELECTRIC & PARAFFIN-ELECTRIC PLANT



Specially designed for PRIVATE  
HOUSE, HOTEL, and SHIP  
LIGHTING and POWER.

**RELIABLE & ECONOMICAL.**

**ESTIMATES ON APPLICATION.**

THE  
**INDIA RUBBER, GUTTA PERCHA  
AND  
TELEGRAPH WORKS CO., Ltd.**

Head Offices:  
106, CANNON ST., LONDON, E.C.

Works:  
SILVERTOWN, LONDON, E.

## LOCAL NOTES

**Bolton:** *Large Electric Power Contract.*—A contract is to be entered into with Messrs. Dobson and Barlow, the large textile mill manufacturers, for a supply of electricity upon special terms.

**Brighton:** *Series Lighting.*—The scheme of series lighting with which experiments are to be made in Brighton, as mentioned on page 725 of our last issue, is that in place of the old 7½ to 8 ampere open type arc lamps which are at present used in the lesser important main thoroughfares, 8 ampere metallic filament lamps of about 400 c.p. and 48 volts will be fixed, which can be run five in series on the existing wiring and under the present conditions off the 230-volt network.

**Devizes:** *Electric Supply.*—A London firm have asked permission of the Council to put down electricity generating plant with a view to supplying current to the town.

**Dundee:** *A Large Power Installation.*—The Council have successfully negotiated with a large mill for the installation of electric motors which, when completed, will add some 600 to 700 h.p. to the mains.

**Street Lighting.**—Great satisfaction has been expressed with the street lighting of Dundee since the new G.E.C. flame arc lamps were installed in September.

**Farnworth:** *Street Lighting.*—Mr. A. J. Hutchinson, the Borough Electrical Engineer, has been instructed to make a trial of high candle-power incandescent lamps for street lighting purposes. It has been decided to replace each of the forty-five 10-ampere Brockie-Pell arc lamps by two 300-c.p. Osram drawn-wire 220-volt lamps, which will be fixed on the same posts by means of a two-armed bracket, each arm projecting some 36 in. from the pole. The old lamps were 1,200 c.p., and were fixed 27 ft. 9 in. from the ground. The incandescent lamps, although fixed on the same posts, have been lowered to 20 ft. from the ground.

**Hamilton:** *Loss of Traction Supply.*—With reference to the decision of the Lanarkshire Tramways Co. to terminate their agreement with the Council for a supply of current for tramway purposes, the Manager of the Company states that a more advantageous contract is being entered into with the Clyde Valley Electric Power Co. In the discussion in the Hamilton Council (reported on page 713 of our issue for December 19th), it had been stated that the contract with the Clyde Valley Co. was to be at the same price as that now paid to the Council.

**London:** *Marylebone: Electricity Accounts.*—The accounts of the electricity undertaking for the June quarter show that the credit balance as compared with the corresponding period of last year is reduced by £2,539. The expenditure upon publicity work has increased in consequence of extensive development propaganda.

**Stoke-on-Trent:** *Supply in Wolstanton.*—In the recent sums for further capital expenditure on the undertaking sanctioned by the Corporation is £600 for extending mains to certain portions of Wolstanton under an agreement with that Council. At the last meeting of the Corporation an effort was made to have this decision rescinded, the argument in favour of it being that it was the first duty of the Corporation to do all they can to improve the supply in their own district. It was pointed out, however, that, so far as the portions of Wolstanton in question are concerned, the Corporation are bound to give a supply in consequence of the existence of the agreement already referred to, and the motion to refer the matter back was lost.

**Stroud:** *Electric Lighting.*—Messrs. Seymour Williams and Co. of London, have placed an electric lighting scheme before the Council.

**Swansea:** *Electricity Undertaking.*—At the annual inspection of the Corporation electricity works, Colonel Sinclair, Chairman of the Tramways and Electric Light Committee, reviewed the progress of the undertaking during its twelve years' existence. He called attention to the fact that the profits have increased from £700 in the first year to £3,600 last year, notwithstanding that the assessment has gone up to £800. The capital expenditure now amounts to £185,000, whilst the amount invested in sinking fund is £38,000. In addition, £10,000 has been placed to reserve from profits, and £1,000 have been contributed to the relief of rates from the same source. In conclusion, Mr. C. A. L. Prusmann, the Borough Electrical Engineer, was warmly praised for his work in bringing about such good results.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

## GENERATING STATIONS, SUB-STATIONS, MAINS, &amp;c.

**Ashford.**—A new generating set is recommended by the Borough Electrical Engineer, at an estimated cost of £5,260.

**Atherton.**—Extra high tension switchboard, also high tension switchboard. Resident Electrical Engineer. January 29th.

**Basingstoke.**—The Council have adopted an electric light scheme reported upon by Mr. F. R. Phipps, the Borough Engineer, and approved by Mr. J. B. Morgan, Electrical Engineer at Horsham. The estimated cost is £12,590, and Diesel engines are to be used.

**Birmingham.**—The Electric Supply Committee have now approved the scheme recently referred to in our columns for the construction of a new power station at Saltley, which will have an ultimate capacity of 100,000 kw. The first section of 25,000 kw. is expected to take four years to complete at an estimated cost of about £250,000.

**Bridlington.**—The Council have now decided to apply for powers to borrow £5,000 for a new generating set.

**Chile.**—Tenders are invited for a concession to erect a power station to distribute electrical energy in Valparaiso. Specifications may be seen at the Chilean Legation, 48 Grosvenor Square, W., and tenders will be opened at Chile on September 10th, 1913.

**Darlington.**—Mr. J. R. P. Lunn, the Borough Electrical Engineer, reports that the demand upon the generating station has almost reached the maximum capacity. He therefore recommends an expenditure of £10,790 upon additional plant, £8,000 for mains and services, and £1,500 for static transformers. The new plant will include a 1,000-kw. generating set with condensing plant and an additional boiler.

**Darwen.**—Further extensions to the generating station are contemplated.

**Glasgow.**—Mr. W. W. Lackie, the City Electrical Engineer, has reported that the maximum demand this winter has been 28,000 kw., which is also the maximum which the station can meet. It is therefore essential to order at once new generating plant, which will be installed in one of the existing power stations and removed later to the new works at Dalmarnock. He recommends the purchase of two of the largest generating sets commercially available, and, as will be seen from our advertisement columns, the Electricity Committee have acquiesced in Mr. Lackie's recommendations.

In connection with the new works at Dalmarnock and the general extension of the electricity undertaking, the Secretary for Scotland has sanctioned the borrowing by the Corporation of a further sum of £500,000.

**Kettlewell.**—A local company with a capital of £625 has been formed for the purpose of lighting this village by electricity. Mr. W. P. Inman, of Kettlewell, is the secretary.

**Lincoln.**—750-kw. turbo-alternator, surface condenser, rotary converter, switchboard, water-tube boiler, coal-handling plant, &c. (See an advertisement on another page.)

**Norway.**—Particulars are available at the Board of Trade Intelligence Dept., 73 Basinghall Street, E.C., of an electric power scheme in a Norwegian mining district. Transmission will be carried out at 10,000 volts by overhead wires.

**South Africa.**—An electric lighting scheme costing £6,000 is to be put in hand at Ladybrand.—The Harrismith Council propose to spend £14,500 upon a water-power electric lighting scheme.—The Cape Town Council require quantities of electrical accessories, including high tension cable.

## WIRING

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Brighton.**—Electric fire alarm and private telephone service for the Guardians. Consulting Electrical Engineer, P. Coote, Central Chambers, North Street Quadrant.

**Chorley.**—A new cotton mill to accommodate 700 looms. Architects, Buckley and Catterall, Bradford.

**Durham.**—Infectious diseases hospital at Easington.

**Greenock.**—Consumptive sanatorium. Town Clerk.

**Huddersfield.**—Weaving shed, Tenter Croft Mills. Architects, J. Berry and Sons, 3 Market Place.

**Leeds.**—The Holbeck Board of Guardians have decided to instal electricity at their institution.

**Sevenoaks.**—Swimming baths.

### MISCELLANEOUS

**Buenos Aires.**—A concession has been applied for for a service of trolley omnibuses.

**Harwich.**—Four motor-driven centrifugal pumps with switchgear, &c. Consulting Engineer, T. Mills, Manoria, Melksham, Wilts.

**London: Islington.**—An estimate of £1,326 has been passed for the electric lighting of Tufnell Park Road.

### TENDERS RECEIVED AND ACCEPTED

**Balderton.**—The tenders for public electric lighting have been handed over to a sub-committee for consideration and report.

**Greenock.**—A tender for a 5,000-kw. turbo-generator has been accepted at £13,500.

**London: L.C.C.**—It has been decided to fit all the L.C.C. tramcars with an improved type of Venner sign for numbering them, at a cost of £1,570.

**Rhondda.**—The Rhondda Tramways Co. have placed an order for the equipment of their tramways with Chamberlain and Hookham meters.

### APPOINTMENTS AND PERSONAL NOTES

At the Great Central Hotel, Leeds, on Saturday, there was a very enthusiastic gathering on the occasion of bidding farewell to Mr. Harold Dickinson, who is relinquishing his post as Chief Electrical Engineer to the Leeds Corporation in order to take up the position of City Electrical Engineer at Liverpool. As we pointed out at the time of Mr. Dickinson's appointment, he has been Manager of the Leeds undertaking since 1898, when the Yorkshire House-to-House Company's business passed into the hands of the Corporation, and was also Manager of the business under the Company prior to that date. There were some 300 present on Saturday, and Mr. Dickinson was presented with a pair of silver electric lamp standards and a silver cake basket. In returning thanks for the gifts, Mr. Dickinson indulged in a few reminiscences. He well remembered coming to the old Company twenty years ago when they had a small portable engine driving a 20-kw. dynamo supplying about twenty customers. The undertaking now had a capacity of 15,400 kw. and the new set on order would increase it to 22,940 kw. He also remembered well the trouble with the old rubber mains. As to the future, he is one of those who believe we are on the eve of tremendous electrical developments, and looks forward to the time when a privately owned power plant in Leeds will be a novelty.

The following is the final list of applicants for the post of Electrical Engineer and Tramways Engineer to the Bexley Council:—T. J. Kendrew, deputy borough electrical engineer and tramways engineer, Southport; J. C. Whiteley, assistant manager Chatham and District Light Railway Co., Chatham; A. A. Watkins, engineer and manager, Musselburgh; H. P. Stokes, borough electrical engineer and tramways manager, Ilkeston, and J. C. Williams, borough electrical engineer and deputy general manager of tramways, Rotherham. Mr. H. P. Stokes has been selected for the post.

A recommendation has been made that the salary of Mr. J. E. Starkie, Borough Electrical Engineer at Burnley, be increased from £400 to £500 per annum.

Mr. Travis, of Southport Electricity Works, has been appointed Chief Assistant Electrical Engineer at Hastings.

Mr. F. J. Delves, Constructional Superintendent for some time past of the Sales Department of the West Ham Corporation Electric Supply undertaking, has resigned to take up the position of Electrical Engineer to the United Malaysian Rubber Co., Ltd. Mr. Delves leaves for Singapore on January 8th.

Mr. Claude Crompton, Manager of the Lamp Shop of Messrs. Crompton and Co., Chelmsford, has severed his connection with the Company.

Mr. G. E. Piggott is now conducting, at 24 New Broad Street, E.C., the South Eastern Counties business of Messrs. Etchells, Congdon and Muir, Ltd., of Manchester.

Mr. W. Ogden Dayson, 1 Mount Street, Swansea, has been appointed the South Wales agent for the Electric and Ordnance Accessories Co., Ltd., in succession to Mr. C. R. Hough, who has given up the agency to start on his own account in the Midlands.

### MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. G. Smith and Son, of 5 Philpot Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night, was £81 10s. to £82. (Last week the same.)

**Aubert Grenier and Co.**—The English business of this firm will in future be carried on as the General Cable Manufacturing Co. The address, 68A Lincoln's Inn Fields, E.C., remains the same, as do the telegraphic address and telephone number.

**Phoenix Dynamo Co.**—This firm announce their intention to double the capacity of their Thornbury works, Bradford.

**Plant for Sale.**—The Bristol Corporation have a quantity of plant for sale. (See an advertisement on another page.)

**Liquidations.**—The International Z Lamp Association, Ltd., is to be wound up voluntarily. Mr. C. Field, of Messrs. Franklin, Wyld and Co., Broad Street Avenue, is liquidator. A meeting of creditors will be held at the above address on January 6th, at 12 noon. Particulars of claims should be sent to the liquidator before January 31st.

**Bankruptcies.**—The last day for receiving proofs in the bankruptcy of A. E. Martin, trading as the Midland Electrical Supply Co., of 39 Great Charles Street, Birmingham, is January 8th. The trustee is A. S. Cully, 191 Corporation Street, Birmingham.

**Metal Filament Lamp Patents.**—On Friday, December 20th, 1912, Mr. Justice Warrington granted an interim injunction to Osram Lamp Works, Ltd., restraining Messrs. David Smith and Co. (Goblin lamps), their servants, agents, and workmen, from selling lamps infringing Osram Patents 23,899 of 1904, and 18,622 of 1906. The lamps in question had been supplied to Messrs. David Smith and Co. by the Dresdener Glühlampenfabrik. Writs for injunction have been served on a number of other lamp manufacturers and factors as well, and it appears that the Osram works are continuing their patent campaign with great vigour. The two patents in question are those which were certified by Mr. Justice Warrington as valid in the recent action against the "Z" Electric Lamp Manufacturing Co., which eventually ended in the "Z" Co. taking out a licence and joining the Tungsten Lamp Association.

**The Danger of Temporary Connections.**—The necessity of giving the utmost care and attention to temporary connections when alterations are in progress in the wiring of buildings was exemplified by a fire which took place at a large drapers, Messrs. Harvey, Nicholls and Co., Ltd., Knightsbridge, London, at 4.30 a.m. on Tuesday. Fortunately, owing to the promptness of the fire brigade, the damage was not so serious as it might have been, but it gave rise to grave anxiety, as there were about 200 workgirls sleeping in the building. Peculiarly enough, the alterations were being carried out for the purpose of improving the wiring system and rendering it more secure by replacing the old wiring in wood casing with special conduit wiring. During the change-over, however, a good deal of temporary wiring and several temporary fuse-boards were in use, and at one of the latter, behind which were a number of roughly-bunched cables, the fire probably originated, due to the blowing of a fuse. The board was fixed to a brick wall, in which a large hole had been made to accommodate an ironclad distributing-box immediately behind the board. A large stationery cabinet was just behind the board on the other side of this wall, and a lift-well was near by, so that the fire had ample opportunity to spread.

FOR  
**STEAM JOINTS**  
USE



JOHN HUDSON & CO.'S SUCCESSORS, Mansell St., London, E.

# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

NO. 315 [VOL. IX., No. 2]  
*All rights reserved.*

THURSDAY, JANUARY 9, 1913.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES AND TECHNICAL COLLEGE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

*Other Advertisement Rates on Application.*

### Latest Time for Receiving

Letters for Insertion, Tuesday first post

Small Advertisements and Official Announcements, Wednesday first post.

Displayed Advertisements, Tuesday first post.

Corrections in Standing Advertisements, Monday first post.

All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 208-206, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Circling, Fleet, London." Telephone No.: 5509 Holborn.

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## CONTENTS

	PRICE
SUMMARY	17
"Tricity" House Restaurant	19
Street Lighting in the City of London	20
A New Moving Coil Instrument	21
A One-part Lampholder	22
G.E.C. House Service Cut-out	22
Questions and Answers by Practical Men	22
Drying by Electricity	23
Use and Misuse of Metal Filament Lamps	23
Catalogues and Pamphlets Received	24
Electric Traction Notes	24
Telephony and Telegraphy (Including Wireless)	24
Local Notes	25
Patent Record	26
Tenders Invited and Prospective Business	27
Tenders Received and Accepted	28
Miscellaneous Business Notes	28
Calendars and Souvenirs for 1913	28

## SUMMARY

We describe the electric new restaurant, known as Tricity House, recently opened in London. The adaptability of electric cooking utensils for awkward places and the saving in space possible are well brought out. A detail described is the arrangement of an indicating lamp to show full and quarter heat. (Page 19.)

DETAILS are given (with illustrations) of the new electric street lighting which is now to be carried out in the City of London. Electricity is responsible for three times as much candle-power as gas. A new form of bracket is illustrated, and some particulars of the very substantial span wire construction adopted is given. (Page 20.)

A NEW moving-coil measuring instrument, in the construction of which there are several new and interesting details, is described. One feature is an extremely long evenly divided scale. (Page 21.)

We describe and illustrate a new lampholder designed for easy wiring, and a house service cut-out. (Page 22.)

A COMMUNICATED article deals with the question of drying by electricity. (Page 23.)

AN informal Paper by Mr. E. Handcock, discussed by the members of the Dublin Local Section of the Institution of Electrical Engineers, dealt with the relative benefit to the eyes of different systems of illumination. (Page 23.)

PETROL-ELECTRIC tramcars are to be experimented with at Oxford. At Folkestone the National Electric Construction Co. are proposing to adopt trolley omnibuses, or if the scheme is to be abandoned, powers are being sought to compel the Corporations of Folkestone, Sandgate, and Hythe to return certain sums of money paid by the Company. (Page 24.)

FURTHER evidence with regard to the Poulsen system has been heard by the House of Commons Committee, which is dealing with the Imperial Wireless scheme, there being complaints as to the way in which the British Government are alleged to have treated the Poulsen Co.—We also publish some information on the progress of the American Marconi Co. (Page 25.)

A PATENT by J. S. Highfield for the automatic reversible booster expires during the current week. Others expiring during the week include one dealing with details of a submarine telegraph relay by A. Muirhead, and a type-printing telegraph by Siemens & Halske. The specifications published by the Patent Office on Thursday last included one by the Westinghouse Metallfaden Glühlampenfabrik for the production of ductile tungsten for lamp filaments. Mr. W. P. Durnall's opposition to the grant of Patent No. 5,551/11 for the production of adjustable frequency, by K. Zickler and R. Czepek, has not been successful. (Page 26.)

An interesting but fortunately not serious mishap at Brighton calls attention to a necessary alteration in the ordinary methods of making the earthing connections of 3-phase generators.—The Belfast Corporation has been asked by some large power users to postpone the erection of a new power station.—The Nottingham Corporation is recommended to abandon the proposal to utilise some local water power for generating electricity.—The gas power at Accrington is being started up.—The County of London Electric Supply Co. are acquiring a large area of land in Essex for a new power station. (Page 27.)

THE large Birmingham power scheme is to be proceeded with. A 1,500-kw. turbo-alternator and two 500 motor-alternators are to be installed at Oldham.

A reciprocating engine set is to be installed at Maidstone; Diesel engines are required in New Zealand; £15,000 expenditure is contemplated at Ellesmere Port, £20,000 by the Stalybridge Joint Board, £13,000 at Stepney, and £8,000 at Bath. (Page 27.)

Mr. C. E. C. SHAWFIELD, Chief Electrical Engineer, Wolverhampton Corporation, and the President of the I.M.E.A., has resigned to join the Knowles Oxygen Company of Wolverhampton. (Page 28.)

We give particulars of the rearrangement of capital of Messrs. Willans & Robinson. (Page 28.)

## ARRANGEMENTS FOR THE WEEK

(TO-DAY) THURSDAY, JANUARY 9TH.

*Institution of Electrical Engineers.*

8 p.m. "Design of Apparatus for Improving the Power Factor of Alternating-current Systems," by Prof. Miles Walker.

*Institution of Electrical Engineers: Dublin Section.*

8 p.m. At Royal College of Science. "Notes on Self-propelled Cars for Light Railway Work," by J. P. Tierney.

FRIDAY, JANUARY 10TH.

*Electro Harmonic Society.*

8 p.m. Smoking Concert, Holborn Restaurant.

SATURDAY, JANUARY 11TH.

*Birmingham and District Electric Club.*

7 p.m. At Swan Hotel, New Street. Presidential Address.

MONDAY, JANUARY 13TH.

*Institution of Electrical Engineers: Western Section.*

4 p.m. At S. Wales Institute of Engineers, Park Place. Resumed discussion on Paper by T. Schontheil on "Overhead Transmission Lines." (An abstract of the Paper and first portion of the discussion was published in our issue for December 26th, 1912, p. 722.) Address on "Automatic Telephones," by W. Aitken.

*Institution of Post Office Electrical Engineers.*

5 p.m. At Institution of Electrical Engineers. "The Electrophone Service," by J. H. Pattman.

TUESDAY, JANUARY 14TH.

*Institution of Electrical Engineers: Manchester Section.*

7.30 p.m. At University. "Starting and Speed Control on Induction Motors," by F. C. Aldous.

*Association of Mining Electrical Engineers.*

7.30 p.m. North of England Branch. At Armstrong College, Newcastle-on-Tyne. "Induction Motor Details," by W. Baxter.

*Institution of Electrical Engineers: Scottish Section.*

8 p.m. At Glasgow University. "A Single-Phase Motor with Pole-Changing Windings," by J. S. Nicholson and B. P. Haigh. (An abstract of the Paper and the discussion in London appeared in our issue for December 19th, 1912, p. 705.)

WEDNESDAY, JANUARY 15TH.

*Institution of Electrical Engineers: Yorkshire Section.*

7.15 p.m. At Leeds University. "Comparative Notes on Independent Steam Condensing Plants," by W. A. Dexter.

*Institution of Electrical Engineers: Students' Section.*

7.45 p.m. At Victoria Embankment.

## The London Electrical Engineers.

MONDAY, JANUARY 13TH. A. Company.—Recruit Training, 7 to 10 p.m. Company Training, 7 to 10 p.m.

TUESDAY, JANUARY 14TH. B. Company.—Recruit Training, 7 to 10 p.m.; Company Training, 7 to 10 p.m.

**International Electrotechnical Commission.**—Meetings of the Special Committees on Symbols, Rating, and Prime Movers, in connection with Electrical Plant, will be held in Zürich from January 13th to 19th inclusive. We understand that the question of rating will be discussed. The co-operation of the British and Electrical Allied Manufacturers' Association has been of considerable value to the Joint Committee of the Engineering Standards Committee and the British Electrotechnical Committee, by whom the proposals made at the Paris meeting have been fully discussed in detail. It is also interesting to learn that Mr. A. R. Everest (British Thomson-Houston Co., Ltd, Rugby), representing the B.E.A.M.A., is to accompany Dr. Gisbert Kapp (who is the British delegate on the Rating Committee) to Zürich. Although not going as a delegate, Mr. Everest's intimate knowledge of manufacturing details, as well as difficulties, will be of much value to Dr. Kapp.



OVERHEARD AT "TRICITY" HOUSE RESTAURANT.

SHE:—I suppose they have to be very careful not to let too much electricity into the food, so as not to give one an electric shock.

HE:—I don't think there is any real danger; if proper precautions are taken, the electricity does not come into contact with the food at all.

SHE:—Oh! I thought it was the electricity that made it taste so nice.



# INSTRUMENTS

OF ALL KINDS.

4½" SOFT IRON  
FROM

**19:3d.**

SUBJECT TO  
LARGE DISCOUNT



MOVING COIL  
SOFT IRON  
HOT WIRE

EVERYTHING



ELECTRICAL  
SWITCHBOARD  
PORTABLE

SEND FOR COMPLETE LIST P.M. 3.



6" MOVING COIL  
FROM

**£2:1:3**

SUBJECT TO  
LARGE DISCOUNT

THE ELECTRICAL ENGINEERING & EQUIPMENT CO., LTD.

109-111 New Oxford Street,

LONDON, W.O.

Telephone: Gerrard 133.

Telegrams: "THERMOTYPE, WESTCENT, LONDON."

## "TRICITY" HOUSE RESTAURANT

ON Tuesday we accepted an invitation of the British Electric Transformer Co. to inspect the recently opened electric restaurant at "Tricity" House (48 Oxford Street, London), and to partake of an electrically cooked luncheon. The restaurant, which is managed by a subsidiary company (Modern Electric Kitchens, Ltd.), is well arranged and the various rooms are tastefully decorated. Some of the simpler cooking operations are carried out in the room on the ground floor, enabling lunchers and diners to obtain an idea of the simplicity and convenience of electric cooking. Eggs are boiled, cakes are baked, and tea, coffee and toast are made in full view of the visitors. There are half-a-dozen hot-plates and a couple of "Tricity" ovens in this room.

Descending the stairs, one comes to a room in the basement of most irregular shape, and so demonstrating in a remarkable degree the flexibility of electric cooking as evidenced by the ingenious way in which cookers have been put into the odd corners and niches. There, also, are disposed the flour bins, china cupboard, and a pantry. On the first floor is a fine room, known as the "East" Room, decorated in Oriental style, with provision for light cooking as in the other cases. There is seating accommodation for about 150 persons in the three rooms.

The kitchen itself, where meat is baked, fish fried, vegetables cooked, &c., is situated right at the top of the building, and is only 15 ft. by 12 ft. in area. Into the middle of this has been put a square table, while round the walls are ovens, hotplates, grills, warming cupboards, and water-boilers, aggregating about 30 kw. The elements each take 800 watts and the standard "Tricity" extension cookers are used here as in the other parts of the restaurant. A feature is the extensive use of the duplex restaurant cooker, which is practically two ordinary ovens in one, with a sliding partition between and two doors, so that one large or two small ovens may be used at will. For the grill, standard grillers are used, with hanging cups to catch the fat, and ordinary elements, mounted in an inverted position on adjustable arms so that both sides of the viand may be cooked at once. All the apparatus is fitted with the Company's new indicating lamp.

As is well known, "Tricity" cookers are provided with a two-way switch, so that full or quarter heat may be obtained by putting the two elements (one at the top and one at the bottom of the ovens) in series or parallel. The ordinary indicating lamps can be arranged to show whether the element is in circuit

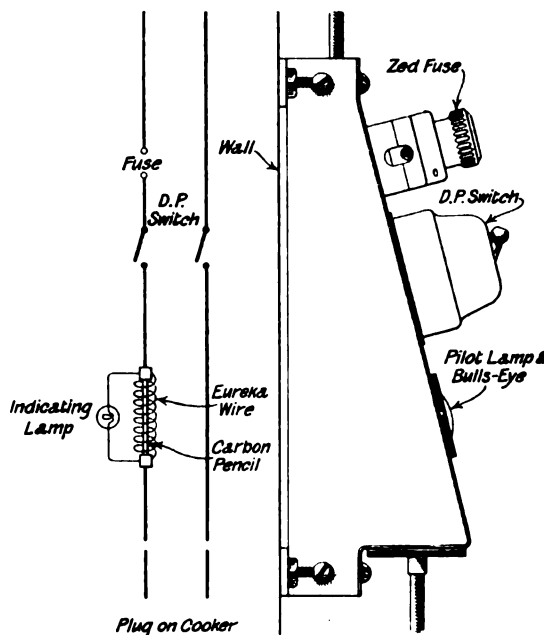


FIG. 1.—CONNECTION TO INDICATING LAMP.

FIG. 2.—CONTROL BOARD AND INDICATING LAMP.

or not, but at quarter heat the illumination is infinitesimal. To overcome this defect, the ingenious device shown in Fig. 1 has been invented by Mr. A. F. Berry. Fig. 2 shows its general arrangement, as mounted on the wall near the cooker. On closing the D.P. switch, current flows from the positive main via the fuse, and a suitably proportioned carbon pencil and

Eureka wire in parallel to the cooker and back to the negative main. The indicating lamp, which is mounted behind a red-glass bull's-eye, is connected across the ends of the carbon pencil as shown. The pressure drop across its ends is about 2.3 volts with full current. Owing to the fact that carbon has a negative temperature coefficient, while Eureka has practically no temperature coefficient, the resistance of the combination is appreciably more at quarter-load than at full load, so that the pressure drop is not then reduced to so much as a fourth, and the lamp will still glow faintly.

The electrical equipment of the restaurant comprises, in addition to the above, a complete induced ventilating plant, push-button service lift, vacuum cleaners, &c. The loads already connected are: lighting, 3.2 kw.; a sign (outside the restaurant), 1.6 kw.; radiators, 49 kw.; cookers, 54 kw.; lift, &c., 6.2 kw. The total is thus 124 kw. The wiring is on the three-wire system. The pressure is 480 volts D.C. between outers and 240 volts across lamps, cookers, &c., and current is supplied by the St. Marylebone Borough Council. The cooking at the Press luncheon to which we were invited was absolutely perfect.

## STREET LIGHTING IN THE CITY OF LONDON

THE City of London Electric Lighting Co., Ltd., are at last being authorised to extend the flame arc lighting in the streets of the City of London; a contract is about to be signed, and the work is on the point of commencement. It may be recalled that, in *ELECTRICAL ENGINEERING*, Dec. 22nd, 1910, p. 803, there appeared a complete description of the "experimental" lighting of the City streets by flame arcs, metal filament lamps and high-pressure gas, arranged by the Corporation to give the companies concerned a chance to show what they could do. As a result it was decided that the lighting of the streets should be divided between the electric lighting company and the gas company. The present contract allows for the continuance of the lighting schemes as adopted in the experimental sections and the replacement of the older existing electric lamps by the modern systems. In practically all places, however, where gas was the illuminant in 1910, it will remain, but we believe no further installations of centrally suspended high-pressure gas lamps will be carried out. Those erected in Cheap-side from Bow Lane to the Mansion House will be replaced by centrally suspended flame arcs, so that a continuous line of these will be formed from the Mansion House to Holborn, where flame arcs on central posts will take the place of the existing lamps.

When complete, there will be upwards of 400 arc lamps, by far the larger portion of these being of 2,000 c.p. (Oliver), while some will be of 3,000 c.p. (Oliver), and some of 4,000 c.p. (Excello). Over 300 of these will be centrally suspended, 27 ft. 6 in. high, about 40 on side-posts, and 20 on brackets. The handsome design of the latter is shown in Fig. 1, while the centre suspension or span-wire construction is well indicated in Fig. 2, which is reproduced from our issue of Dec. 22nd, 1910. One of the patterns of lamp-posts to be adopted (with an ingenious tilting lamp-carrier) was also illustrated in that issue; some improvements in detail have since been made, but

the rigidity of the construction is well brought out by the fact that no cases of failure have been reported.

The total candle-power of the electric lamps is nearly a million, most of which will be supplied by arcs. There will

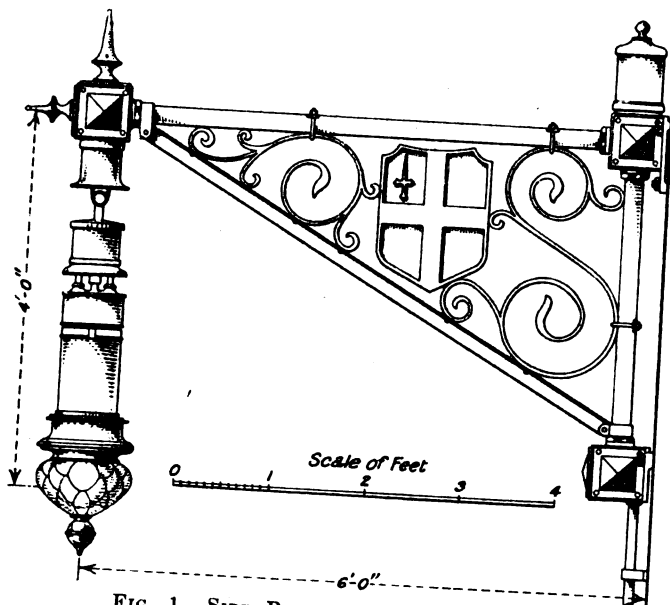


FIG. 1.—SIDE BRACKET AND FLAME ARC.

only be about 120 metal filament lamps, varying in candle-power from 150 to 300. The total candle-power, gas and electric, is about one and a quarter millions.

(Continued on page 24.)

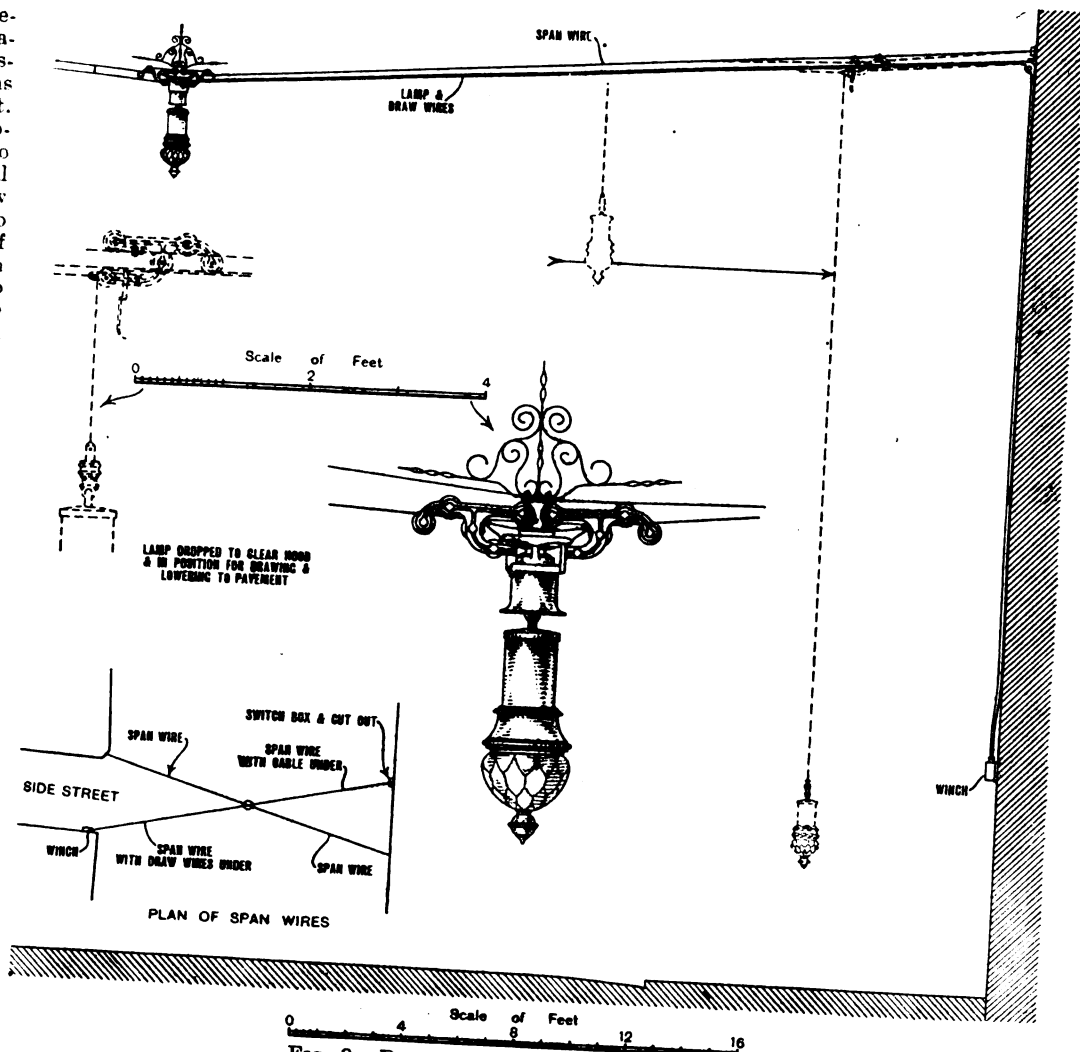


FIG. 2.—DETAILS OF SPAN WIRE CONSTRUCTION.

## A NEW MOVING COIL INSTRUMENT

**M**R. J. W. RECORD, of the Record Electrical Co., has devised an extremely ingenious method of extending the scale and range of a moving coil ammeter. In a new line of instruments, which his firm has now placed on the market, the length of the scale is  $300^\circ$ , and the instrument requires no more power than that consumed in the ordinary type, with which there is only a  $90^\circ$  deflection. The instrument can, in fact, be utilised with the ordinary shunts of standard resistance for the standard drop of 0.075 volt.

The arrangement which is adopted is seen in Figs. 1, 2 and 3. Fig. 1 shows the instrument with the cover removed.



FIG. 1.—INSTRUMENT WITH COVER REMOVED TO SHOW WORKING PARTS.

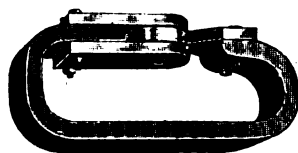


FIG. 2.—PERMANENT MAGNET AND POLE SHOES.

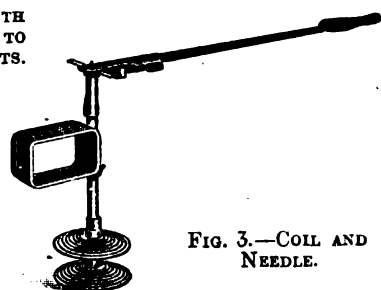


FIG. 3.—COIL AND NEEDLE.

Fig. 2 the permanent magnet, and Fig. 3 the coil and needle, whilst Fig. 4 is a front view of the instrument, showing the extremely long scale. Instead of the pole pieces being of the usual shape they take the form of flat annular discs. On the one pole there is a pair of discs and on the other pole a single one placed between these two and leaving just sufficient clearance for the coil to rotate in the small air

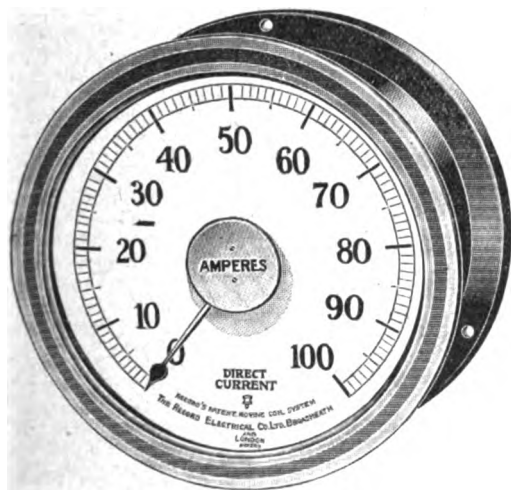


FIG. 4.—FRONT VIEW OF INSTRUMENT, SHOWING LONG SCALE.

space left. By this arrangement the coil is free to revolve almost through the entire circle. It will be seen, also, that the two air gaps are not in series, but in parallel, so that the addition of the second air gap actually reduces the magnetic reluctance.

In addition to giving a long scale, this construction has a further advantage of considerable importance also. The permanent magnet itself serves as the main frame for the working parts of the instrument and supports the lighter portions. Another mechanical advantage is that, owing to the disposition of the coil between the pole-pieces, it is impossible for it to foul the latter should there be any

## A VALUABLE WORK ON ELECTRICAL INSTALLATIONS.

By Rankin Kennedy, C.E.

If any reader who is interested in this subject will send the coupon below, he can obtain a complimentary copy of an illustrated booklet describing what is probably the most valuable work on the subject ever published.

The necessity for electrical engineers being well acquainted with all designs for installations that have given good results will be readily acknowledged by those whom the matter concerns.

While there are numerous text-books dealing with one branch or another of electrical engineering, they are all prepared for the student, and their contents deal rather with theory than with practice.

The aim of "ELECTRICAL INSTALLATIONS" is to assist the practical man who is concerned with electrical installations in any form, and this because it is recognised that there exists a very large class engaged in constructive and installation work, and a still larger class whose duty it is to take care of the machinery employed in working by electricity. Most of these men have picked up a working knowledge of their employment. What they need is to study the elements of the science of the subject. These elements are fully treated of in the first volume; and on the sound foundation thus laid, the author, who is a civil and electrical engineer by profession, and recognised as being in the front rank of electricians and engineers, proceeds to deal with every possible form of electrical installation, their principles and practical application.

This work describes and illustrates the best practice in all branches of the electric light and power installation business; the last volume treats of all the lighter branches of electrical manufactures—telephones, wireless telegraphy, and kindred subjects.

This second and revised edition of the work justly claims to have brought all subjects up to date with descriptions and information regarding recent machinery and apparatus. The matter has also been re-arranged so that all information relating to one subject follows consecutively.

The illustrations number 1,000, and there are eight fine plates in each volume. In addition, each plate contains a coloured cardboard sectional model of an electrical machine in four sections superposed.

### TWO OPINIONS:

**Mr. PONTECORVO, Engineer, The British Westinghouse Electric Co., Ltd., Manchester:**—"The work is very clear in its explanations, and gives, by means of well illustrated experiments, a complete idea of the electrical phenomenon. The chapter with hints as to how to build experimental apparatus seems particularly useful. Printing and illustrations are clear and accurate."

**Mr. A. H. SHAW, M.I.E.E., A.M.I.Mech.E., Manager Ilford Electricity Supply and Tramways, Ilford:**—"I consider this work is all you claim for it. The matter is clear and up-to-date, and the diagrams and plates are particularly good. The article on supply meters should prove very useful. This is a work that everyone engaged in the practical applications of electricity should have access to."

## A FREE BOOKLET.

To the CAXTON PUBLISHING Co., LTD.,  
97, Surrey Street, London, W.C.

Please send me, free of charge, and without any obligation on my part, Illustrated Booklet on ELECTRICAL INSTALLATIONS, and particulars of your plan whereby the volumes are delivered for a first payment of 1s. 6d., the balance being paid in small monthly instalments.

NAME.....

Send this Form or a Post Card.

ADDRESS.....



slackening of the jewels, a fault to which, it is said, some makes of moving coil instruments are subject.

Two sides of the coil are in the magnetic field, and these are at right angles to the axis of rotation, and the idle length of conductor is therefore exceptionally short, which results in the coil having a very low resistance. The resistance of the frame itself is low, and as the damping is produced by eddy currents in this frame, the instrument is very dead-beat. The scale is practically evenly divided throughout its entire length.

Another detail to which thought has evidently been given is in the marking of the scale. The pointer has a heavy blob, terminating in a fine point, and the figures are to the inside and not to the outside of the scale, and sufficiently far from the scale not to be hidden by the blob on the pointer. By this arrangement the figures can be very bold and are not hidden by the bezel when the instrument is viewed at an acute angle. At present ammeters and voltmeters are ready for the market in two sizes—8 in. diameter dials with scales 17 in. long, and 15 in. diameter dials with 3 ft. scale; laboratory sub-standard semi-portable instruments with 17 in. scales are also listed.

### A "ONE-PART" LAMPHOLDER

THE wiring of lampholders is always regarded as a "fiddling" job, and any innovation to render this simpler is to be welcomed. Messrs. G. St. John Day and Co. (Mumps Electrical Works, Oldham) have sent us a specimen of their new "one-part" lampholder, the wiring of which is particularly easy. The plungers, with their terminals, are simply pushed into the holder at the lamp end, and can be pulled out for wiring with a pair of pliers. Each

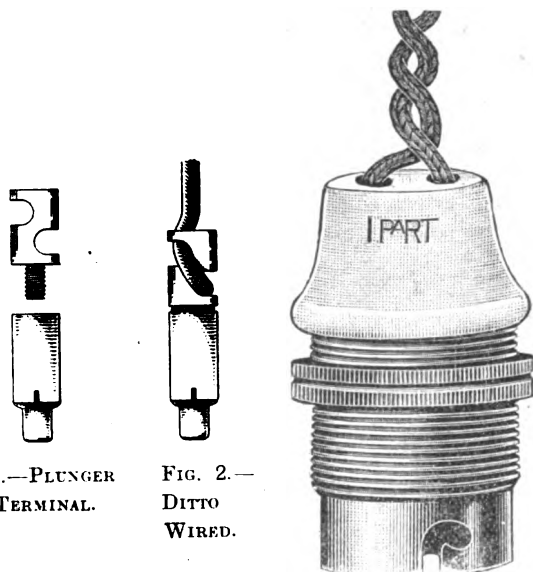


FIG. 1.—PLUNGER AND TERMINAL.

FIG. 2.—DITTO WIRED.

FIG. 3.—THE LAMPHOLDER.

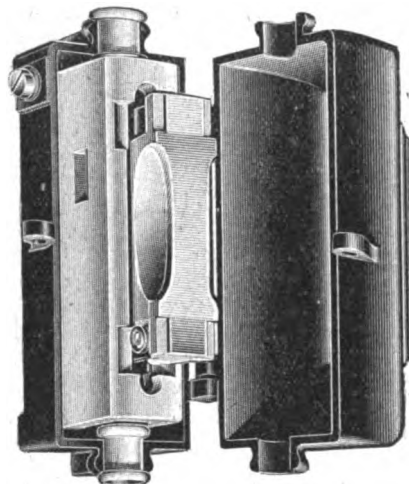
wire of the flex is passed right through the holder through a hole in the top, and is screwed up in the terminal of the plunger, as seen in Figs. 1 and 2, and the plunger is then pushed back into the holder, keeping a slight strain on the wire to guide it. The top of the lampholder is of porcelain and is permanently secured to the barrel of the holder.

A simple plug adapter, in which the same principle is used, has also been sent us.

**An International Power Transmission Scheme.**—According to the *Basler Nachrichten*, an important transmission line is now under construction by the Swiss Beznau Electricity Works for the supply of power to the Ronchamp coal mines, near Belfort. The line is 84 miles long, and will transmit some 6,000 h.p. at a pressure of 70,000 volts, three-phase. The very long average span of 650 ft. will be employed, with steel towers weighing from 2 to 3 tons each, and suspension insulators according to the most recent American practice. It is a double-circuit line, and over 200 tons of copper will be required. Power will later be taken from the Olten-Gösigen station, now under construction. It is interesting to note that the line passes through territory of three countries, Switzerland, Germany (Alsace Lorraine), and France, *via* Anwil, Liestal, Münchenstein, Waldhohofen, Niedersept. and Belfort.

### A G.E.C. HOUSE SERVICE CUT-OUT

THE accompanying illustration shows the new pattern of house service cut-out, recently introduced by the G.E.C., Ltd. In the design and construction of this new cut-out, Home Office requirements have been strictly adhered to. The case is of cast iron, enclosing the fittings in a very neat manner. There is efficient insulation between the case and the fittings, and a



NEW G.E.C. SERVICE CUT-OUT.

liberal rating of metal parts. The contacts are sunk in a recessed porcelain block, thus rendering it impossible to make accidental contact with live parts when replacing the fuse holder. The fixing holes are drilled under the porcelain cable bushes. The capacity of this new pattern cut-out is 10 amperes. It is being placed upon the market at a very reasonable price.

## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelopes.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,321.

A private self-contained installation is required for supplying about fifty 16-c.p. lamps in a private house, in which possibly two or three radiators and other miscellaneous domestic appliances may be required later. The plant is to be placed in a shed or outhouse to be built near the house. The generating plant is to run only a few hours each evening, and cells are to take the intermittent demand. State, with reasons, what plant you consider the most suitable, whether petrol, oil, gas, or steam driven, the most suitable voltage to adopt, and give comparative estimates of cost. Details of wiring not required. Replies not to exceed 1,000 words in length.

(Replies must be received not later than first post, Jan. 16th.)

### ANSWERS TO No. 1,319.

No reply of sufficient merit for an award has been received

## DRYING BY ELECTRICITY

By Sydney F. Walker

IN ELECTRICAL ENGINEERING of Oct. 31st, 1912, a reply was given to a question, in which information had been asked upon the subject of drying by the aid of electricity. The drying operations in different industries are carried on almost entirely by means of air; and where the quantity of moisture to be removed is large, by air raised to a fairly high temperature. There are two methods open to the engineer who has to lay out a drying plant; he can first dry the air that he is going to use, and then heat it; or he can heat the air without previously drying it. The latter is the more common practice, but the former has the advantage that the drying operations are completely under the control of the engineer. If the air is not dried previously to heating, the drying operations are more or less subject to the vagaries of the atmosphere. The difference may be met by increasing the temperature of the air on damp days, but in some cases the higher temperatures may be objectionable, and in any case it is better to perform almost any drying process at as low a temperature as possible. Air varies very considerably with the temperature in its capacity for absorbing vapour. At 80° F., for instance, a cubic foot of air can only absorb two grains of moisture; while at 80° F. it can absorb 11 grains; at 100° F., 20; at 120° F., 35; and at 150° F., 70 grains. Where, as may frequently happen, the outside air is at a temperature of 80° F. and has a humidity of 90 per cent., the temperature to which the air passing through the drying apparatus must be raised is much higher than when it has been previously dried.

The process of drying the air, before it is heated, is very simple. It is merely caused to pass over a grid of pipes, through which brine, cooled by refrigerating apparatus, is circulating. The temperature of the air is lowered to 80° F. or thereabouts, and caused to deposit its moisture on the grid of brine pipes. When drying any substance by air there are two distinct operations to be performed; the water held by the substance to be dried has to be converted into vapour; and the air which is to cause the evaporation has to be raised to the temperature at which it will absorb the vapour. The heated air must also be caused to pass continually over the surface of the object to be dried.

Taking the figures given, 1,000 lb. of moisture per hour, and also taking the figure 1,000 B.Th. units as the latent heat of the vapour that is to be formed from the water held by the object to be dried, this means that 1,000,000 B.Th. units per hour have to be removed; and, taking 778 lb. foot per B.Th.U. as the mechanical equivalent of heat, the writer makes out that this would require 292 kw. hours, on the assumption that 100 per cent. efficiency was obtained.

In addition to this, the air that was to cause the evaporation would have to be heated to a certain temperature, say, from 50° F. to 150° F.; if the air could be humidified to full saturation, 181,100 B.Th. units would be required per hour, or 52.7 kw. hours, making a total of 344.7 kw. hours. But 100 per cent. efficiency could hardly be hoped for, for several reasons. Probably the greatest loss would be in the air itself. It would only be the skin of air, so to speak, passing over the objects to be dried, that would be operative in causing evaporation. Up to a comparatively high limit, the higher the velocity at which the air is passed over the objects to be dried, the more rapid is the evaporation, as the skin of air which receives the moisture from the object to be dried is continually being renewed. In practice, as much as ten times the quantity of air that would absorb the moisture from the objects to be dried, if still, might be driven over it, in order to obtain the rapid drying which is usually of so great importance. This would mean that 527 kw. would be required for heating the air, in addition to that required for evaporating the water itself, or a total of 819 kw.

In addition, a comparatively small amount of power would have to be supplied for driving the fan that kept the air in circulation. There would also be considerable thermal losses, but a good deal could be done to reduce these by the aid of thermal insulators.

The method suggested by the correspondent, "M. M.," who gave a solution of the question, of resistance coils placed inside perforated covers, or below the floor under gratings, is in the direction that the electrical driers will probably be developed. Steam driers have been developed to a remarkable state of efficiency, principally in America. The air-heating apparatus usually consists of what is practically a nest of small iron pipes, arranged inside a casing, with a small space between the pipes. The object to be attained is the exposure of as large a heating surface as possible to the air current passing over it, and the throttling of the air as little as possible. The electrical heating appliance will have to follow somewhat the same

lines; but it will have one very great advantage over steam heating, viz., that the whole of the mass of the electrical heater, if properly designed, should be doing useful work. With steam heaters, even when the pipes are small, one-inch pipe is the usual size; there is a core of steam that is performing no useful work. There is no electrical apparatus at present on the market that is suitable for warming air that is to be applied to drying purposes; the most suitable arrangement will have to be the result of careful experiment. The above figures, the fact that 819 kw. per hour are required for the drying operation mentioned, presumably puts it out of court. At even  $\frac{1}{4}$ d. per unit, this would mean about 34s. an hour. Steam heating could be obtained at a fraction of that cost. Probably as time goes on, and as experience is made in electrical heating, the hint given above, the elimination of thermal leakage, will lead to various economies that will bring the matter within the range of practical commercial engineering.

## USE AND MISUSE OF METAL FILAMENT LAMPS

AN informal paper by Mr. E. Handcock, entitled, "Metal Filament Lamp Lighting in Relation to the Eye," was read at a meeting of members of the Dublin Local Section of the Institution of Electrical Engineers last month. The author first outlined the action of the eye, explaining the automatic expansion and contraction of the iris according to the intensity of the brightest spot within the field of view, and explaining that the effect of bad or dim light means that the picture is not clearly focussed on the retina, and the focussing muscle keeps varying the focus to get it right, and consequently gets tired. From time immemorial, he continued, the human eye has been accustomed to the light coming from above and to having this light well diffused and not too brilliant. It demands these conditions and makes its demands felt in the form of eye-fatigue, headache, &c.

The eye is incapable of judging intensely of illumination because light falls on an object, and depending on the reflective power of that object more or less, light is reflected; it is only this varying proportion of reflected light that presents the object to the eye. Again, the inclusion of unduly bright light sources in the line of vision causes the iris to contract more than is suitable for seeing the surrounding objects. It has been found that anything with an intrinsic brilliancy over 6 has a distressing, if not harmful, effect on the eye. Glare can also result from surfaces reflecting that source, when too great a contrast is present in the light given to the retina. A very common mistake is over-concentrated local lighting; there are a very large number of people who imagine they are taking the best possible care of their eyes by having on their roll-top desks a lamp shaded from the eyes but concentrating the light on the papers and the rest of the room in comparative darkness. The effect of this is to reflect the light off their papers to the eyes, thus producing a "glare." Results were quoted with the object of showing that indirect lighting is not inefficient, and slides were shown illustrating typical installations on the "Eye-rest" indirect system, developed by the British Thomson-Houston Co., Ltd.

### DISCUSSION.

Mr. A. E. PORTE spoke strongly in favour of indirect lighting from the eye-comfort point of view. He was of opinion that every metal lamp used for direct lighting should be frosted at the bottom. Owing to the filaments being end-on to the bottom of the lamp, the amount of light lost was surprisingly small. In actual working practice he had found that the efficiency of indirect lighting was fully equal to that of direct.

Mr. TWEEDY protested against naked metal filament lamps being displayed in shop windows. He considered that a shop-keeper offending passers-by in that respect should be liable to prosecution for nuisance.

Mr. G. F. PILDITCH found it hard to persuade customers that indirect lighting was equal to direct. In one case he had proved by photometry test that the indirect method was rather better than the direct, but could not get the customer to believe it was so.

Mr. F. W. PARKES advocated a more liberal use of silvered reflectors, applied to shop-window lighting. He had found it a very economical system.

Mr. DOUGLAS asked for a definition of "glare." "Glare," he understood to mean, "light in the range of vision not coming from the object of vision and having an intensity proportionally great."

Other speakers agreed that the comfort of indirect lighting was undoubted, but opinions differed as to its comparative efficiency.

## STREET LIGHTING IN THE CITY OF LONDON

*(Concluded from p. 20.)*

Our readers will doubtless be interested in the following details of the span-wire construction:—

The span wires are fixed to rosettes screwed to mild steel plates  $\frac{1}{2}$  in. thick by means of two or more  $\frac{1}{2}$ -in. diameter mild steel bolts. The back plates are attached to the wall by two or more Lewis bolts, about  $\frac{1}{2}$  in. diameter, spaced 11 ins. apart, and penetrating 5 ins. into stonework, or 7 ins. into brickwork. In Fig. 2 a diagram is included which will explain the method of suspension. The two main cross-street span wires, the outside diameter of which is  $\frac{5}{16}$  in., consist of 19 crucible steel wires, and a central core of mild steel. In the earlier designs a core of rope was used, but this was found in time to absorb moisture, and so was liable to deteriorate. The breaking stress is about  $4\frac{1}{2}$  tons. These wires have generally a sag of about six degrees between the central headpiece and the wall. The draw wires for traversing the trolley and lowering the lamp are of the highest quality, galvanised flexible stranded steel rope  $\frac{1}{2}$  in. in circumference. The breaking stress is about 2,500 lb. All the flexible wires are impregnated with a special hydro-carbon grease to prevent electrochemical action due to moisture. The weight of the central headpiece is about 70 lb., and the lamp about 45 lb. Taking all factors into account, the working stress is equivalent to a 750-lb. stress on the attachments. All parts of the equipment are designed to meet the strains with a factor safety of 10. Tests are carried out, before any erection is passed, to at least four times the calculated stress by hanging a lead weight on a long line in place of the lamp, and setting it swinging. Measurements of extensions, sags, &c., are then made.

The equipment was assembled in the shops of the City Co., and the winches, headgear, &c., were supplied by the London Electric Firm, Ltd. (Croydon), who have for many years specialised in lamp-lowering gear, and whose existing standard designs have been modified for the heavier duty they will have to do, in conformity with the requirements of Mr. Frank Bailey, the Engineer-in-Chief of the City of London Electric Lighting Co. To Mr. Bailey and his staff we are indebted for assistance in the preparation of this article.

## CATALOGUES, PAMPHLETS, &amp;c., RECEIVED

**ALUMINIUM.**—A convenient waistcoat-pocket-sized note-book, giving much concise information on aluminium rod, tube wire standard sections, &c., as well as particulars relating to aluminium alloys, and other useful notes, has been prepared by the British Aluminium Co., Ltd. (109 Queen Street, E.C.), who will be pleased to send copies to those of our readers who are likely to make practical use of the information.

**ELECTRIC FIRES.**—A list from Neville Williams & Co. (80a Southwark Street, S.E.) describes a portable "Ensign" electric fire made and marketed by the firm. The element is run at a red heat, and is contained in a fire-box which can be readily separated from the frame, so that any one of a variety of designs may be used. The standard pattern is of simple design in iron with a copper ledge in front. Easy and cheap replacement of the heater wire is one of the good features claimed.

**G.E.C. TELEPHONES.**—The General Electric Co., Ltd., 67 Queen Victoria Street, E.C., are now distributing a revised edition of their telephone list. It is, in most respects, similar to the preceding edition, but it differs in respect to list prices, and it is for this reason that the company are anxious to get this list into the hands of contractors and others.

*Readers desiring copies of catalogues or pamphlets should apply to the firms in question, referring to the notice in "Electrical Engineering."*

**ADVICE ON COUNTRY HOUSE LIGHTING.**—Under this title, Simplex Conduits, Ltd. (113-117 Charing Cross Road, W.C.), have issued a little booklet which cannot fail to be useful to owners and prospective owners of private lighting plants and their electricians. It has been prepared in answer to several requests for a publication dealing in simple language with the various uses of electricity in the average country house. Suggestions as to the arrangement of the lamps and the application of other electrical apparatus in the various rooms are given, and there are hints on the maintenance of the plant and installation. The company will be pleased to send small quantities of copies, free of charge, to any electrical contractors carrying out country house installations.

## ELECTRIC TRACTION NOTES

The National Electric Construction Co. is doing its best to get free of its difficulties in carrying out their contracts with the Oxford Corporation, and in connection with the Folkestone, Sandgate and Hythe tramway scheme, both of which lines were to have been on the surface contact system, now banned by the Board of Trade. At Oxford the powers for converting the horse lines to electric traction expire in 1914, and the trouble is to secure some system of traction which will not involve the use of overhead wires in the one-and-a-half mile of track in the centre of the city. As the conduit system is too expensive, the Company is now considering the possibility of using petrol-electric trams. As to the Folkestone scheme, the Company, as already mentioned in our columns, has deposited a Bill in Parliament authorising it to adopt trolley omnibuses. The history of this scheme is that the Company contracted with the Councils of Folkestone, Sandgate and Hythe, to construct tramways on some system not using overhead wires, and a sum of £15,000 was paid to Folkestone, £1,500 to Hythe, and £3,600 to Sandgate, in order to obtain the necessary "consents" from the Local Authorities. These sums have not only been paid, but have actually been spent by the Councils on certain road widenings. In Folkestone the £15,000 was nominally to reimburse the Council for the cost of road widening in the Cheriton Road incurred about two years before the Company obtained powers for the tramway, and in one of the other cases, we believe, the road widening was carried out in a road not even on the line of the proposed route. The Company have already tried unsuccessfully to obtain permission from the Councils to erect overhead wires, and their Bill will presumably meet with opposition from all three Councils. There is also a clause in the Bill which states that if, within six months of the passing of the Act, the Councils agree with the Company not to proceed with any scheme, they shall repay the sums received from the Company mentioned above.

A committee is to be appointed by the Bristol Corporation to consider the question of purchasing the Bristol Tramway Company's undertaking.

The Sheffield Tramways Committee have contributed £2,000 from the special purposes fund towards the cost of extending the Applied Science Department of the University.

TELEPHONY AND TELEGRAPHY  
(INCLUDING WIRELESS)

Major Archer-Shee, who wrote the much-discussed article in the *National Review* last September, gave evidence last week before the House of Commons Committee which is considering the Imperial wireless telegraph scheme. He said he was a strong supporter of State control and management, and recommended that the Admiralty or Post Office should deal with this matter directly. Further, he could not understand why such special consideration was being given to the Marconi Co. whilst other companies had not even been asked to tender. Whilst he considered that an ordinary cable system would be more efficient for Imperial communication, he was not antagonistic to wireless telegraphy, but nevertheless thought that if a Technical Committee had been set to work to test the various systems, the Marconi system would not have been the selected one. Already in the House of Commons Major Archer-Shee has dissociated himself from any of the charges made against Ministers. The suggestion now made was that the Committee should present an interim report recommending the acquisition of sites in order to make a commencement with the work, pending a report by Technical Committee as to the best system to adopt. Mr. V. Gandil, the representative in England of the Poulsen system, was closely cross-examined with regard to the financial resources of the Poulsen Co., and the work which it had carried out. He was unable to tell the Committee between which two points, apart from San Francisco and Honolulu, the system was in daily communication, but he complained of the view expressed by Sir Alexander King, Secretary to the Post Office, that the Poulsen system would be unable to meet the requirements of the contract, as being a most damaging one. He suggested to the Committee that it should not be taken seriously, as

# ADAMS IGRANIC

Specialists in Electric Motor Starting and Control Gear.

Adams & Co. Ltd. Balfour House, Finsbury Pavement, London, E.C. Works-Bedford.

Sir Alexander King was a layman, and had no technical knowledge. It was pointed out to him by the Committee, however, that the statement in question was made on the advice of the Post Office experts. Mr. Gandil further stated that had the Poulsen Co. been given an opportunity to tender for the scheme, they could have given financial guarantees for carrying out the work, and would have certainly been prepared to quote less than £60,000 per station. The solicitors to the English Poulsen Co. have also given evidence, the tone of which was one of complaint at the attitude of the Government towards the Poulsen system.

The report of the American Marconi Co. shows that considerable progress has been made during the past six months. Not only has the business of the United Wireless Telegraph Co. been taken over, but an additional 200 vessels have been equipped with the Marconi system. The net profits for the six months to the end of August amount to £5,000.

On the first day of the year the line between Bagdad and Bassorah was down, but was working normally on the 2nd inst.—The Compagnie Française des Câbles Télégraphiques cable between Paramaribo and Cayenne is also interrupted. Telegrams for the latter place are being despatched by every opportunity.—The two routes between Indo-China and Siam were down on the 2nd and 3rd inst.—The Fao route was down again from the 4th to the 6th inst.—The line between Otranto and Vallona ceased working on the 6th inst.—It is understood that extensive repairs are being undertaken in connection with the Direct Atlantic Cable, and that the work has been secured by Messrs. Siemens.—Some disturbance to the normal flow of Atlantic Cable traffic has been caused by failure of landlines and connecting cables in Ireland. This has been put right.—Mr. Baxendale, late of the Pacific Cable Board, is now in New York on the business of the Wireless Company, with which he has now become identified.—An important new cable is to be laid in the East shortly, and is already being manufactured.

## LOCAL NOTES

**Aberdeen: Trouble with Electrical Contractors.**—In consequence of statements made in a certain letter recently, Mr. J. A. Bell, the City Electrical Engineer, has entered an action against some local electrical contractors for £1,000 damages.

**Accrington: Gas Power Plant.**—The gas power generating plant is now practically complete, and was given a thoroughly satisfactory ten-hour run under full load conditions last week.

**Batley: Proposed Electricity Extensions.**—The respective advocates for extending the Municipal electricity works, and of taking a supply in bulk from the Yorkshire Electric Power Co., are providing the local newspapers with some interesting reading matter, for as soon as one member of the Council champions the first course of action, another replies with strong advocacy of the bulk supply scheme. The Council itself has not yet come to any conclusion.

**Belfast: The New Power House.**—A deputation of ratepayers waited upon the Corporation last week to ask that the proposal to construct a new power station should be postponed for the present. The deputation was composed of representatives from many of the large works in Belfast, and the chief ground for the request is the possibility of a mistaken policy on the part of the Council in deciding upon steam generating sets, in view of the developments in connection with the Diesel engine. Another reason for urging delay was that the present is a bad time for borrowing money. It appears that Messrs. Harland and Wolff have decided to instal Diesel engines in their large power station, and have, after a period of working, offered to place the results before the Corporation. Hence another reason for delay.

**Brighton: A Peculiar Mishap.**—Although only causing an interruption to a small section of the supply for ten minutes,

an accident which occurred at the Brighton electricity works and town sub-station on Friday evening last presents some points of considerable interest. One of the high-tension coils on the stator of a 1,300-h.p. induction motor at the sub-station went to earth, and the oil switch controlling the machine failed to trip on one leg, with the result that the arc was maintained and the resistance, earthing the neutral of the machine at the power-house, was burnt out, and the drop in the H.T. voltage caused the other induction motors running in parallel to trip their circuits. There was further trouble at the power-house, which, however, did not in any way interfere with the supply. The earth wire connecting the neutral point of one of the machines with the earth resistance bus wire was composed of only ordinary grade insulated cable, and when the earth resistance was blown to pieces, the loose end of this cable fell foul of the lead-covered three-core cable connecting the alternator with its oil switch, and before the defective leg on the oil switch at North Road had been knocked out, this wire became red-hot, and seared a hole in the lead sheathing of the machine cable, causing a "short" between one phase and earth. The machine circuit was instantly cut out and the field circuit broken, and no damage was done to the machine, but the cable, however, was nearly burnt in two. Mr. Christie advises central station engineers to make the cable in connection with the earthing of the neutral of a three-phase machine of the same quality insulation and as carefully supported mechanically as the high-tension circuit up to the earthing resistance.

**Gromer: Proposed Sale of Electricity Undertaking.**—The ratepayers are not disposed to allow the decision of the Council to transfer the electricity undertaking to Messrs. Edmundson's without very strong effort to prevent it. A three hours' public meeting took place last week, and on a poll being taken, there was a majority of more than 2 to 1 against the transfer.

**Essex: Electric Supply.**—The County of London Electric Supply Co. propose to acquire 34 acres of land in Dagenham with a frontage to the Thames for the purpose of a generating station.

**London: Woolwich: Position of Electricity Undertaking.**—The loan of £19,000 recently sanctioned by the L.C.C. for extensions to the electricity works was on the understanding that the Council repays within three years the outstanding balance amounting to £9,228 of loans for machinery and plant at the Plumstead Station, which will be rendered obsolete by the adoption of the £40,000 scheme referred to on p. 713 of our issue of Dec. 19th, 1912.

**Nottingham: Water Power Scheme.**—We reported some time ago that, on the initiative of Alderman A. Ball, the Corporation decided to obtain reports on the possibilities of using two weirs in the district for generating electricity. Accordingly, Mr. E. W. Monkhouse, of Westminster, took the matter in hand at the request of the Corporation and has now reported. This report shows at once that the scheme would be a financially unsound one. The total brake horsepower obtainable from one weir at low water is only 160, and from the other it is only 180, and the figures show that the expenditure of £52,869 which would be necessary would result in a loss of £191 per annum, whereas with the same capital expenditure on an up-to-date steam plant, assuming a 22 per cent. load factor, there would be a profit of £8,902 per annum. Mr. Monkhouse definitely recommends the Corporation to give up the idea of water power, and when the time comes for making extensions to put down a thoroughly up-to-date steam plant.

**Suffolk: Purchase of Electricity Co.**—The Suffolk Electricity Co., which owns works at Felixstowe, Diss and Stowmarket, is considering an offer of purchase by Dr. C. H. Leibbrand.

**The Effect of Electric Radiator Heat.**—We have received an interesting photograph from the Dowsing Radiant Heat Co., Ltd., which shows that so intense was the heat given out by a Dowsing radiator which was on show in the window of Messrs. Troy & Co., of Hampstead, that the glass was unable to withstand it, and was cracked severely.

# "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

## Specifications Published Jan. 2, 1913

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

27,342/11 and 27,345/11. **Extracting Metals from Ores.** H. S. MACKAY. These specifications relate to those processes where chlorine is used as the reactive agent. Chlorine acids are produced by electrolysis, and the ore is then treated with this solution, the resulting solution being again electrolysed, and after this again used for treating the ore, and so on. By one method a solution of sodium chloride is electrolysed in the presence of copper. For ores containing sulphate, a chloride of an alkaline metal is used. Treatment for ores containing sulphur is also given. One figure to each specification.

27,836/11. **Melting Metals and Alloys.** R. S. WILE. The method does not apply to iron and steel. To prevent oxidation, a thin layer of glassy or slag-like material is allowed to form on the molten surface. This acts as the resistance of a tilting electric furnace, and so is kept sufficiently hot without it being necessary to raise the molten metal up to boiling point. Three figures.

3,650/12. **Small Variable Speed Dynamos.** C. SCHLICK. A variable-speed dynamo for lighting vehicle-lamps has on its armature a coil which is automatically short-circuited by a centrifugal switch, and so acts demagnetisingly, when a pre-determined speed is reached. At low speeds the demagnetising coil helps the main coil. Nine figures.

6,987/12. **Adjustable Condenser for Wireless.** A. C. COSSOR, Ltd., and H. J. STENNING. The condenser is made of small size by winding alternate layers of insulating and conducting materials on to a bobbin, and varying the number of layers. One way is to have a central bobbin surrounded by four others, alternately carrying conductor and dielectric. By revolving the central bobbin the desired result is obtained. Three figures.

7,486/12. **Control for Screw-cutting Lathes.** C. G. M. BENNETT and L. S. FOSBROOKE. This specification describes an electrical arrangement devised to do away with the necessity for chalking the change wheels when cutting odd threads. The lead screw can only be engaged when its position relatively to that of the mandril is correct. The arrangement was described in *ELECTRICAL ENGINEERING*, October 10th, 1912, p. 562.

8,058/12. **Incandescent Lamp with Bipartite Bulb.** P. WEISSE. The lower edge of the cup, which extends conically downwards, is embedded in the trough-shaped outer edge of the filament carrier to reinforce the joint. The diameter of the opening of the bulb allows the filament carrier to be removed without melting any part of the glass. One figure.

12,869/12. **Manufacture of Tungsten and Molybdenum in Ductile State.** WESTINGHOUSE METALLFADEN GLUHLAMPENFABRIK. The metal or alloy to be treated is first heated, and then cooled slowly while under pressure. This is effected by embedding the body in a molten mass or heated mould, which cools slowly and so exerts the required pressure.

## Specifications Published To-day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, E.C., at the price of 8d. each, post free.

Names in italics indicate communicators of inventions from abroad. Summaries of some of the more important of these patents will appear in our next issue.

**Arc Lamps:** WORSLEY [Raising and lowering gear] 28,668/11.  
**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** KALLMANN [Conductors] 28,459/11; BRITISH THOMSON-HOUSTON Co., TAYLOR, WHITAKER, and SPORBORG [Distributing] 3,532/12; BROOKING and ST. HELENS CABLE & RUBBER Co. [Insulating boots] 17,864/12.

**Dynamos, Motors, and Transformers:** BROWN, BOVERI & Co. [D.C. dynamo pressure regulation] 28,486/11; BRITISH THOMSON-HOUSTON Co. and GARTON [Generators] 4,529/12; WARWICK MACHINERY Co. (1908) (*G.E.C., U.S.A.*) [Turbo-dynamos] 7,497/12; BRITISH THOMSON-HOUSTON Co. (*G.E.C., U.S.A.*) [Vapour rectifiers] 7,775/12; BERGMANN A.-G. [Speed regulation of asynchronous motors] 12,134/12; ALGEMEINE ELEKTRICITÄTS-GES. [Power machine plant] 16,517/12.

**Electrochemistry:** BAUER [Regenerative production of Roentgen rays] 15,171/12.

**Ignition:** SIEMENS & HALSKE [Distributors] 19,069/12.  
**Incandescent Lamps:** FRENOT [Combined bulb and diffuser] 13,796/12.

**Meters:** SCHUPPISSEY [Excess load] 13,602/12.

**Storage Batteries:** TAYLOR [Separators] 28,858/11 and 28,859/11.

**Switchgear, Fuses, and Fittings:** BRITISH THOMSON-HOUSTON Co. (*G.E. Co., U.S.A.*) [Contacts and electrodes] 535/12; LUCAS and JACKSON [Battery terminals] 9,278/12; MERRIAM [Switches] 14,752/12; MOWRER [Terminal plugs] 23,564/12; STOTZ & COMPAGNIE ELEKTRICITÄTS [Plug] 23,877/12.

**Telephony and Telegraphy:** WALL [Telephone meters] 1,157/12; MARCONI'S WIRELESS TELEGRAPH Co. and ROUND [Receivers] 3,055/12; MUIRHEAD [Reception of "call up" signals in wireless] 3,445/12; RAMDOHR [Telephones] 16,241/12; HEINICKE and JASPER [Wireless] 18,632/12; IMRAY (*Compagnie Generale Radiotelegraphique*) [Adjusting length of spark gaps] 26,457/12.

**Traction:** EVANS [Deadening noise of trains in tubes, &c.] 28,031/11; COOKE and JOHNSON [Insulating fish plate] 6,717/12; COOKE and SCHENCK [Station indicator for vehicles] 9,360/12; WHITE (*Carson*) [Automatic block signalling] 10,208/12.

**Miscellaneous:** SIBLEY [Automatic piano players] 7,369/12.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Arc Lamps:** GENERAL COMPOSING Co. GES., 28,503/12.

**Distributing Systems, &c.:** SOC. INTERNATIONALE DE LUMIÈRE FROIDE [Lighting] 28,229/12.

**Dynamos and Motors:** SOC. ANON. WESTINGHOUSE-LEBLANC [Automatic balances for rotors] 16,809/12; SIEMENS SCHUCKERT-WERKE GES. [Safety device for] 28,483/12.

**Ignition:** RUPRECHT [Spark plugs] 28,412/12.

**Incandescent Lamps:** FISCHER and ZIMMERMANN [Incandescing bodies] 24,875/12.

**Miscellaneous:** HASLER ART.-GES. [Speed indicators] 17,045/12.

## Opposition to Grant of Patents.

20,207/11. **Spark-Plugs.** H. G. LONGFORD, W. W. LONGFORD, and W. A. CLARK. The opposition to this patent has been unsuccessful, and the grant allowed.

5,551/12. **Production of Adjustable Frequency.** K. ZICKLER and R. CZEPEK. The opposition to the grant of this patent by Mr. W. P. Durnall (*see ELECTRICAL ENGINEERING*, September 26th, 1912) has not been successful. The grant is allowed.

## Expiring and Expired Patents

The following Patents expire during the current week, after a life of fourteen years:—

516 of January 9th, 1899. **Telegraph Relays.** A. MUIRHEAD. The following details are covered by this specification: A means by which the mechanism which imparts directive force to the signal coil effects electrical variations in the local circuit. A method of imparting a constant tremor to the contact-maker through a friction gear, so that it may keep to its true zero position. The mechanism actuating the contact-maker is curbed by means of an "overflow" connection between the two circuits. The apparatus may be affixed to a siphon recorder, and may be duplexed. Nine figures.

517 of January 9th, 1899. **Type-printing Telegraphs.** C. D. ABEL (*Siemens & Halske*). The same apparatus may be used as transmitter and receiver by untrained persons. A number of constructional details are protected. Three figures.

537 of January 10th, 1899. **Automatic Reversible Booster.** J. S. HIGHFIELD. The armatures of a motor, exciter, and booster are all mounted on one shaft. The currents from the exciter oppose those from the source of energy and excite the field magnet of the booster, the armature of which is in series with the source of energy and the load.

The following are the more important Patents that have become void through non-payment of renewal fees.

**Switchgear, Fuses, and Fittings:** A. F. BERRY [Thermally controlled electro-magnetic switches for cutting in and out supplementary transformers] 19,015 05; J. BOOKER [Combined motor starters and speed regulators] 20,560 06.

**Telegraphy:** SIEMENS BROS. & Co. (*Siemens & Halske*) [Polarised relays for high-speed working] 19,877 03.

**Traction:** R. A. HADFIELD and D. GALBRAITH [Conduits for tramways, &c.; construction at junctions] 20,240 02; SIEMENS BROS. & Co. (*Siemens & Halske*) [Hand levers for block signalling] 20,779 07.

**Miscellaneous:** F. G. JAHN [Postmarking and cancelling machine] 16,607 00; I. SUTHERLAND [Moving picture targets] 20,586 07.



## TENDERS INVITED AND PROSPECTIVE BUSINESS

### GENERATING STATIONS, SUB-STATIONS, MAINS, &c.

**Accrington.**—A sub-station is to be erected to deal with the Clayton-le-Moors district.

**Bath.**—The Local Gas Co. opposed at an inquiry last week into a loan of £8,000 for extensions to the electricity undertaking. The proposed loan consists of £3,000 for laying electric mains in Weston, a district recently incorporated with the city; £2,250 for prospective expenditure on mains during the next three years; £2,250 for house services, and £500 for transformers. Of these amounts £1,394 have been spent in anticipation of the loans on mains, £1,561 on services, and £240 on transformers. The Local Gas Co. was represented by Mr. Vesey Knox, K.C., the main point made on their behalf being to secure the insertion of the Northumberland clause as regards the extension into Weston, in order to prevent any call on the rates in which the Gas Co. would have to take part.

**Birmingham.**—Having definitely decided to erect a large new power station at Saltley with a total ultimate capacity of 100,000 kw., the Electric Supply Committee and their engineer and secretary are to visit London, Newcastle-on-Tyne, Glasgow and Liverpool, to inspect power stations there, before deciding upon the details of the new scheme.

**Doncaster.**—Extensions to the electricity works are contemplated.

**Ellesmere Port.**—A site has been approved for a generating station, and an expenditure of £15,000 is contemplated under the Council's Provisional Order now before the Board of Trade.

**London: Stepney.**—A loan of £18,000 for new machinery and mains is to be applied for.

**Maidstone.**—The provision of an additional reciprocating engine set is recommended at a cost of £5,620.

**New Zealand.**—The Thames Council require tenders by Jan. 30th for two 100-kw. Diesel engine sets with switch-board, mains, street lighting equipment, &c. A stipulation of the scheme is that the feeders and distributors are to be of aluminium. Further particulars at 73 Basinghall Street, E.C.

**Oldham.**—The installation of a 1,500-kw. turbo-alternator, and two 500-kw. motor-alternators, at an estimated cost of £13,000, is recommended by the Borough Electrical Engineer in order to meet the heavy demand which is coming in for power from large mills. In addition £9,500 will be necessary for mains, £1,200 for switchgear, and £5,000 and £1,800 for future expenditure on mains and transformers respectively.

**Stalybridge Joint Board.**—A loan of £20,000 is to be taken up for extensions to the Joint Board's electricity works.

In addition to the extensions of area mentioned in these columns in recent issues, the following municipalities are applying to the Board of Trade for powers to extend their electric lighting areas, and in connection with which orders for electrical plant and machinery may be anticipated:—Beckenham, Derby, Doncaster, Neath, Stoke-on-Trent, Watford and Wolverhampton. Extensions by companies in the following areas are also to be made:—Barnet, Dartmouth, Leatherhead, Northwood, Smethwick and Wellingborough.

### WIRING

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Aberdeen.**—New baths.

**Chester.**—New buildings at Upton Hospital. H. Beswick, Newgate Street. Jan. 20th.

**Dublin.**—Considerable extensions to joint hospital. Architect, T. F. McNamara, 192 Great Brunswick Street.

**Hamilton.**—£30,000 hospital.

**Haslingden.**—New Council school.

**High Wycombe.**—Grammar school.

**London.**—Electrical Installations at Camberwell School of Arts and Vauxhall Street elementary school for L.C.C. (See an advertisement on another page.)

**Manchester.**—New goods offices for L. and Y. Railway.

**Portsmouth.**—Extension to the electrical equipment of workhouse.

**Swansea.**—Three hundred workmen's houses. Town Clerk.

New municipal buildings.

**Tenbury.**—Electric lighting of workhouse.

### MISCELLANEOUS

**Australia.**—The Deputy Postmaster-General at Perth requires 2,165 ft. of lead-covered paper-insulated telegraph cable. Further particulars at 72 Victoria Street, S.W., or 73 Basinghall Street, E.C.

**Birmingham.**—The Tramways Committee are advertising for their annual supply of stores, which includes electrical sundries. General Manager. Jan. 27th.

**London: L.C.C.**—Three-and-a-half miles of 4'0 grooved trolley wire. Clerk to Council. Jan. 14th.

**N.E.R.**—It is stated that the North Eastern Railway Co. propose to extend their electric lines in the Newcastle area at a cost of £30,000.

**Plymouth.**—Twelve months' supply of arc-lamp carbons, meters, &c. Borough Electrical Engineers. Jan. 23rd.

**South Africa.**—The Germiston Council requires a trolley bus installation.

**West Ham.**—Engine-room supplies, chemicals, A.C. house-service wattmeters. Electrical Engineer. Jan. 24th. (See an advertisement on another page.)

## TENDERS RECEIVED AND ACCEPTED

**Bristol.**—The tenders of the British Westinghouse Co. and Messrs. Bruce Peebles and Co. for the supply of electrical apparatus at £903 and £2,187 10s. respectively, have been accepted.

**Eccles.**—The tender of the British Westinghouse Co. for a twelve months' supply of meters has been accepted.

**Hull.**—The tender of Messrs. Cox, Walkers, Ltd., at £1,129 has been accepted for the electric wiring and fitting of the teachers' training college, Cottingham Road. This is the lowest tender, the highest being £1,460.

**London.**—According to the *Railway Gazette*, contracts have been let for a portion of the work for linking up the North London Railway with the Underground system of London.

**Talcahuano (Chile).**—Messrs. Gillespie & Beales, purchasing engineers for Messrs. Martin Bros., Valparaiso, have placed the following orders:—Generators, Messrs. Laurence Scott; battery, &c., Hart Accumulator Co.; switchboard, Messrs. Ferranti; cable, Messrs. W. T. Glover & Co.; crane, Messrs. Holt and Willetts; steel poles, Messrs. Stewarts & Lloyd; lanterns and fittings, Mr. Hadyn Harrison.

## APPOINTMENTS AND PERSONAL NOTES

Mr. C. E. C. Shawfield, who has been engineer-in-chief to the Wolverhampton Corporation Electricity Works since 1898, and prior to that was Chief Assistant for two years, has resigned in order to take up an appointment as Joint Managing Director with the Knowles Oxygen Co., of Wolverhampton, who manufacture oxygen and hydrogen gases by an electrolytic process. Mr. Shawfield's resignation, which takes effect in about three months' time, will necessitate his giving up the presidency of the I.M.E.A. We understand that his resignation will be formally tendered at a Council meeting this month, when it is expected that Mr. R. A. Chattock (Chief Electrical Engineer of the Birmingham Corporation), the senior vice-president, will be nominated for the year. In all probability, however, the meeting will be held in London, as originally arranged, and not in Birmingham.

We are very pleased to be able to announce that Mr. W. J. U. Sowter, the Borough Electrical Engineer at Bray, has now sufficiently recovered from the effects of the serious accident he met with in July last, when a compressed air cylinder used in conjunction with a Diesel engine there burst, to enable him to resume charge of the Bray Electricity undertaking. As we have since announced in our columns, Mr. McDonnell, the Assistant Engineer at the time of the accident, and who was also injured, but fortunately not seriously, has now left the service of the Council and Mr. V. Dempsey, of the Galway Electric Supply Co., has been appointed his successor at a commencing salary of £104 per annum.

Messrs. Bruce Peebles, Ltd., have appointed Mr. Lee Murray to the Board. Mr. S. E. Bastow and Mr. J. H. Bunting have been appointed Joint Managers of the Company in place of Mr. Lee Murray.

The Manchester Electricity Committee recommend the appointment of Mr. H. Lamb as Resident Engineer at the Stuart Street generating station, at a commencing salary of £350.

Mr. C. N. Hefford has been appointed temporarily to take charge of the Leeds Electricity undertaking.

In consequence of Mr. Dickinson's removal to Liverpool, the duties of Hon. Secretary of the Yorkshire Section of the I.E.E. will in future be carried on by Mr. J. D. Baillie, Messrs. C. A. Parsons and Co.'s Leeds representative.

Mr. Dundas Fox, Manager of the Penrith Electric Supply Co., has severed his connection with that Company and has made arrangements to proceed to Canada with Mr. J. W. Bleasdale, his assistant engineer, to commence business as consulting engineers. Mr. J. W. Speight, who has hitherto been connected as Consulting Engineer to the Penrith Co., has taken over the managership.

The salary of Mr. G. F. Nayler, Chief Assistant Electrical Engineer at Nelson, has been increased from £140 to £160 per annum.

Mr. E. Jaeger has been appointed London Manager of Messrs. Jaeger Bros., 18 Christopher Street, Finsbury Square, E.C., in succession to Mr. H. Steinbach.

A chief assistant is required in Technical Department of the Union Cable Co. (See an advertisement on another page.)

Laboratory assistant required at South Western Polytechnic. (See an advertisement on another page.)

Jointer wanted in South Wales, accustomed to E.H.T. three-core paper cables. (See an advertisement on another page.)

**An Unusual Application of the "Magnet" Iron.**—An interesting case has just come to our notice of the use of an electric iron. During the recent cold spell in the North, a customer of the General Electric Co., Ltd., became anxious for the safety of his motor-car, in consequence of the danger of the water in the radiator freezing. For some reason a supply of oil for the heating lamp usually employed in the garage could not be obtained. Possessing a 6-lb. "Magnet" Electric Iron, he hit upon the excellent idea of connecting it to a lamp-holder in the garage and placing it in the bonnet of the car. The effect was entirely satisfactory, and we are pleased to learn that the customer referred to has lost no time in purchasing a G.E.C. Electric Heater for his garage.

#### MISCELLANEOUS.

**F. H. LOVELL & COMPANY,**  
of  
**ARLINGTON, NEW JERSEY,**  
U.S.A.

#### DESIRE TO ANNOUNCE

That they maintain a large and well-equipped Brass Foundry, Machine-shop, and Finishing Rooms suitable for the manufacture or assembly of electrical and steam specialities. They are in close touch at all times with the U.S. Navy Department and the leading companies, whose patronage they have enjoyed for many years. They are therefore peculiarly fitted to handle under the new provisions of the new U.S. Act governing the free importation of material used in shipbuilding, such raw materials and such devices as can be imported in part and assembled here.

They solicit the inquiries of all those who are desirous of obtaining capable U.S. Agents for the handling of their products.

### MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. G. Smith and Son, of 5 Philpot Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night, was £81 15s. to £82. (Last week, £81 10s. to £82.)

**Patent for Sale.**—A patent of electric current regulators is offered for working in this country. (See an advertisement on another page.)

It is desired to work in this country a patent for improvements in forecarriages for motor-cars. (See an advertisement on another page.)

**Armorduct Manufacturing Co., Ltd.**—This Company state that they have acquired the sole licence for the manufacture and sale of Mr. Napier Prentice's "Lightning" Cooking Oven, and that they will be placing it on the market some time in February. They also announce that they are making further large extensions at their Witton Works to cope with the increasing demand for their specialities.

**Electrical Engineering and Equipment Co.**—This Company has taken over the agency of the Vereinigte Isolatorenwerke of Berlin, with the exception of traction material.

**Bankruptcies.**—The public examination of Messrs. Samuel Lord and W. Sutton, electrical engineers, Redcross Street, Liverpool, took place last week. There are unsecured liabilities of £3,340 with only £3 10s. assets. The debtors traded as the Howe Electrical Engineering Co., and the failure is attributed to the large sum of money spent on the development of certain patents.

**National Telephone Co.**—Creditors are requested to send in particulars of their claims not later than February 1st, to G. Franklin, Telephone House, Victoria Embankment.

**Dissolution of Partnership.**—Mr. A. J. Boulton has retired from Messrs. Boulton, Wade & Tennant, Patent Agents, 111 and 112 Hatton Garden, E.C. The business will continue as usual.

**Willans & Robinson.**—The accounts for the year to June 30th, 1912, show a trading loss of £20,881, after setting aside £18,607 for depreciation and debenture interest. A scheme, which will involve the entire rearrangement of the share capital of the company, is to be submitted to the shareholders to-day. This embraces a working arrangement with another English engineering firm (one which has for six years paid 20 per cent. per annum to their ordinary shareholders), who will invest some new capital in the company, and will, it is suggested, be able to place regularly with the company a large number of orders at remunerative prices.

### CALENDARS AND SOUVENIRS FOR 1913

We are very pleased to receive a most substantial desk blotter and diary of subdued design in their usual style, from A. Graham & Co. (St. Andrew's Works, Crofton Park, S.E.). This firm have also presented us with a useful little book, giving the daily tide tables for the principal seaports of the United Kingdom, port charges, knot tables, distance tables, together with electrical tables, &c.

A tear-off wall calendar from the Westinghouse Brake Co., Ltd. (Chain Department, 82 York Road, King's Cross, N.), illustrates the Company's rocker joint chain.

A wall calendar from the Jandus Arc Lamp & Electric Co., Ltd. (Hartam Road, N.), is embellished with an excellent reproduction of an original water-colour, specially prepared for this occasion. The firm will be pleased to forward a copy of this calendar to any of our readers interested in their manufactures.

A small but bold and clear wall calendar—one sheet to a month—has been received from Nalder Bros. & Thompson, Ltd. (34 Queen Street, E.C.).

The Liverpool Electric Cable Co., Ltd., have printed on their wall calendar for 1913 a striking picture of their new works in Bootle, Liverpool. The calendar itself will be useful for office purposes, as the figures are printed in white on a dark green background, and stand out very prominently.

We have received a copy of a practical telephone card from the Benjamin Electric Co. (117 Victoria Street, S.W.).



# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 316 [Vol. IX., No. 3]  
*All rights reserved.*

THURSDAY, JANUARY 16, 1913.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 6d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES AND TECHNICAL COLLEGE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (only 11m width).

*Other Advertisement Rates on Application.*

### Latest Time for Receiving

Letters for Insertion, Tuesday first post.

Small Advertisements and Official Announcements, Wednesday first post.

Displayed Advertisements, Tuesday first post.

Corrections in Standing Advertisements, Monday first post.

All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 208-206, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Circling, Fleet, London." Telephone No.: 5509 Holborn.

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## CONTENTS

	PAGE
SUMMARY ... ..	29
Arrangements for the Week ... ..	30
Phase Advancers ... ..	31
ELECTRICAL ENGINEERING LITERARY SECTION:—	
New Publications ... ..	33
Reviews of Books ... ..	33
ELECTRICAL ENGINEERING Book List ... ..	36
Three-phase Extensions at Marylebone ... ..	37
Large Turbo-generators ... ..	37
A Power Station Weighbridge ... ..	37
An Enclosed Reversing Switch ... ..	37
Willans & Robinson ... ..	37
Catalogues and Pamphlets Received ... ..	38
Tea-making by Electricity ... ..	38
Questions and Answers by Practical Men ... ..	39
Electric Traction Notes ... ..	40
Telephony and Telegraphy (Including Wireless) ... ..	40
Local Notes ... ..	42
PATENT RECORD ... ..	42
Tenders Invited and Prospective Business ... ..	43
Tenders Received and Accepted ... ..	44
Miscellaneous Business Notes ... ..	44

## SUMMARY

An article, based on a paper and discussions at the Institution of Electrical Engineers, reviews the various methods possible for improving the power factor in A.-C. systems, and in particular the Miles Walker phase advancer, which is suitable for use with large motors. It is similar to the Scherbius machine with the addition of a field magnet. The question as to whether con-

densers are still too costly for general use was debated, and it appears that over-excited synchronous motors are too expensive to employ as phase advancers when large currents are in question. (Page 31.)

OUR "ELECTRICAL ENGINEERING Literary Section" contains a list of new publications, reviews of a number of technical books, and gives a selected list of recommended works on all branches of electrical engineering. (Page 33.)

ON the advice of Mr. J. F. C. Snell, the St. Marylebone Borough Council have decided to adopt the three-phase system of generation at their power station, and have ordered two 3,750 K.V.A. Oerlikon turbo-alternators. (Page 37.)

A GENERAL exposition of the steam end of turbo-generators was given on Tuesday by Mr. J. P. Chittenden before the Rugby Engineering Society. (Page 37.)

A NEW enclosed reversing switch and an electric tea-making equipment are described in short illustrated articles on pages 37 and 38.

THE prominent question of the improvement of power factor on A.-C. systems is well treated in reference to the use of over-excited synchronous motors or rotary-condensers in conjunction with induction motor-loads in our "Questions and Answers" columns. (Page 39.)

A FURTHER report has been issued regarding the conversion of the Berlin suburban railways to electric traction. Schemes for the adoption of electrical working on the local lines in Vienna are also under consideration. (Page 40.)

JUDGMENT for £12,515,264 was given by the Railway and Canal Commissioners on Monday last as the value of the National Telephone Company's undertaking. The straight line method of depreciation was held to be the more suitable, and "physical" life of plant was taken, though the lives assigned by the Company were reduced for various reasons. The only point upon which the Commissioners were not unanimous was the charge for raising capital, but this was allowed by a majority of 2 to 1.—The House of Commons Committee has recommended the appointment of an independent sub-committee to test and report upon wireless telegraph systems within three months.—The extension of the underground telegraph and telephone mains to the North of Scotland is stated officially to be a commercial impossibility. (Page 40.)

THERE is some difference of opinion in the Sheffield Corporation as to continuing the wiring department.—The West Hartlepool waste heat power scheme will shortly be put into operation.—The Dublin Corporation have decided upon a maximum salary of £200 per annum for shift engineers.—The Rhyl Corporation are

adopting the "rateable value" system of charging.—Opposition is threatened at the forthcoming audit of the Marylebone electricity accounts.—Considerable complaint is being made as to smoke nuisance from the Salford electricity works. (Page 41.)

A PATENT covering various details in the connections to and mechanism of a submarine relay by S. G. Brown expires during the current week after a life of fourteen years. Among the Specifications published by the Patent Office on Thursday last were three relating to wireless. The Bergmann A.-G. are protecting the use of a direct-coupled exciter to a rotary for induction motor control, an electrolytic excess-current meter is covered by E. Schuppiser, and the B.T.-H. Co. claim the use of wrought tungsten for contacts subjected to high temperature. (Page 42.)

THE Sheffield tramways and lighting power-houses are to be linked up. A 120 kw. reciprocating set and switch-gear is required at Colwyn Bay; rotary converter plant by an Indian company; traction battery, booster, and switchgear at Nelson; steam turbine plant at Lincoln, and a switchboard at Salford. Extensions are contemplated at Watford, £12,564, and Gravesend, £10,000. Street electric lighting is to be carried out at Nuneaton, and miscellaneous stores are required at Belfast and Cheltenham. (Page 43.)

**Electrical Concerts.**—Last Friday, by a peculiar coincidence, the Electroharmonic Society and the Batti-Wallahs held their smoking concerts simultaneously at the Holborn Restaurant—needless to say, in different rooms. At both there was a good attendance, and at the Batti-Wallahs Society in particular there were far more members and visitors present than usual; the total attendance at this concert was 157. Several members divided their favours between the two societies.

## ARRANGEMENTS FOR THE WEEK

FRIDAY, JANUARY 17TH.

*Royal Institution.*

9 p.m. Evening discourse. "Further Applications of the Method of Positive Rays," by Prof. Sir J. J. Thomson, F.R.S.

MONDAY, JANUARY 20TH.

*Institution of Electrical Engineers: Newcastle Section.*

7.30 p.m. At Armstrong College. "Electric Resistance Welding," by P. Bucher. (An abstract of the Paper and discussion in Manchester was published in our issue for January 2nd, p. 7.)

TUESDAY, JANUARY 21ST.

*Institution of Electrical Engineers: Newcastle Section.*

7.30 p.m. At Literary and Philosophical Society, Middlesbrough. Mr. Bucher will repeat his Paper as above.

*Institution of Electrical Engineers: Manchester Students' Section.*

7.30 p.m. At Municipal Technical School. "Street Photography," by S. E. W. Taylor.

THURSDAY, JANUARY 23RD.

*Institution of Electrical Engineers.*

8 p.m. "The Use of a Large Lighting Battery in Connection with Central Station Supply," by F. H. Whysall.

FRIDAY, JANUARY 24TH.

*Royal Institution.*

9 p.m. Evening discourse. "Recent Advances in Scientific Steel Metallurgy," by Prof. J. O. Arnold, F.R.S.

*Association of Mining Electrical Engineers.*  
East of Scotland Branch. Meeting at Dunfermline.

## The London Electrical Engineers.

THURSDAY, JANUARY 16TH. C. Company.—Company Training, 7 to 10 p.m.

FRIDAY, JANUARY 17TH. D. Company.—Recruit Training, 7 to 10 p.m.; Company Training, 7 to 10 p.m.

SATURDAY, JANUARY 18TH. D. Company.—Week-end run at Fort Coalhouse. No arms or equipment will be taken. Parade at Fenchurch Street Station at 3 p.m. Headquarters will be opened for Regimental business from 10 a.m. till 12 noon.

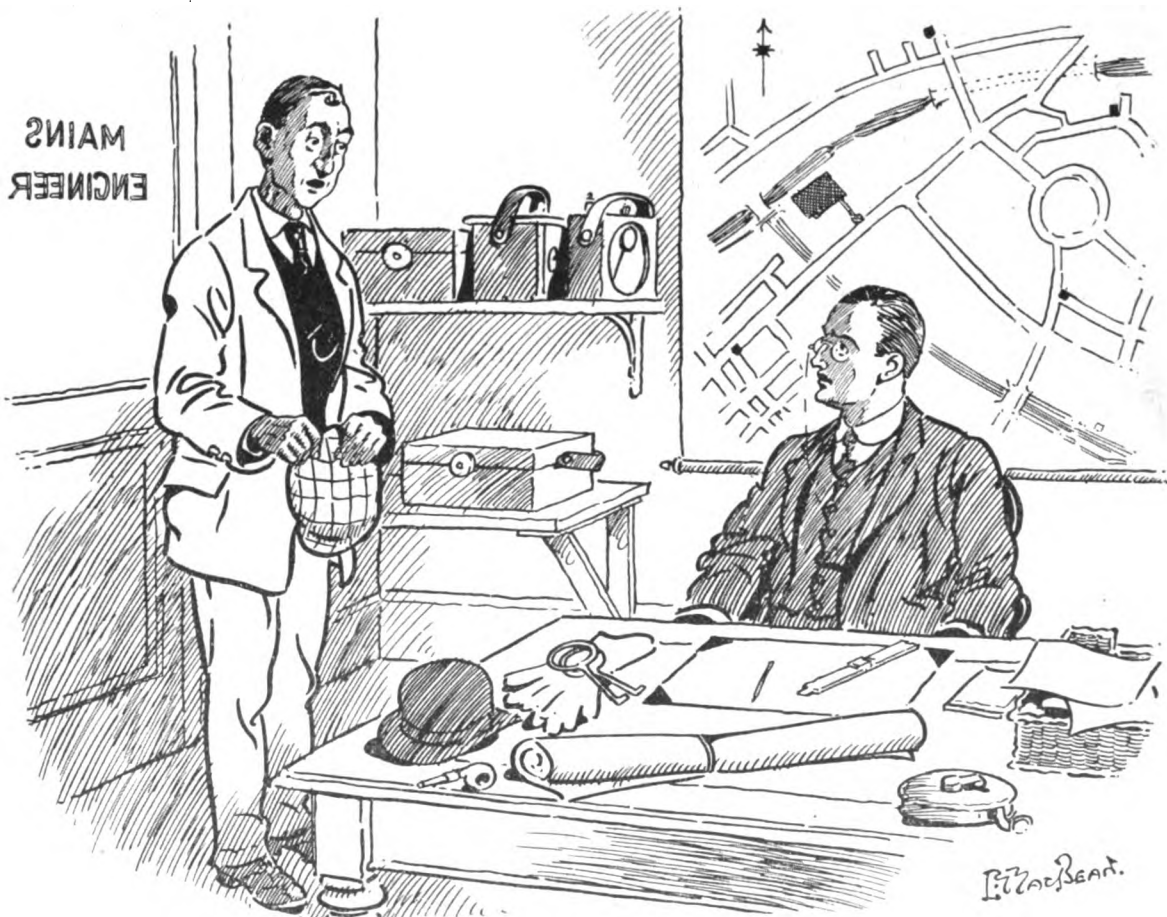
MONDAY, JANUARY 20TH. A. Company.—Recruit Training, 7 to 10 p.m.; Company Training, 7 to 10 p.m.

TUESDAY, JANUARY 21ST. B. Company.—Recruit Training, 7 to 10 p.m.; Company Training, 7 to 10 p.m.

THURSDAY, JANUARY 23RD. C. Company.—Company Training, 7 to 10 p.m.

FRIDAY, JANUARY 24TH. D. Company.—Recruit Training, 7 to 10 p.m.; Company Training, 7 to 10 p.m.

SATURDAY, JANUARY 25TH. A. Company.—Week-end run at Fort Coalhouse (as for D. Company last week). Headquarters open from 10 a.m. till 12 noon.



**MAINS ENGINEER TO APPLICANT FOR POST OF JOINTER:**—Oh, so you've worked on Low and High Tension mains—ever had a shock?  
**JOINTER:**—Yes, sir, four, sir, two of 'em fatal!

## PHASE ADVANCERS

THE question of the design of apparatus for improving the power-factor in A.-C. systems was discussed last week in a Paper by Professor Miles Walker (Manchester Municipal School of Technology), both at the Birmingham Local Section of the Institution of Electrical Engineers and at the London meeting. The Paper may be regarded as an extension of the one which Professor Walker read before the I.E.E. in 1909 (ELECTRICAL ENGINEERING, Vol. V., January 21st, 1909, p. 65, and May 6th, p. 420).

The apparatus now in use for improving power factor is as follows:—The over-excited synchronous motor, the static condenser, the Scherbius phase advancer, the Kramer phase advancer, the Kapp vibrator, and the Miles Walker phase advancer. The synchronous motor is expensive to instal, as a large machine is necessary. This is brought out, incidentally, in our Questions and Answers columns in this issue. The static condenser suitably designed for the purpose in view could be obtained in 1909, according to Mr. W. W. Mordey (ELECTRICAL ENGINEERING, Vol. 5, May 27th, 1909, p. 481), at a less cost than a synchronous motor, and with only a quarter the annual losses. In the discussion in London, Mr. A. W. Ashton spoke strongly in favour of condensers. The initial cost is, he said, about £2 8s. per k.v.a., and is practically independent of pressure. Further advantages of condensers are great strength mechanically, ability to stand overloads of 300 per cent. and a temperature rise of 30° above normal.

On the other hand, Mr. A. M. Taylor (Birmingham) had found, on going into the cost, that this was prohibitive, as the expense per kw. would amount to something like £5. He thought that, as the capacity necessary for the condenser varies inversely as the square of the voltage, it would be feasible to use a condenser in connection with a high-pressure transformer. To the cost of the condenser would then have to be added the cost of the transformer, but some saving might even then be effected.

Professor Walker, however, pointed out that the economy suggested is open to question, as the high voltage necessitates increasing the thickness of the dielectric in the condenser, and this causes the capacity to fall.

The Scherbius phase advancer manufactured by Brown, Boveri & Co. is in considerable use on the Continent, and gives excellent results. The overall dimensions of a set capable of bringing a 600-h.p. motor to unity power factor are 50 in. by 22 in. by 25 in., and its weight 750 lbs. Power factor curves for a 400-h.p. 32-cycle motor running at 160 r.p.m., with and without the advancer, are given in Fig. 1. The

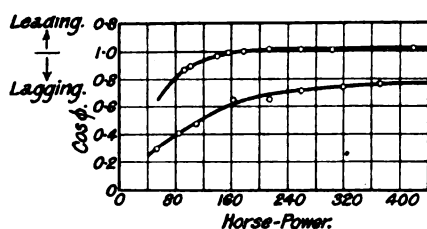


FIG. 1.—POWER FACTOR CURVES OF 400 H.P. MOTOR. THE LOWER CURVE WITHOUT AND THE UPPER CURVE WITH SCHERBIUS PHASE ADVANCER.

winding, which is of the usual drum type, lies in holes in the laminated core. The field is produced by the armature itself and rotates at a certain slow speed. A smooth iron ring surrounds the armature to reduce magnetic reluctance. The required e.m.f. is produced by the cutting of the field by the armature conductors producing it. The generated e.m.f. is high at small loads, so that at normal loads the current is already leading. If it is required that the power factor never exceeds a certain value, the machine is designed to become saturated at this value.

The Kapp vibrator consists of an oscillatory magnet excited with a weak continuous current, and placed within a wound stator, one of which is put in series with each of the rotor phases of the motor. As the current pulsates with the frequency of the rotor slip, the magnet oscillates, and induces an e.m.f. in the stator winding. This e.m.f. is leading, and the power factor is thus improved. The "injected" e.m.f. can be controlled by adjusting the excitation of the magnet. Professor Kapp pointed out in the discussion that this machine is different from a rotary machine in that the injected e.m.f.

varies as current÷slip, instead of current alone. His vibrator is therefore better than the rotary phase advancer at light loads and for slips of small magnitude. Tests on a 25-h.p. 500-volt motor running at 1,000 r.p.m., with the vibrator, showed that at  $\frac{1}{4}$ -load the power factor was 0.82; at  $\frac{1}{2}$ -load, 0.98; at  $\frac{3}{4}$ -load, 0.94; and at full-load, 0.93. Tests are in progress with a view to the adoption of the vibrator on the three-phase traction systems in Italy, where 200,000-h.p. is in use. At 5 per cent. over synchronism, a train on test threw back power into the line to the amount of 35 per cent. at a power factor of 0.94. The suggested arrangement is shown in Fig. 2. The vibrators are in mesh connection.

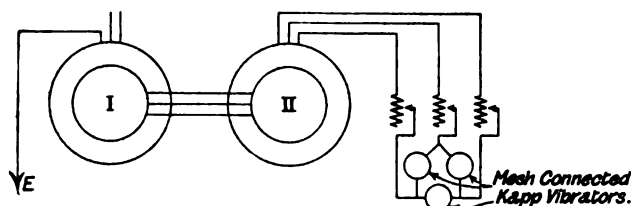


FIG. 2.—PROPOSED ARRANGEMENT OF KAPP VIBRATORS ON 3-PHASE LOCOMOTIVE.

The magnetising currents from the vibrators are sufficient for machine No. II., with a little over for No. I.

The Kramer advancer is similar to the Scherbius, except that it is connected mechanically instead of electrically.

The Miles Walker machine is also similar to the Scherbius machine, with the addition of field magnets whereby commutation is improved, and it is probably the best construction for use with large motors. It is doubtful whether Scherbius advancers could be built to work sparklessly for motors of 2,000 h.p. The cases most suitable for the addition of phase-advancers are those where the motors run continuously in one direction. Large induction motor-generators, whether the continuous current load is steady or not, might be fitted with advancers.

Professor Walker gives the following as a suitable construction and design for an advancer direct-connected to an 800-h.p. 50-cycle induction motor running at 490 r.p.m., with three-phase star-wound rotor having a standstill pressure of 800 volts per phase. The working current  $Ow$  will be about 255 amperes. To find the rotor current necessary to make the motor run at 0.95 leading power-factor, the construction shown in Fig. 3 is adopted. The power-factor without the advancer will be about 0.88, equivalent to a lagging current  $wu$  equal to 47 per cent. of the working current, i.e., 120 amperes. For the rectification required, the advancer must supply to the rotor an additional 31 per cent. of leading current  $au$  making 200 amperes wattless in all. Adding as vectors, Fig. 3, the 200 amperes wattless to the 255 amperes working current, we get 324 amperes per phase for the rotor. If the rotor had a phase voltage of 400, we should have had 650 amperes, which, though more expensive, would give a possible design of advancer.

The armature is mesh connected. If the full-load slip of the motor is 1.45 per cent., the E.M.F. generated will be 20 volts between rings. Lay off as in Fig. 4 the vertical line  $OE_a$  to represent this voltage in phase A. Fig. 3 shows the angle of lead of the current on this voltage; therefore set off the line

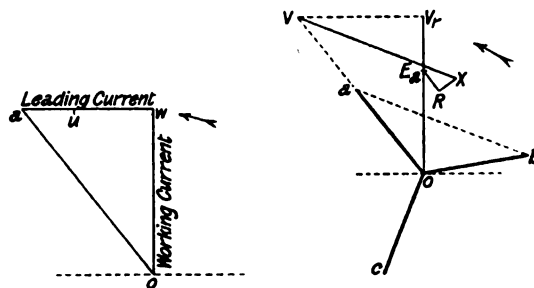


FIG. 3.—CONSTRUCTION TO FIND ROTOR CURRENT TO GIVE A CERTAIN POWER-FACTOR.

FIG. 4.—CONSTRUCTION TO FIND VOLTAGE TO BE SUPPLIED BY ADVANCER.

$Oa$  to represent the current in phase A. Similarly  $Ob$  and  $Oc$  represent the currents in the other phases. Allow about 6 volts for pressure drop. This will be represented by  $E_a R$ . Provisionally allow about five volts for the reactive drop in the field coils of the advancer. This is represented by  $RX$ . There is no reactive drop in the armature, because the compensating winding wipes out its field. If a voltage  $XV$  is added parallel to  $ba$ ,

we shall get a resultant voltage  $OV$  in phase with  $Oa$ . Therefore excite the advancer with a current in phase with the sum of  $Oa$  and  $-Ob$  (shown by the dotted line  $ba$ ) and the current leads by the right amount. The voltage to be generated by the advancer is given by  $XV$ , which when scaled off gives us 33 volts. The projection of  $OV$  on the vertical line gives  $OV_r$ , which is greater than  $OE_r$ . If  $OV_r$  is greater than is necessary to drive the working current through the rotor circuit, the slip of the rotor will be reduced. If  $OV_r$  is not sufficient to drive the working current, then the slip will be increased. Thus the rating of the advancer is 33 volts between terminals, and 324 amperes per phase. It will be found, said Professor Walker, that the series-wound advancer will have more suitable characteristics for the case in hand than a shunt-wound or separately excited advancer. With a series excitation, the amount of leading current taken from the line increases with the load, so that the power-factor of the motor remains more nearly constant than where the excitation of the advancer remains constant. When the voltage to be generated is of the order of 30 volts or higher, and the current reasonably low, a closed armature winding is best. Theoretically, three salient poles (equivalent to two magnetic poles) are quite enough for a machine of the rating required, but six poles are more likely to fit in with standard parts. This gives six brush-arms, two in parallel in each phase. There will be 162 amperes per brush arm, and  $162 \div 1.73 = 94$  amperes per conductor. The remaining questions are of design. The armature need not differ from a continuous-current armature. The field winding will be provided with series exciting coils and compensating windings connected to the various phases in a suitable way. The main points to look to were summed up by Professor Walker as follows: (1) The six salient poles are equivalent to a 4-pole machine magnetically. (2) The voltage to be generated as a continuous-current machine is 1.41 times greater than the virtual voltage called for. (3) The fluxes in the poles are  $120^\circ$  apart in phase. The induced armature pressure per coil is only 0.86 of that which would be generated if the two poles were carrying the maximum flux at the same time. (4) The series winding on each pole must cause the flux to lead the current in the armature conductors under the pole. (5) The phases of the currents in the armature and field must be looked to when arranging the compensating winding. (6) A commutating flux should be provided. The size of armature most suitable will come out to about 46 cms. dia. and 18 cms. long.

In practice it will be found unnecessary to adjust the speed exactly. If it is necessary, however, this can be done either by changing the speed of the advancer or by diverting some of the series field current. It is more economical to drive the advancer at high speed. In the machine described, commutation is made better by giving each armature coil a span of somewhat less than the full pitch, and arranging the positions of the brushes so that one of the limbs of each coil is moving in the fringing field of a pole excited by a current at all times proportional to the current under commutation. The alternation of the current in the armature and field causes a harmful e.m.f. to be set up in each coil under commutation; but as the frequency is so very low (say one cycle per second), this e.m.f. is not sufficiently great to create any disturbance. In the machine considered, it only amounts to one-sixth of a volt.

Several cases are quoted in the Paper of machines in actual operation which are giving good results. In one case three 400-h.p. slow-speed motors for pumping water for the Port of London Authority gave a power-factor of only 0.55 until phase advancers were added, when they took a slightly leading power-factor, a rebate of 10 per cent. being allowed. In another case a 750-h.p. motor driving a rolling mill took 1,000 k.v.a. at 0.64 power-factor, which was changed to 800 k.v.a. at 0.8 power-factor when the advancer was added. Other equally good results were cited by various speakers.

Besides the points connected with design already given, several points were raised in the discussions. Professor G. Kapp, Professor S. P. Thompson, and Professor Walker all dealt with the cheapening of the cost of construction of induction motors rendered possible by the advent of the advancer, whereby more iron and less copper could be used. The cost with an advancer should not exceed the cost of an ordinary induction motor, while the power-factor would be better. Dr. S. P. Smith (Central Technical College) gave several reasons why the advancer should be put at the generating station, and not on the consumer's premises. By installing an advancer (a commutating machine), all the advantages of the induction motor were done away with, and the factor of safety reduced. The consumer paid for something he did not get. It was, he said, a fundamental fault to put in a second machine, though there would no doubt be a few cases where this course would be desirable.

Professor Kapp described the results obtained in Italy with Professor Arno's discriminating meter. It had been found that the cost of a consumer to the power company could be given by  $K_i r^2 (aEI \cos \phi + bEI) dt$ , where  $a$  may be taken as  $\frac{2}{3}$  and  $b$  as  $\frac{1}{3}$ . Working out for the case of a machine giving a power-factor 0.88 at full load, and assuming that it ran for 3,000 hours at about  $\frac{1}{2}$  load ( $\cos \phi = 0.8$ ), the meter would register 1.08 K, whereas an ordinary meter would register K. Taking the cost of the Miles Walker advancer as £170, and current at  $\frac{1}{2}$  d. per

unit, the profit would be £170, say £85 for the consumer and £85 for the company. He held that by this system, where a consumer could get 50 per cent. profit on the capital cost of an advancer, he could be easily induced to instal one himself.

Mr. W. E. Burnand has sent a long communication in which he advocates charging the wattless component at bare cost and the true watt component at cost plus profit. This is effected by adjusting the meter so that with full-load current at zero power-factor, the meter runs at about  $1/5$  full-load speed instead of standing still. For small motors up to 20 h.p., he would strengthen up the transformer of the auto-starter and have two or three running positions at different voltages; some saving is effected in a few cases, though, of course, the system is not always applicable.

**Institution of Electrical Engineers.**—The following is the result of the ballot for new members and transfers from one class to another at the meeting on Thursday:—*Graduates*: W. C. Bexay, W. Brodie, C. E. Covell, B. Drane, H. G. Furlong, L. B. Giles, F. H. Jennings, I. E. Poyser. *Students*: A. Alves, A. E. Ammar, S. G. Anderson, A. Arias, G. G. Dawson, V. G. de Ferranti, E. A. do Rio, W. O. Fenwick, G. V. Fraser, R. Gray, E. A. Guthrie, G. Haigh, A. T. Hitch, J. C. Holden, D. H. Jaques, W. W. Keen, W. H. Kerman, D. J. McCourt, G. S. Marston, A. Morales, K. V. Ramana, W. J. Rawlings, B. Rowe, O. W. Sherwell, M. Singer, E. Wolf. *Candidates transferred: Student to Associate Member*:—F. E. Windross. *Student to Graduate*:—F. Bailey, J. E. Blair, C. M. Gillies, G. E. Graham, C. B. Gresham, G. K. Loveday, F. L. Otter, N. B. Patel, G. H. Reay, N. N. Roy, A. S. Sarkaria, C. W. Saunders, G. F. Schmidt, W. C. Stewart, H. M. Theaker, C. Vandermin, H. P. Young.

**An American Opinion on Electric Restaurants.**—The following, taken from the *Electrical Review and Western Electrician* (Chicago), is interesting:—"The recognition of the future possibilities to the central station by electric cooking seems to be greater in England than in this country, in spite of the fact that we usually regard ourselves as most enterprising, and that most of the central stations in England are municipally owned." The large and increasing number of electric restaurants in London on a commercial basis is then commented on. The article continues:—"Why it is that more effort along this line is not made by the central-station companies in this country is somewhat of a mystery. . . . The usual American enterprise has not been in evidence in this particular connection, and until some persistent pioneer efforts are made to acquaint the general public in this way with the possibilities and advantages of electric cooking, we can hardly look for a very rapid introduction of the electric range."

**The Action of Electricity on Concrete.**—The results of some extensive experiments in this connection were presented at the last convention of the National Association of Cement Users in Pittsburg. A report is contained in the *Electrical World* of New York. It appears that on unreinforced concrete the only effect is a migration of the water-soluble elements. Non-reinforced concrete buildings are therefore immune from trouble due to stray earth currents. They might, however, be injured by the earthing of cables carried in conduits embedded in the concrete, since these conduits would then act as electrodes. It is recommended that waterproofing membranes should be applied to the surface of reinforced concrete in preference to adding waterproofing substances to the concrete itself as preventatives of electrolysis. Painting or otherwise coating iron with an alkali-resisting metal preservative before embedding it in concrete may serve to minimise the dangers of electrolysis, but no such coating has been found that does not prevent the formation of the bond between the concrete and iron when the concrete sets.

**Phasing out A.C. Apparatus.**—At a meeting of the Newcastle Students' Section of the Institution of Electrical Engineers on the 6th inst., Mr. J. Hacking read a Paper containing a very complete description of the various tests to be gone through to determine whether the various phases of newly-installed A.C. apparatus bear the correct relationship to one another and to the corresponding phases of other apparatus in parallel. In addition to tests on the simpler machines, tests on rotary converters, induction regulators, and direct-boost regulators are gone into in considerable detail. The author states that if a self-starting rotary is started up in the right direction from each delta in turn, it does not necessarily follow that the connections are right, as is sometimes believed. For example, it is quite conceivable that each delta would have the correct vector rotation, but that one of them might have a double crossing as compared with the other. Further, if the vectors of the two meshes exactly coincide, each will have the same vector rotation, but it is obvious that the connections will not answer. Rotaries fitted with boosters may have them connected either between the slip rings and the armature winding, or between the transformer secondary and the slip rings. In the latter case, it must be remembered that if any crossings are required to give the machine correct phase rotation, they should be made on the transformer side of the booster. If made at the slip rings, the boost on two phases will be changed over.

## "ELECTRICAL ENGINEERING" LITERARY SECTION

### NEW PUBLICATIONS

*We shall be pleased to post any of the undermentioned works to any address in the United Kingdom, Colonies, or Abroad at the prices given. Orders should be addressed to the Kilowatt Publishing Co., Ltd., 203-6 Temple Chambers, Temple Avenue, London, E.C., accompanied by a remittance.*

"Notes on the Materials of Motor-Car Construction." By A. E. Berriman. 171 pp. 11½ in. by 8½ in. 150 figures. (London: St. Martin's Publishing Co.) 5s.; abroad, 5s. 9d.

"Design of Electrical Machinery." By W. T. Ryan. Vol. III.: Alternators, Synchronous Motors, Rotary Converters. 129 pp. 9½ in. by 6 in. 103 figures. (London: Chapman & Hall, Ltd.) 6s. 6d. net; abroad, 6s. 11d.

"Hazel's Annual for 1913." Edited by H. Hall. 592 pp. 7½ in. by 5 in. (London: Hazell, Watson & Viney, Ltd.) Price 3s. 6d. net; abroad, 4s. 2d.

"The Practice of Electrical Wiring." By D. S. Munro. 248 pp. 7 in. by 4 in.; 97 figures. (London: H. Alabaster, Gatehouse & Co.) Price 3s. net; abroad, 3s. 3d.

Poems by E. L. Hill. 60 pp. 7½ in. by 4½ in. (London: Electrician Printing and Publishing Co., Ltd.) 2s. 6d. net; by post, 2s. 8d.

"The Practical Electrician's Pocket Book for 1913," edited by H. T. Crewe. 440 pp. and Diary. 5½ in. by 3½ in.; about 250 figures. (London: S. Rentell and Co., Ltd.) Cloth, 1s. net; by post, 1s. 2½d. Rexine, 1s. 6d. net; by post, 1s. 8½d.

"Der Spannungsabfall des synchronen Drehstrom-Generators bei unsymmetrischer Belastung." By L. G. Stokvis. 96 pp.; 9 in. by 6 in.; 25 figures. (Munich: R. Oldenbourg.) 4s. net; by post, 4s. 3d.

"Foundations and Machinery Fixing," by F. H. Davies. 152 pp. 6½ in. by 4½ in. 52 figures. (London: Constable & Co., Ltd.) 2s. net; by post 2s. 2d.

"Fortsschritte der Elektrotechnik," edited by K. Strecker. Part IV., 1911. 1,410 pp. 9½ in. by 6½ in. (Berlin: Julius Springer). 14s. net; by post 14s. 4d. Abroad 14s. 7d.

"Technical Electricity," by H. T. Davidge and R. W. Hutchinson. 590 pp. 7 in. by 5 in. 273 figures. (London: University Tutorial Press, Ltd.) Third edition. 5s. 6d.; abroad 6s.

"Electrical Photometry and Illumination," by H. Bohle. 222 pp. 9 in. by 6½ in. 200 figures; 35 tables. (London: Charles Griffin & Co., Ltd.) 10s. 6d. net; abroad, 11s.

### REVIEWS OF BOOKS

**The Practical Telephone Handbook.** By J. Poole. 624 pp. 7½ in. by 5 in. 535 figures. (London: Whittaker & Co.) 5th edition. 6s. net; by post, 6s. 8d.

Owing to the rapid growth of telephony in this country during recent years and the consequent continual increase in the number of telephone engineers who have had to be trained, there has been a constant demand for Mr. Poole's excellent work on the subject. This, combined with the wisdom of the publishers in limiting the size of each edition, has enabled the book to be revised and brought up to date frequently, and it is safe to prophesy that the present edition—the fifth—will be exhausted even more rapidly than its predecessors. The publishers have been able to keep the price of the book extremely low for a high-class work of this character, so that it is well within reach of every member of the telephone industry and every student.

In almost every section of the book the author has displayed due sense of proportion. He has not attempted, for instance, to describe every telephone instrument on the market, but has selected a sufficient number of typical ones. He has also resisted the temptation to make use of the diagrams of the large number of junction circuits which must be at his disposal; his treatment of this part of the subject, however, is sufficient to enable the student subsequently to tackle with confidence the most complicated circuit which he is likely to meet in practice. The same applies to party-line systems;

those chiefly in use in this country are dealt with, but the author has refrained from describing the enormous number of highly ingenious systems which have been introduced in America from time to time. Exchange apparatus and equipment, underground and overhead construction, long-distance work, and "loading," testing, automatic telephone exchanges, and wireless telephony are all well described with accuracy of language and without too elaborate detail, but on the point of accuracy we must except one name, "Peel-Conner," which is wrongly spelt.

The book is not above reproach from the typographical point of view, owing to the revision from edition to edition and the natural desire of the publishers to utilise standing type or stereotypes, but as the student obtains the benefit of this by the low cost of the book we do not think that he will complain.

**Common Battery Telephony Simplified.** By W. Atkins. 164 pp. 7½ in. by 5 in. 150 figures. (London: Electrician Printing and Publishing Co., Ltd.) 3s. net; abroad, 3s. 3d.

As an elementary book to enable those who are already acquainted with the fundamental principles of telephony to extend their knowledge to the common battery system, this publication will be of great utility. The author has, with great wisdom and moderation, employed simple diagrams to illustrate his teaching rather than complete wiring diagrams. This is particularly fortunate, as in the present volume the illustrations show a distinct falling-off in the excellence of engraving, which has usually been a prominent feature in the publications issued by the "Electrician" Co., and, if the more detailed diagrams had been employed, there might have been considerable difficulty in tracing out the connections.

**The Science of Illumination.** By L. Bloch. Translated by W. C. Clinton. 108 pp. 8½ in. by 5½ in.; 47 figures. (London: John Murray.) 6s. net; abroad, 6s. 5d.

In the space of 146 pages of text and 30 of tables it cannot be expected that the subject indicated by the principal title of this book can be adequately treated. The sub-title, "An Outline of the Principles of Artificial Lighting," better describes it, and examination shows that after the usual preliminaries, the greater part of the contents deals with street lighting. The author assumes that his readers are not only well versed in integral calculus, but that they enjoy that mode of working in cases where very elementary geometry is quite sufficient. He ignores such commonplace matters as units and standards of light and considers the description of more than one photometer to be outside the scope of his work. Fortunately, the translator has recognised that the book in its original form would be useless for engineers except as a collection of mathematical exercises, and he has added in brackets some necessary statements about units and standards, illustrated descriptions of some modern photometers and various other practical matters. Besides this, he has made some alterations and has recalculated some of the tables, giving the foot-candle values. Many very clumsily executed diagrams have been redrawn, and the book has been lifted from a pedantic essay into one which may prove to be of use to those who care to follow the methods of calculation indicated.

Like some American writers, Dr. Bloch prefers to deal with the flux of light rather than with candle-power and illumination, and this accounts for his free use of integrals. A set of diagrams and tables at the end of the book are arranged for certain typical cases, and it is claimed that these enable minimum and mean illuminations on given areas to be calculated. On page 71 he takes a lamp of 32 horizontal candle power and a given polar diagram and proceeds to calculate the candle power at 45° by an involved process utilising the tables. He uses (without explaining) the well-known mean spherical reduction factor of 0.8, but says this gives the hemispherical candle power. His result is 23, but the commonsense graphical result from the curve is obviously about 24. The translator makes some strange confusion about surface-brightness on page 102.



**The Practice of Electrical Wiring.** By D. S. Munro. 248 pp. 7 in. by 4 in. 97 figures. (London: H. Alabaster, Gatehouse & Co.) 3s. net; abroad, 3s. 3d.

It is evident that the author knows his subject well, but he makes one mistake, namely, that he assumes almost equal knowledge in the reader. In fact, the book will appeal chiefly to two classes: those who have knowledge and experience and can meet the author on equal ground, and those who are equipped with the necessary knowledge and practical training, but whose experience has been but short. The former will find much in the work with which they agree and sufficient upon which their opinions differ with those of the author to enable them to derive the same profit by its perusal as from a keen discussion on ways, means, and methods with a fellow craftsman. For the readers who lack only the experience there is a gold mine of information in the volume. But for the learners who have practical experience only and desire to be taught the theoretical and technical side of the business, or those who have received their student training, but are only beginning to take up practical work, the book cannot be so strongly recommended.

**Technical Electricity.** By H. T. Davidge and R. W. Hutchison. 590 pp. 7 in. by 5 in. 273 figures. (London: University Tutorial Press, Ltd.) Third edition. 5s. 6d.; abroad, 6s.

Many of the suggestions contained in our review (*ELECTRICAL ENGINEERING*, Vol. 5, October 14, 1909, p. 894) of the second edition of this very popular treatise have been acted upon in this, the third edition, so that now it is even more useful than formerly. The sections on incandescent lamps, accumulators, boosters, etc., have been brought quite up-to-date and are very representative, while the space devoted to testing has been considerably extended, and includes good descriptions of the principles and construction of the ohmmeter, megger, ducter, and other well-known instruments. Somewhat excessive prominence is still given to one type of flame arc lamp, but some others are mentioned. The elementary expositions of the principles of the dynamo and motor are very good. Considering the book as a whole, one may confidently recommend it to those desiring a general knowledge of the subject or those commencing its study from a practical point of view.

**Hilfsbuch für die Elektrotechnik.** By K. Strecker. 968 pp. 8 in. by 5½ in. 800 figures. (Berlin: Julius Springer.) Eighth edition. 18s. net; by post, 18s. 8d.

This is a thoroughly practical and reliable text-book covering in a very efficient manner the whole range of electrotechnics, from the first principles of electricity and magnetism to heavy power station and traction work. The various branches of electrical work and the different classes of apparatus are not, of course, dealt with in very great detail, but the author and his collaborators, including such eminent men as Drs. Arendt, Benischke, Görges, Orlich, Ritter, Seibt, and Wikander, have succeeded in presenting clearly representative types of apparatus, and in stating concisely the more important facts and figures in each section. Heavy electric traction is discussed with an unfortunate bias towards single-phase working, but, considering the limited space, the amount of information contained in this section is remarkable. Electrochemistry and electrometallurgy are dealt with in a highly interesting chapter, which includes short descriptions of the most recent electric steel furnaces, smelting furnaces, the arc furnaces employed in the electrical production of nitrates, and ozone generators. As a result of the very practical selection of matter, this volume will be of considerable use to engineers in practice, besides being an excellent text-book for students.

**Design of Electrical Machinery.** By W. T. Ryan. Vol. III. Alternators, Synchronous Motors, Rotary Converters. 129 pp. 9½ in. by 6 in.; 103 figures. (London: Chapman and Hall, Ltd.) 6s. 6d. net; abroad, 6s. 11d.

If one with a knowledge of electrical and magnetic phenomena proceeded to design an alternator or rotary-converter on the lines indicated in this book there is no doubt that a passable machine would result. Unless, however, it was required to be a machine of practically standard pressure, current and speed, it would be a piece of luck if it was anything like the cheapest or best machine possible. The author does not claim that this book deals fully with the subject, but much better use of the space could be made than by half-filling it with photographs of machines apparently from manufacturers' catalogues. The complete set of working drawings reproduced would be very useful if the

text contained some reference to them and discussed the design from a mechanical point of view, noting the stress liable to arise in the various parts and giving methods to determine them. The author is quite correct when he says that electrical machine design is an art, but it is open to much more comprehensive treatment than that meted to it here. There is one useful feature—all calculations are made in inch measure.

**The Principles of Applied Electrochemistry.** By A. J. Allmand. 547 pp. 8½ in. by 5½ in. 136 figures. (London: Edward Arnold.) 18s. net; abroad, 19s.

A few years ago there were very few books on electrochemistry, but recently there have been quite a large number, both practical and theoretical, published. The first section of the book before us deals chiefly with fundamental phenomena and the theory of the electrochemistry of aqueous solutions, and is very complete. The chapter on electromotive force is lucidly written, and another deals in detail with cathodic and anodic processes. The phenomenon of over-voltage is discussed here, but its technical importance, however, is dealt with further on. Part II. deals with the technical part of the subject, commencing with a chapter on primary cells. In Chapter XVI. we would draw attention to the description of the Edison alkaline cell, which is very clearly written. The actual technical part of the book starts with a chapter dealing with copper, silver, and gold. Theoretical considerations are first discussed, and then it is shown how theory and practice agree. This combination of theory and practice is well set out and enhances the value of the book. The work is certainly one of the most valuable which have been published in this country. We have only one slight complaint to make. In his preface, Dr. Allmand says: "To those who wish to study the subject further, I recommend, besides the books of Haber and Foerster mentioned above . . . the following," which, so far as electrochemistry is concerned, are all German, with one exception, a book which is not yet published. Surely he might have mentioned some of the numerous English and American works on the subject.

**Electroplating.** By W. R. Barclay and C. H. Hainsworth. 399 pp. 7½ in. by 5 in. 62 figures. (London: Edward Arnold.) 7s. 6d. net; abroad, 8s.

This book has primarily been written for the practical electroplater, that is, for the man who has had little or no scientific or technical training. The authors commence with a chapter on fundamental chemical principles, explaining constitution of matter, elements, compounds, chemical equations, valency, etc., all in fourteen pages—and it cannot be done. Chapter II. deals with chemical and electrochemical action. On page 16 it is hardly correct to say that pure zinc is not soluble in dilute sulphuric acid. Pure zinc dissolves much less readily than impure zinc, and, as is stated, solution takes place more readily when it is connected up with a piece of copper, both being placed in the same solution of sulphuric acid. We are afraid that the practical workshop plater will become hopelessly muddled with the chapter on electroplating when he is brought into contact with joules and calories. These introductory chapters are, as a matter of fact, quite well written, but they are not for those who have had no elementary chemical or electrical training. If the authors could be sure that the practical electroplater would first study the elements of chemistry and electricity, then Chapter I. should be dropped, and the man with his elementary training would, with careful study, be able to master the other chapters leading up to the actual practical part of the work. The working details of the practical side are well set out, and this portion of the book is of undoubted value, and there is full evidence that it is written with practical knowledge.

**Poems by E. L. Hill.** 60 pp.: 7½ in. by 4½ in. (London: Electrician Printing and Publishing Co., Ltd.) 2s. 6d. net; by post, 2s. 8d.

When first we saw a volume labelled "Poems" among the technical tomes waiting for our cruel reviewer's paper-knife, we thought that a well-known publisher had played us a practical joke; but when we noticed Mr. Hill's name modestly nestling in the corner of the cover, our frown relaxed into a smile of welcome for the work of a brother electrical engineer. We have known Mr. Hill's comic muse, and laughed with him over divers quaint conceits, but dipping into this volume reveals him to us as a poet of serious mind. The collection before us includes some thirty miscellaneous pieces and ten sonnets. It commences with an affectionate ode



addressed to his dog, whose portrait forms the frontispiece, and ranges from light shimmering reflections of childish happiness to patriotic war songs and deep musings on the undercurrent of our modern life. We are pleased to see among the sonnets one in memory of the late Dr. John Hopkinson, of whom Mr. Hill truly writes, "The world is poorer by the death of one whose work Death cannot touch."

**Der Spannungsabfall des synchronen Drehstrom-Generators bei Unsymmetrischer Belastung.** By L. G. Stokvis. 98 pp. 9 in. by 6 in. 25 figures. (Munich: R. Oldenbourg.) 4s. net; by post, 4s. 3d.

This is a thoroughly mathematical study of the reactions in an unsymmetrically loaded three-phase generator, resulting in a determination of the pressure drop under any conditions. The author divides the armature reaction into six rotating components, three synchronous and three inverse, and the phase pressure is shown to be the resultant of seven electromotive forces. A factor is deduced to express the influence of the closed field circuit on the reactance of the armature, and finally a diagram expressing the whole theory in a graphical form is developed. An experimental determination confirming the theoretically deduced figures is appended. The work will be of interest to those concerned with the special case of three-phase generators supplying groups of single-phase furnaces or single phase railways and very unsymmetrically loaded.

**Die Veranschlagung elektrischer Licht- und Kraft-Anlagen unter Benutzung Vordruckter Formulare.** By B. Jacobi. 207 pp. 9½ in. by 6½ in. (Munich: R. Oldenbourg.) 7s. net; by post 7s. 5d.

Herr Jacobi, an engineer who has had considerable experience in the design and erection of electrical installations, presents in book form a series of 20 schedules of apparatus and material required for different kinds of plant, the object of which is to enable estimates of the total installation cost to be rapidly carried out. The schedules are similar to those in such widespread use for electrical machine design, but there will be many who will doubt the wisdom of applying this method to plant installations under widely varying conditions. However, for certain classes of estimating work these schedules will undoubtedly save time and reduce the risk of omission of small items. They can be obtained separately foolscap size, and printed in copying ink on paper suitable for writing on at one halfpenny per schedule. The explanatory notes published with the smaller schedules in the book seem to be largely superfluous. The schedules cover generator, motor, transformer, motor-generator, and accumulator installations, switchgear for each kind of plant, overhead transmission lines, cable networks, distribution boards, and lighting installations.

**Die Krankheiten des Stationären Elektrischen Blei-Akkumulators.** By F. E. Kretschmar. 162 pp. 8½ in. by 5½ in. 83 figures. (München: R. Oldenbourg.) 6s. net; by post, 6s. 6d.

The author of this handbook has set out in a clear and thoroughly practical manner the fruits of a long and rich experience in the management of storage batteries of various types and under many different conditions of operation. The symptoms of disease or other trouble and methods of diagnosing and curing the various ills are clearly set forth, and many invaluable hints as to correct management for obtaining the best work out of a battery are scattered throughout the volume.

**Deutscher Kalender für Elektrotechniker, 1913,** edited by G. Dettmar. Part I., 624 pp., 6½ in. by 4 in., 235 figures. Part II., 347 pp., 6½ in. by 4 in., 154 figures. (Munich: R. Oldenbourg.) 5s. net; by post, 5s. 5d.

This electrical pocket book is unique of its kind in that it is to be found in the possession of almost every trained electrical engineer in Germany. For the present edition, which is edited by Dr. G. Dettmar, the well-known Secretary of the Verband Deutscher Elektrotechniker, every part has been thoroughly revised, and a new section added dealing with electrically-operated railway points and signals. The authorship of the various sections is a sufficient assurance of their excellence. Dr. W. Lincke is responsible for those on electricity and magnetism, and Messrs. Kleinath, Paulus, and Linke for that on instruments and electrical measurements, which is one of the most useful in the volume. Dr. J. Teichmüller adds some valuable notes on distribution systems, including cost figures for estimating. The sections on electrical machinery and apparatus, and a particularly useful summary of power-station statistics, are by the editor himself. The electrical rules, standards, and recommendations issued by the Verband Deutscher Elektrotechniker occupy a considerable portion of the volume. A supplementary volume gives a mass of condensed up-to-date information on electric traction, telegraphy, and telephony and kindred subjects, electrochemistry and electrometallurgy, and finally useful reference sections on mathematics, mechanics, and general physics.

**The Practical Electrician's Pocket Book for 1913.** Edited by H. T. Crewe. 440 pp. and diary. 5½ in. by 3½ in. About 250 figures. (London: S. Rentell and Co., Ltd.) Cloth, 1s. net; by post, 1s. 2½d. Rexine, 1s. 6d. net; by post, 1s. 8½d.

The editor of this popular annual pocket book (Mr. H. T.

Crewe) has not shirked his task of revising last year's edition and bringing it up to date for this year, and we find evidences of commendable thoroughness in this direction. There has been some condensation where advisable, and one of the principal new articles is that dealing with electric coal-cutting machinery. New matter has also appeared on sizes of cable for electric lighting, average errors of instruments, electric power requirements, power factor meters, the control of lighting circuits, wireless stations of the world, the new Home Office mining rules, &c. The size of the work has thereby been increased by over 40 pages, and in its present form it should prove of considerable utility to those employed in many branches of the electrical industry.

**The Arbitration Clause in Engineering and Building Contracts.** By E. J. Rimmer. 24 pp. 7½ in. by 5½ in. (London: Constable and Co., Ltd.) 2s. net; by post, 2s. 1d.

The insistence of many municipalities upon the insertion of a clause in their engineering and building contracts appointing their engineer arbitrator in cases of disputes has been the subject of much controversy for many years, although it is a fact that borough engineers themselves do not all take kindly to having this duty thrust upon them. It may be regarded as a product of the Town Clerk's department; but it does put a municipal officer in a somewhat invidious position at times, as although he is the servant of one of the parties to the contract, he has, nevertheless, immediately a dispute arises, to clothe himself in a mantle of impartiality with the rapidity of a quick-change artist, and is supposed to deal with the difficulty in a truly judicial manner. This book makes a few suggestions which it is hoped will lead to the adoption of a form of contract under which the employer will be free from the fear of expensive litigation and the contractor free from the fear of unfair arbitration. Some recent cases have given prominence to the inadequacy of the average arbitration clause; but the matter is such a controversial one, and the divergence of opinion so wide, that any attempt at designing a standard clause is almost foredoomed to failure. The author does not do this, but his suggestions are well worth consideration, and will no doubt be adopted in some cases.

**The Electrical Engineer's Diary, 1913.** 11½ in. by 8½ in. (London: S. Davis and Co.) 2s. 6d. net; by post 2s. 10d.

This annual work of reference now ranks as one of the regular publications of the electrical industry, and worthily so, inasmuch as it contains some most important information which is not to be obtained in any other work. Particular attention may be drawn to the list of streets in the London area in which electric supply mains are laid, which wiring contractors could only secure otherwise at the expense of much trouble. In considerable detail the application of electricity to various industries is dealt with, and figures of power and cost are given for some forty industries, in addition to domestic applications. Another section gives technical information both on electrical questions and also mechanical engineering matters allied to the use of electricity. A model specification of electrical wiring installations issued by the Electrical Contractors Association is followed by the Home Office regulations for the use of electricity in factories and workshops, and also in mines. There is, further, an exceedingly useful feature in an index to manufacturers, which has for its object the easy ascertaining of the names of makers of articles with a distinctive or trade name; and, finally, the three days to a page diary interleaved with blotting paper.

**Notes on the Materials of Motor-Car Construction.** By A. E. Berriman. 171 pp. 11½ in. by 8½ in. 150 figures. (London: St. Martin's Publishing Co.) 5s.; abroad, 5s. 9d.

Primarily, this finely illustrated work, which is by an author well known in automobile journalism, is a description of the methods, ideals, and objects of certain departments of the manufacturing works of the Daimler Co. Incidentally, however, a great deal of most interesting information is given regarding the selection and treatment of steels and other materials, and special prominence is given to micrographic study of the subject. Written in an easy style for the general reader rather than the expert, the work should arouse general interest in modern metallurgical methods as well as admiration for the complete way in which they are carried out in the particular works referred to.

**Hazell's Annual for 1913.** Edited by H. Hall. 592 pp. 7½ in. by 5 in. (London: Hazell, Watson and Viney, Ltd.) 5s. 6d. net; abroad 4s. 2d.

Once more does Hazell's Annual provide us with a connected story of the events of the past year and a guide to the questions likely to come to the fore in 1913. The index now numbers 34 pages, and there are no less than 7,000 references. There are few matters of interest, whatever one's tastes, upon which information is not given. Among the maps is one showing the position of the stations under the proposed Imperial wireless telegraph scheme, and in addition there are references to every phase of the electrical industry.

## "ELECTRICAL ENGINEERING" LIST OF SELECTED TECHNICAL BOOKS

We shall be pleased to send any of the following books to addresses in the United Kingdom at the net published prices named, unless otherwise stated. The increased price for sending abroad is also quoted after each book. All the books listed have been recommended by our editorial staff and reviewers.

Orders should be addressed to the Kilowatt Publishing Co., Ltd., 203-206 Temple Chambers, Temple Avenue, E.C., and should be accompanied by a remittance.

### Electricity Supply and Distribution.

(See also *Steam, Gas, and Water Plants.*)

- Power House Design. J. F. C. Snell. 21s. net; abr., 22s. (Reviewed Jan. 18th, 1912.)  
Heavy Electrical Engineering. H. M. Hobart. 16s. net; abr., 17s. 3d. (Reviewed July 15th, 1909.)  
Three-Phase Transmission. W. Brew. 7s. 6d. net; abr., 8s. 1d.  
Electric Cables, Their Construction and Cost. Coyle and Howe. 15s. net; abr., 15s. 8d.  
Electric Power Conductors. W. A. Del Mar. 9s. net; abr., 9s. 8d.  
Theory of Electric Cables and Networks. Alex. Russell. 8s. net; abr., 8s. 8d. (Reviewed Oct. 7th, 1909.)  
Electric Mains and Distributing Systems. Dick and Fernie. 10s. 6d. net; abr., 11s. 4d. (Reviewed Feb. 29th, 1912.)  
Long Distance Electric Power Transmission. R. W. Hutchinson. 12s. 6d. net; abr., 13s. 4d.  
Practical Calculation of Transmission Lines. L. W. Rosenthal. 8s. 6d. net. (Reviewed Oct. 14th, 1909.)  
Electricity Meters. C. Gerhardt. 9s. net; abr., 9s. 8d.  
Electric Lighting Accounts. G. Johnson. 5s. net; abr., 5s. 5d.  
Central Station Electricity Supply. Gay and Yeaman. 10s. 6d. net; abr., 11s. 2d.

### Steam and Gas and Oil Engines, Water Plants, and General Engineering

- Steam Turbine Engineering. Stevens and Hobart. 21s. net; abr., 22s. 4d.  
The Steam Turbine. R. M. Neilson. 4th edition. 15s. net; abr., 15s. 10d.  
Steam Turbines. Rankin Kennedy. 4s. 6d. net; abr., 4s. 9d. (Reviewed January 19th, 1911.)  
Steam Turbines. J. W. Roe. 8s. 6d. net. (Reviewed August 10th, 1911.)  
The Steam Engine and other Heat Engines. Sir J. A. Ewing, F.R.S. 3rd ed. 15s.; abr., 15s. 6d.  
Elementary Manual of Steam and the Steam Engine. A. Jamieson. 12th edition. 3s. 6d.; abr., 3s. 9d. (Reviewed Dec. 31st, 1908.)  
Steam Boilers. W. Inchley. 8s. 6d.; abr., 9s. (Reviewed Sept. 26th, 1912.)  
Boiler Draught. H. K. Pratt. 4s. net; abr., 4s. 3d. (Reviewed Jan. 18th, 1912.)  
Boiler Explosions. E. J. Rimmer. 4s. 6d. net; abr., 4s. 11d. (Reviewed Sept. 26th, 1912.)  
The Indicator Handbook. C. N. Pickworth. Part I., The Indicator; Its Construction and Application. 3s. net; abr., 3s. 4d. Part II., The Indicator Diagram: Its Analysis and Calculation. 5th ed. 3s. net; abr., 3s. 4d. (Reviewed Nov. 28th, 1912.)  
Applied Thermodynamics for Engineers. W. D. Ennis. 21s. net; abr., 22s. 3d. (Reviewed March 16th, 1911.)  
An Introduction to the Study of Fuel. F. J. Brisslee. 8s. 6d. net; abr., 9s. 3d. (Reviewed May 16th, 1912.)  
Fuel, Gas, and Water Analysis for Steam Users. J. B. C. Kershaw. 8s. net; abr., 8s. 6d.  
Liquid Fuel and its Applications. W. H. Booth. 8s. 6d. net; abr., 9s. 3d. (Reviewed May 16th, 1912.)  
Diesel Engines for Land and Marine Work. A. P. Chalkley. 8s. 6d. net; abr., 9s. 2d. (Reviewed Feb. 29th, 1912.)  
The Gas, Petrol, and Oil Engine. Dugald Clerk. Vol. I., Thermodynamics of the Gas, Petrol, and Oil Engine, together with Historical Sketch. 12s. 6d. net; abr., 13s. 3d.  
The Design and Construction of Internal Combustion Engines. H. Guldner. 42s. net; abr., carriage forward.  
The Internal Combustion Engine. H. E. Wimperis. 6s. net; abr., 6s. 6d. (Reviewed July 29th, 1909.)  
Primer of the Internal Combustion Engine. H. E. Wimperis. 2s. 6d. net; by post 2s. 9d. (Reviewed Nov. 28th, 1912.)  
Gas Engines. Marshall and Sankey. 6s. net; abr., 6s. 8d. (Reviewed May 18th, 1911.)  
Gas and Oil Engines. H. Allen. 12s. 6d. net; abr., 13s. 6d.  
Power Gas Producers. P. W. Robson. 10s. 6d. net; abr., 11s. 3d.  
Hydroelectric Developments and Engineering. F. Koester. 21s. net; abr., 22s. (Reviewed Oct. 21st, 1909.)  
Hydraulic Motors and Turbines. G. R. Bodmer. 3rd ed. 15s.; abr., 15s. 8d.  
Electric Crane Construction. C. W. Hill. 25s. net; abr., 25s. 10d. (Reviewed May 18th, 1911.)  
Punches, Dies, and Tools. J. V. Woodworth. 16s. net; abr., 16s. 8d.

- General Foundry Practice. W. Roxburgh. 10s. 6d. net; abr., 11s. 2d. (Reviewed Feb. 16th, 1911.)  
Elements of Machine Design. W. C. Unwin, F.R.S. Part I., General Principles, Strength of Materials, &c. 7s. 6d. net; abr., 8s. Part II., Chiefly on Engine Details. 6s.; abr., 6s. 6d.  
Testing of Materials of Construction. W. C. Unwin, F.R.S. 18s. net; abr., 19s. 4d.  
Text-book of Mechanical Engineering. W. J. Lineham. 11th ed. (1911). 12s. 6d. net; abr., 13s. 10d.  
Manual of Machine Drawing and Design. Low and Bevia. 7s. 6d.; abr., 8s.  
Reinforced Concrete. Marsh and Dunn. 3rd edition. 31s. 6d.; abr., 32s. 10d.  
Standard Specifications of the Engineering Standards Committee, at net published prices. (List on application.)

### Electric Lamps, Wiring, &c.

- Electric Lamps. M. Solomon. 6s. net; abr., 6s. 10d. (Reviewed Aug. 19th, 1909.)  
The Development of the Incandescent Electric Lamp. G. B. Barham. 5s. net; abr., 5s. 6d. (Reviewed May 16th, 1912.)  
Application of Arc Lamps to Practical Purposes. Justus Eck. 2s. 6d. net; by post, 2s. 9d. (Reviewed Dec. 15th, 1910.)  
Arc Lamps and Accessory Apparatus. J. H. Johnson. 1s. 6d. net; by post, 1s. 7d. (Reviewed May 18th, 1911.)  
The Practice of Electrical Wiring. D. S. Munro. 3s. net; abr., 3s. 3d. (Reviewed Jan. 16th, 1913.)  
Electric Wiring. Fittings, Switches, and Lamps: Circuits. W. P. Maycock. 6s. net; abr., 6s. 8d. (Reviewed May 18th, 1911.)  
Theory and Practice of Electric Wiring. W. S. Ibbetson. 5s.; abr., 5s. 6d.  
Practical Electric Wiring. C. C. Metcalfe. 5s. net; abr., 5s. 8d.  
Mill and Factory Wiring. R. G. Devey. 2s. net; abr., 2s. 2d. (Reviewed Nov. 16th, 1911.)  
Ship Wiring and Fitting. T. M. Johnson. 1s. net; by post, 1s. 1d. (Reviewed Jan. 18th, 1912.)  
Institution of Electrical Engineers' Wiring Rules, with Extracts from the Board of Trade Regulations and the Home Office Rules for Mines. 6th ed. 6d. net; by post, 7d.  
Phoenix Fire Office Rules for Electric Installations. 6d. net; by post, 7d.

### Motors, Generators, and Transformers (Theory and Design of).

- Dynamo-Electric Machinery. S. P. Thompson, F.R.S. Vol. I., Continuous Current Machines. 30s. net; abr., 31s. 3d. Vol. II., Alternating Current Machinery. 30s. net; abr., 31s.  
Electric Machine Design. Parshall and Hobart. 42s. net; abr., carriage forward.  
The Dynamo. Hawkins and Wallis. 5th edition. Vol. I., 10s. 6d. net; abr., 11s. 6d. Vol. II., 10s. 6d. net; abr., 11s. 6d. (Reviewed March 31st, 1910.)  
High-speed Dynamo Electric Machinery. Hobart and Ellia. 25s. 6d. net; abr., 26s. 10d. (Reviewed Dec. 10th, 1908.)  
Electric Motors. H. M. Hobart. 18s. net; abr., 19s. 4d. (Reviewed Dec. 15th, 1910.)  
Armature Construction. Hobart and Ellis. 15s. net; abr., 15s. 6d.  
Construction of Dynamos: Alternating and Direct Current. T. Sewell. 7s. 6d. net; abr., 8s. 3d.  
Elementary Principles of Continuous Current Dynamo Design. H. M. Hobart. 7s. 6d. net; abr., 8s.  
Elementary Principles of A.C. Dynamo Design. A. G. Ellis. 12s. net; abr., 12s. 8d. (Reviewed March 16th, 1911.)  
Continuous Current Dynamos and Motors and Their Control. W. R. Kelsey. 2nd ed. 7s. 6d. net; abr., 8s. 2d. (Reviewed August 11th, 1910.)  
Continuous Current Machine Design. For Advanced Students. W. Cramp. 5s. net; abr., 5s. 6d. (Reviewed Dec. 15th, 1910.)  
Single-phase Commutator Motors. F. Punga. Translated by R. F. Looser. 4s. 6d. net; abr., 4s. 10d.  
The Induction Motor. B. F. Bailey. 10s. 6d. net. (Reviewed Jan. 18th, 1912.)  
Transformers. Bohle and Robertson. 21s. net; abr., 22s. (Reviewed May 18th, 1911.)  
Design of Static Transformers. H. M. Hobart. 6s. net; abr., 6s. 5d. (Reviewed August 17th, 1911.)  
Transformers. G. Kapp. 2nd edition. 10s. 6d. net; abr., 11s. 2d. (Reviewed April 15th, 1909.)  
Insulation of Electric Machines. Turner and Hobart. 10s. 6d. net; abr., 11s. 3d.

### Electric Traction.

- Electrical Traction. Wilson and Lydall. Vol. I., Tramways and D.-C. Railways. 15s. net; abr., 16s. Vol. II., Three-phase and Single-phase Alternating-current Traction. 15s. net; abr., 16s.  
Electric Traction. J. H. Rider. 10s. 6d. net; abr., 11s.  
Electric Railways. Vol. I., Rolling Stock. Ashe and Keiley. 10s. 6d. net; abr., 11s. 3d. Vol. II., Engineering Preliminaries and Direct-current Sub-stations. S. W. Ashe. 10s. 6d. net; abr., 11s. 3d.  
Electric Railway Engineering. Parshall and Hobart. 42s. net; abr., 44s.  
Electric Traction on Railways. P. Dawson. 25s. net; abr., 26s. 4d.

### THREE-PHASE EXTENSIONS AT MARYLEBONE New Plant Ordered.

**A**N important decision was come to by the St. Marylebone Borough Council at their meeting last Thursday, when they decided to accept the tender of Maschinenfabrik Oerlikon for two 3,750-k.v.a. 6,600-volt 50-cycle (2-pole) turbo-alternators running at 3,000 r.p.m. This decision is the outcome of a report by Mr. J. F. C. Snell (whose advice was taken at the suggestion of the Council's Engineer and Manager, Mr. A. H. Seabrook), in which he recommends the adoption of a three-phase 6,600-volt system for all future extensions at the Richmond Street power-house of the Council.

Mr. Snell's report is only a preliminary one, and deals with the choice of systems, but in a full report yet to be presented, the question of the sizes of rotaries to be adopted, the high- and low-tension switchgear, three-core cables, &c., will be discussed. Further, Mr. Snell will deal fully with the financial aspect, anticipating that the London County Council will, when the matter comes before them in regard to the necessary loan, raise the question of bulk supply from some outside authority. He points out, however, that the economical production at Marylebone is such as entirely to negative any hope of getting terms for bulk supply under existing conditions which could be good enough to compare with present or future costs. Mr. Snell has also considered the alternative systems: battery extension, Diesel engines erected at the sub-stations, and finally, extension of the present 600-volt continuous current generation. None of the systems, however, in his opinion, compete with three-phase, the total cost of which under the proposed scheme will be £42,000, or only £7 per kw. installed. The tender of the Maschinenfabrik Oerlikon for one machine was so low that Mr. Snell immediately advised the Council to purchase a second set at once.

The preliminary note does not give any further technical details than those given above, and Mr. Snell's complete report will therefore be awaited with considerable interest.

### LARGE TURBO GENERATORS

**A** PAPER on this subject was read last week before the Rugby Engineering Society by Mr. J. P. Chittenden. The paper dealt with the steam side of the unit only. The author said that to obtain the best results the maximum number of stages for various types and speeds of 1,500 and 3,000 r.p.m. comes out for multi-stage simple impulse, 15 to 16 and 8 to 10; multi-stage compound impulse, 4 to 6 and 2 to 3; multi-stage pure reaction (blade couples), 70 to 80 and 40 to 50 respectively. Apart from the high economy and reliability of large units for loads such as traction, the ability of turbine plant to hold automatically momentary overloads, even up to 100 per cent., without detriment to the plant itself and with practically no loss in efficiency or increased first cost, is a very important point. As to the question of reliability, said Mr. Chittenden, there is no doubt that the steam turbine can more than hold its own with other prime-movers, and, further, it has the great advantage that even should a mishap occur, it is seldom a serious one, and temporary repairs can be executed in a very short space of time, the turbine put back on load and continue its duty without much loss in economy while awaiting replacements from the manufacturers. The paper reproduced from the technical papers descriptions of some large turbines recently constructed, and the results of efficiency tests upon them.

### A POWER STATION WEIGHBRIDGE

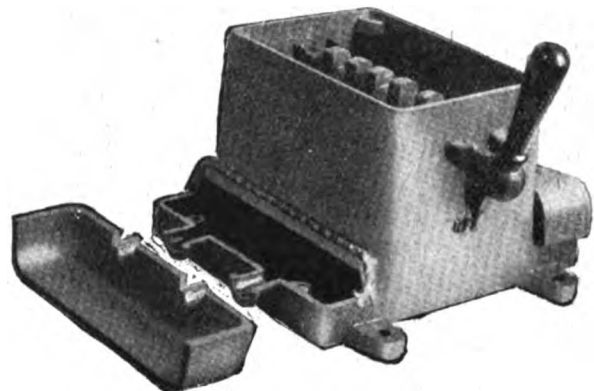
**T**HE provision for coal weighing found in electric supply stations is not always as perfect as it should be, and some details of a new weighbridge which has recently been installed by Messrs. W. and T. Avery (Birmingham), at the Sunderland Electricity Works, are of some interest. The erection of the self-contained machine and the alterations to the gantry which involved pulling down one section and rebuilding it with the weighbridge fixed with the rails on a level with those of the gantry, were carried out within twenty-seven hours without interfering with the coal supply.

The machine is of the three-lever type avoiding torsional strains, and the swing of the platform in the direction of the traffic minimises shock on the bearings. The machined and bolted joggle joints prevent any shifting under stress and interchangeable hardened steel wearing parts are provided. The platform is 17 ft. by 6 ft. with standard gauge rails. The pillar is of the arch pattern, and the steelyard is the ticket-printing type, which indelibly prints the weight on a ticket

at the time of weighing, both gross and tare weights being printed on the same ticket. There are no loose weights, and the steelyard is graduated to its full capacity of thirty tons by divisions of 7 lb. It is also fitted with Avery's Patent steel notched protection bar, which preserves the accuracy of the markings.

### AN ENCLOSED REVERSING SWITCH

**T**HE small drum-type reversing switch (illustrated) has been designed by the General Electric Co., Ltd., especially for the use of Witton-Kramer tools. This switch is constructed with a portable handle; its glands are arranged to serve as efficient cord grips to hold securely the incoming cables, and the fingers are renewable. The revolving drum is



ENCLOSED REVERSING SWITCH.

cast-iron, and the entire switch is rainproof. It is suitable for any motor up to 2 h.p. at 240 volts, and its dimensions are 9½ in. by 8½ in. by 5½ in. The Company has brought out several other switches for portable tool work. These are of the "push-on" and "push-off" type, in aluminium cases, and they are provided with small rollers to reduce friction to a minimum.

### WILLANS & ROBINSON

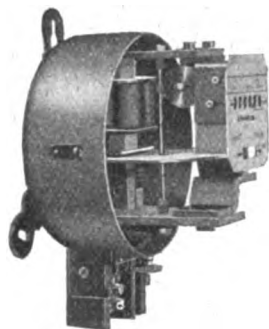
**T**HE Press were not admitted to the Annual General Meeting of Willans and Robinson, Ltd., last Thursday, but we are informed that the report and accounts for the year ended June last were adopted. As mentioned in our last issue, there had been a heavy loss on the year's trading up to June, but it was stated that larger contracts under better conditions, and at somewhat better prices, have been secured during the year, and the Company's shops are now well supplied with work. More working capital is, however, required, and the scheme for rearrangement of the capital of the Company, mentioned in our last issue, was passed. The alterations are mainly as follows: Issue of £30,000 new 6 per cent. (Class A) cum. pref. stock, with option to subscribers to take up one ls. ordinary share with each £5 allotted (this new stock to be offered in the first instance to the existing shareholders). Issue of 4 per cent. (Class B) cum. pref. stock to be allotted to existing shareholders in exchange for present shares as follows: pref. shares, £2 stock for every £5 share; ordinary shares, 2s. 6d. stock for every £1 share. (This means the writing-down of £333,330 preference shares and £66,666 ordinary shares, making a total of £399,996 to a total of £141,665.) Issue of 30,000 new ordinary ls. shares, 6,000 of which are to be reserved for subscribers of Class A and 24,000 will be subscribed by "incoming parties," whom it is proposed, as mentioned in our last issue, shall be associated with the Company. It will be seen that the existing cumulative preference shareholders will lose their arrears of dividend, and that the new preference stock created will take precedence over the stock at a lower face value which they receive in exchange for their present holding. Including the present 4 and 5 per cent. mortgage debentures, which remain unchanged and total £248,828, the revised capital will be £421,993, as against the present capital of £648,824. At a subsequent extraordinary general meeting the necessary resolutions were confirmed.

**BINDING "ELECTRICAL ENGINEERING."**—Vol. VIII. of "Electrical Engineering" (Jan.—Dec. 1912) closed with our issue of December 26th, 1912. Readers can have their volumes bound by their own bookbinder; or, they may send their numbers to THE KILOWATT PUBLISHING Co., Ltd., Temple Chambers, London, E.C., carriage paid (with the reader's name and address), and a remittance of 4s. 6d. under separate cover. The volumes will then be bound and returned carriage paid to any address in the United Kingdom, or carriage forward to the Colonies or abroad. Binding Cases (including index, but not including binding) 2s. each, or post free 2s. 4d. (Abroad 2s. 6d.) Index alone, 1d. (Post free 2d.).

## CATALOGUES, PAMPHLETS, &c., RECEIVED

**NURSERY REQUISITES, &c.**—A folder from the General Electric Co., Ltd. (67 Queen Victoria Street, E.C.) describes the "Magnet" Convertible outfit. The set comprises flat iron, copper kettle, saucepan with china milk heater, frying-pan, special stand, and adaptor. Self-contained milk steriliser and food warmers and radiators are also listed. Other leaflets deal with the well-known toasters, and with holophane type office shades.

**METERS.**—Simplex Conduits, Ltd. (Meter and Motor Department, Garrison Lane, Birmingham), have issued a supplementary sheet relating to the electricity meters which they supply. It gives revised prices and specifications of new types, in addition to those shown in the firm's general catalogue issued last November. The testing and calibrating plant at the com-



pany's works has already been referred to in our Paper, and the company is able to quote for similar plant for supply stations or technical schools, and will furnish specifications on application. The illustration above shows the induction type of A.C. watt-hour meter, which has the following specification:—torque, 5 c.m.g.; shunt loss per 100 volts, 0.9 watt; series loss, 1 watt; weight of rotor, 20 grammes; r.p.m., 60; starting current, three-quarters per cent. of rated max.

**CARBON BRUSHES.**—Dr. Lessing's coppered carbon brushes of medium and high conductivity, of metal, graphite, bronze carbon, and a special quality for traction motors, are listed in a folder to hand from the Electrical Engineering and

*Readers desiring copies of catalogues or pamphlets should apply to the firms in question, referring to the notice in "Electrical Engineering."*

Equipment Co., Ltd. (109-111 New Oxford Street, W.C.). In addition to these brushes, Dr. Lessing's manufactures include welding carbons, carbon electrodes, carbon battery plates, packing rings for high-speed engines and steam turbines, carbon switch contacts, &c. The company will be pleased to send particulars of any of these lines to readers who may be interested.

**ELECTRIC LIFTS.**—A very handsomely produced pamphlet with coloured frontispiece describing the "Graham" electric lift is being sent out by the lift department of Scholey and Co., Ltd. (151 Queen Victoria Street, E.C.). Very full particulars of the working of these lifts are given, aided by excellent illustrations of parts of the mechanism, and photographs of typical examples of cars are reproduced. We had the pleasure not long ago of inspecting one of the first "Graham" lifts installed in London, and an illustrated description of the system appeared in *ELECTRICAL ENGINEERING*, Vol. VIII., page 303 (June 6th, 1912). It will be remembered that among the principal features are the simplicity of the overwinding gear and the accuracy of the floor-levelling device.

**D.C. DYNAMOS, MOTORS, AND STARTERS.**—Simplex Conduits, Ltd. (113-117 Charing Cross Road, W.C.), have issued a supplementary sheet to their general catalogue dealing with D.C. dynamos, motors, starters, and regulators. The motors listed range in size from 1/100th to 20 B.H.P., and the dynamos from 0.015 to 17 kw. They have a complete line of these machines, which are made in closed ventilated, semi-enclosed, and totally enclosed patterns.

**"THE VICKERS BOOK."**—The 1912 edition of this book gives on every one of the 64 pages a fine reproduction of one of the many specialities manufactured by Vickers, Ltd. (Vickers House, Broadway, Westminster, S.W.). Besides dynamos, motors, control gear, turbines, &c., every class of locomotion is represented, from aeroplanes to warships, together with photographs of details.

**ALUMINIUM TRANSMISSION LINES.**—In this illustrated booklet the British Aluminium Co., Ltd. (109 Queen Victoria

Street, E.C.) have collated some of the more important information issued in previous leaflets and folders, and have added new matter. Particulars of existing schemes, technical points in construction, and results of sundry tests are given. A strong case is made out for the use of aluminium at the ruling prices.

**SMALL DYNAMOS AND POLISHING MOTORS.**—Leaflets from Isaria, Ltd. (208 Tower Bridge Road, S.E.) give particulars of D.C. dynamos from 20 to 200 watts, and of small polishing motors for D.C. and single or three-phase A.C. circuits. Copies of these lists may be obtained on application.

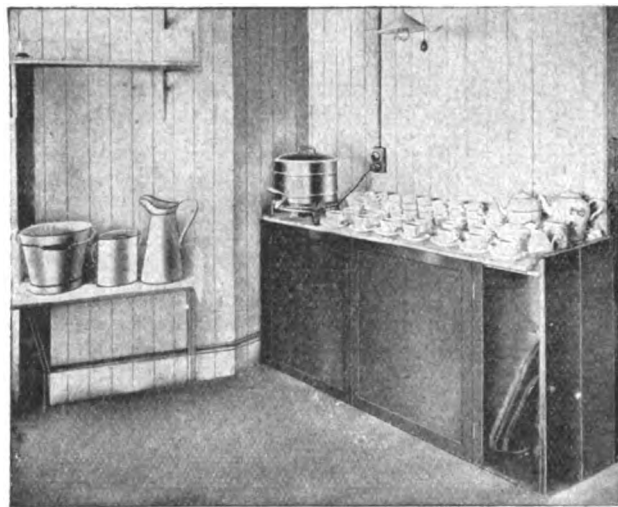
**MERCURY VAPOUR RECTIFIERS.**—A leaflet has been issued by the Westinghouse Cooper Hewitt Co., Ltd. (80 York Road, King's Cross, N.), giving particulars of their rectifiers or converters in sizes suitable for cinematograph work.

**FOOD PRESERVATION.**—The application of the Ozonair apparatus to the problems of food preservation and water purification in ice factories is described in a publication by Ozonair, Ltd. (96 Victoria Street, S.W.).

**A CONTINENTAL COURIER.**—Under this name the Great Central Railway have issued a booklet giving itineraries for sight-seeing in Hamburg and Berlin. A feature is the addition of approximately correct phonetic anglicised pronunciations of the places to be visited, and of other useful words and expressions.

## TEA MAKING BY ELECTRICITY

WE illustrate here the arrangement employed at their head office (67 Queen Victoria Street) by the General Electric Co., Ltd., for making tea for the staff. A small space in a corner of an office is occupied by the compact equipment, and the water is heated by a five-gallon electric urn of G.E.C. manufacture which boils from cold in about an hour. The urn is 11½ in. high by 14½ in. diameter, of



ELECTRIC TEA-MAKING AT THE G.E.C. OFFICES.

rolled copper, highly finished outside, heavily tinned inside, and is fitted with a large-bore tap for quick pouring; it is arranged for three circuits, so that part of the current can be utilised when the maximum 2,000 watts are not required. As boiling water is drawn from the urn, cold water may be added, so that no time need be lost to have a constant supply of boiling water for the teapots.

**A Report on the U.S.A. Patent System.**—A lengthy report on the U.S. Patent Office has been sent to Congress. It is recommended that the Commissioner of Patents be relieved from judicial work, so as to give him more time for supervision of the examining staff, whereby it is hoped to reduce the number of invalid patents issued. An important recommendation is that the life of a patent be so limited as to expire 19 years from the date of filing the application, excluding the time, not exceeding two years, during which an application may be involved in opposition. The commission reports that under the law, which allows an applicant one year in which to answer any action of the Patent Office, there have been many applications kept pending in the Patent Office for ten years or more. The commission believes that the remedy is to make the term of the patent commence from the date of filing the application, as is done in other countries. It is further recommended that an abstract of a patent be published in the *Official Gazette* instead of the first five claims of a patent, as at present.

# QUESTIONS AND ANSWERS BY PRACTICAL MEN

## RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelopes.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

## QUESTION No. 1,322.

Show the relative current values, &c., in the transformer windings, motor, and mains of two auto-transformers "V" or open-delta connected, and used for starting a 3-phase, 3-wire motor by means of 60 per cent. voltage tapplings. Also show why these transformers must have a total capacity of 115.6 per cent. when compared with 3 star-connected transformers used for the same purpose.—A. J.

(Replies must be received not later than first post, Jan. 23rd.)

## ANSWERS TO No. 1,322.

A 3-phase, 500-volt, 50-cycle system of about 1,000 k.v.a. has a power factor of about 0.7, which it is desired to improve by installing a rotary condenser. Can any of your readers tell me the smallest possible size of synchronous motor which can be put in to bring the power factor of the whole system up to 0.9? I should also like to have a method of calculating this.—Cos  $\theta$ .

The first award (10s.) is made to PHRY for the following reply, which we have slightly abbreviated:—

The rating of the machine required may be determined as follows: 1,000 k.v.a. at 500 volts 3-phase corresponds to a total current per phase of  $\frac{1,000}{500 \times \sqrt{3}} = 115.5$  amps. At 0.7 power factor the load current in phase with the volts will be  $115.5 \times 0.7 = 81$  amps., and the wattless current  $\sqrt{115.5^2 - 81^2} = 82.5$  amps. With the same load of 700 kw. at 0.9 power factor, the generators will be delivering  $700 \div 0.9 = 778$  k.v.a., or 90 amps. per phase, and the wattless current will be  $\sqrt{90^2 - 81^2} = 39$  amps. This means that the synchronous motor must supply  $82.5 - 39 = 43.5$  amps. per phase of wattless current; i.e., its rating must be  $43.5 \times 500 \times \sqrt{3} = 375$  k.v.a. The rating for any given case may readily be obtained graphically, as shown in Fig. 1, where OA

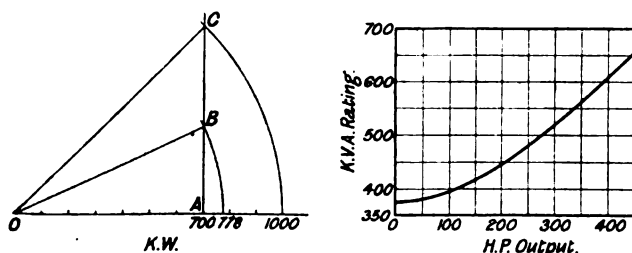


FIG. 1.

represents to scale the power load, in this case 700 kw. AB is drawn at right angles to OA, and from centre O are described arcs of radius = power load and power load  $\cos \phi$ , where  $\cos \phi$  and  $\cos \phi_1$  are the power factors before and after installing the synchronous condenser. The length BC gives the rating of the synchronous machine in k.v.a. If it is required to bring the power factor to unity, B will evidently coincide with A, and AC will be the required rating. In the case considered, the total rating is: generators, 778 k.v.a.; synchronous motor, 375 k.v.a.; total, 1,153 k.v.a. If the present generators are overloaded, it would be better policy to spend the money on

a small generating set to take part of the load and act as a standby, rather than on a synchronous condenser in the generating station, which would be useless if the main generating plant was out of commission. If, however, the generators are supplying the greater part of the load over a fairly long feeder, the case is altered. Assuming that the CR drop in the line is 10 per cent. of the generated volts, and the inductance negligible, then the received voltage will be 450, and the loss in the line 100 kw. If now the power factor at the generators is raised to 0.9 by installing a 375 k.v.a. synchronous motor at the receiving end of the line, the total current required from the generators will be 90 amps., and the drop in the line will be reduced from 50 volts to  $\frac{50 \times 90}{115.5} = 39$  volts. Thus the voltage at

the generators may be reduced to 490, and the rating of the generators will be  $90 \times 490 \times 3 = 762$  k.v.a., or, adding the rating of the synchronous motor, 1,137 k.v.a. in all. At the same time the line current is reduced from 115.5 to 90 amps., and the loss in the line from 100 kw. to 60.5 kw., a saving of nearly 40 kw., which would probably offset the prime cost of the synchronous motor, even allowing for the losses in the motor itself. Thus the increase in capacity of the generators would be clear gain. Further, it is possible that the synchronous motor could be used to drive a portion of the load, taking the place of one of the induction motors otherwise required. If this can be arranged, the rating in k.v.a. of the synchronous motor required would be  $\sqrt{W^2 + K^2}$  where W is the wattless k.v.a. required for power factor control, and  $K = \text{h.p. of load} \times 0.746 \div \text{efficiency of motor}$ . The curve in Fig. 2 gives the approximate rating in k.v.a. of synchronous motors to deliver from zero to 450 h.p., and at the same time 375 k.v.a. in wattless current. It will be seen that a considerable useful output can be obtained without materially increasing the rating. In addition to this, it should be remembered that if the synchronous motor is used to displace a large induction motor, its rating in wattless k.v.a. will be reduced, since the magnetising current formerly taken by the induction motor will be eliminated. A supply of direct current to excite the field of the synchronous motor is, of course, a necessity.

The second award (5s.) is given to J. E. R. R. for the reply given in abridged form below:—

It is not stated whether the improvement is desired in order to reduce the current in the generator or to keep the load on the generator at 1,000 k.v.a. and utilise the increase in the load component for other work; as will be seen from the diagram, Fig. 3, this will mean a big difference in the size of the condenser to be installed. The rotary condenser may take the form of a rotary converter or a synchronous motor. To run the machine simply for its leading power-factor alone is rather an extravagant method; it would be cheaper if the motor or rotary were put down as near the inductive load as possible and the driving power or D.C. supply made use of. In the diagram the existing conditions are given by the triangle ABF. AB is the apparent load, 1,000 k.v.a. AF is the load component =  $AB \cos \phi = 700$  kw. FB is the idle component =  $AB \sin \phi = 715$  k.v.a. By reducing the apparent load and keeping the true load equal to 700 kw., i.e., by making the point B more along BF, we reduce the angle  $\phi$ , or we can keep AB constant at 1,000 k.v.a., by moving it round arc BTS and increase AF. In the former case, the idle component decreases from FB to FD, or from 715 k.v.a. to 340 k.v.a. The rotary or motor will have, therefore, to deal with 375 k.v.a. Adding 10 per cent. for losses, we then require a machine of 410 k.v.a. capacity, and in the latter case the idle component decreases from FB to PT, or from 715 k.v.a. to 440 k.v.a., and the load component goes up to 890 kw. Adding 10 per cent., we therefore require a 300 k.v.a. machine. If the condenser does other useful work, we can produce BF to L, and mark off FL = BH, which will give the required reduction of wattless component. Marking off FJ = 30 kw. to represent the losses in the condenser, and joining L to P, we see that an input LP of 340 k.v.a. is taken, and LF = 275 k.v.a. is available to rectify the wattless component of the system, while PJ = 160 kw. of useful work. "Cos  $\theta$ " would be well advised to consider installing three or four induction motors fitted with phase advancers. For further information on this subject see I.E.E. Journal, Vol. 42, p. 599, and Vol. 43, p. 618. [ELECTRICAL ENGINEERING, Jan. 21st, 1909, pp. 65, 420; May 27th, 1909, p. 481, also July 25th, 1912, p. 420, and this issue.]

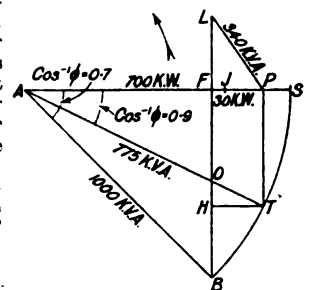


FIG. 3.



## ELECTRIC TRACTION NOTES

The Brighton Corporation have agreed to pay the Brighton, Hove & Preston Omnibus Co. the sum of £12,100 for their trolley omnibus powers and parliamentary expenses incurred in obtaining their Bill two years ago. This includes handing over to the Corporation sixteen electric omnibuses and a garage built specially for their accommodation.

The conclusion of the second report of the Prussian Railway Authorities on the electrification of the Berlin "Stadt-Ring & Vorortbahn" (see *ELECTRICAL ENGINEERING*, Dec. 12th, p. 696) is published in the *Elektrotechnische Zeitschrift* of Dec. 19th. It includes detail estimates of the cost of running the system in 1916 with steam and electric traction respectively, and shows that the latter will be nearly 14 per cent. lower. The system is being worked at a very heavy loss by steam, the deficit for 1916 being estimated at £694,000. With electric traction the deficit is estimated at £400,000, which figure includes interest and depreciation, so that a saving of £294,000 is estimated. The report gives no hope that this serious deficit will be converted into a profit unless an increase in traffic far in excess of that expected follows the electrification. In view of the large proportions of the whole cost taken up by the 557 expensive single-phase locomotives, it would appear that a direct-current scheme would be more successful.

At a recent meeting of the Commission appointed to deal with the traffic question in Vienna, the Government Railway Minister, Dr. F. von Forster, stated that the two financial groups interested in the electrification of the Vienna Stadtbahn, namely, the Vienna Banking group and a French Financial group, had prepared complete schemes, and that these would shortly be discussed by the Government authorities. He further stated that the traffic receipts on the system had increased during the last few years at the average rate of 10 per cent., but that increased working costs, particularly labour and salaries, prevented a similar improvement in the financial results of the railway.

The Hungarian State Railways Authorities have finally decided to postpone indefinitely the electrification of the Triest-Opicina main-line tunnel sections of their system, as the smoke nuisance, the chief reason for electrification, has, it is said, been successfully overcome by the introduction of oil-fired locomotives. It is also stated that the investigation as to the relative economy of steam and electric traction for this particular case was not favourable to the latter. The single-phase system was adopted for the basis of the calculations, and in this case also the cost of the rolling stock would be the determining factor, as the line in question is very short with comparatively heavy traffic. No figures have been published, however.

It is planned to make a change over from 6,600 volt 25 cycle single-phase to 1,200 volt D.C. working on the lines of the Pittsburg and Butler Street Railway (United States of America), in the early months of this year, says the *Electric Railway Journal* (New York). The line is about thirty-three miles long and connects at each end with 600 volt D.C. systems. The district served is thickly populated and very hilly. The present single-phase system has been working since 1907.

An Edison storage battery car has recently given very satisfactory results on the Chicago Great Western Railway. The car, says the *Electric Railway Journal* (New York), is 50 ft. long, it has two bogies, and carries four 20 h.p., 200 volt, 720 r.p.m. series motors. Two are mounted on each truck, one wheel of each axle being driven by a gear (ratio 3.5 to 1) fastened to the inside of the wheel hub. A maximum speed of 35.6 m.p.h. on the level has been attained for an energy consumption of 30.4 watt hours per ton mile. The weight of the car with batteries is about 29 tons, and the train resistance is 15.2 lbs. per ton on the level. The normal distance on one charge is about 80 miles, but 100 miles may be reached on overcharge. On a trip between Silver Lake and Jersey City, including grades both ways, the car was found to consume about 5.65 ampere hours per car mile at a voltage between 238 and 225, the air compressor requiring 0.10 ampere hour per car mile in addition.

An editorial in a recent issue of the *Electric Railway Journal* (New York), commenting on the trolley omnibus, states that it is not likely that its development in America will be large. There is so far only one such line in existence in America—near Los Angeles. The reasons given are, first, that the roads are not kept in good enough condition in America for such vehicles, and, secondly, that track rights are more readily obtained.

## TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

### The Telephone Arbitration Award

The National Telephone Co., Ltd., were on Monday awarded £12,515,264, with costs, by the Court of the Railway and Canal Commission, as the purchase price to be paid by the Post Office for the Company's undertaking. This is about £8,000,000 less than the Company's original claim, and about £3,000,000 in excess of the Post Office offer. Comparing the award with the original claim, we find that under Headings 1 to 4, comprising the bulk of the overhead and underground plant, exchange and subscribers' equipment, the claim was for £20,264,851, depreciated to £17,631,606, whereas the award was for £13,456,016, depreciated to £10,459,796. During the case the Company amended their claim for part of this equipment (less depreciation) from £19,550,315 to £18,133,193, and the Post Office offered £12,143,865 instead of £11,617,159. Headings 5 to 12, including certain other plant, land, stores, buildings, licensed telephonic business at Portsmouth, Brighton, and Hull, the private wire business, &c., were settled out of court in the Vacation for £2,055,468. The original claim was for £3,293,094.

The sum awarded under Headings 1 to 4 included £247,189 to cover the cost of raising capital; the Company's claim for this was for £757,657. The Hon. A. E. Gathorne-Hardy concurred with Mr. Justice Lawrence's award in all particulars, while the third arbitrator, Sir James Woodhouse, agreed in all points except the allowance for the cost of raising capital, which he thought should not have been granted, but the finding of the majority of the arbitrators, of course, holds.

On the question of the allowance to be made for supervision of constructional works, the Judge said that although the evidence of Mr. F. Gill was as remarkable for the care and ability he had brought to bear on the inquiry as it was for his fairness and candour in the witness-box, his results were not completely satisfactory, as the typical period taken for this part of his estimate was one when construction was less than it had been, for the company was beginning to approach the termination of its licence, whereas the staff was not materially diminished. That tended to increase the ratio which general charges bore to construction. On the other hand, he could not adopt the percentages put forward by the Post Office. Some of their documents handed into court were very misleading, and should not have been produced.

He was surprised that the Post Office disputed that the cost of obtaining subscribers' agreements ought to be included in the valuation, and he allowed a sum for this.

With regard to depreciation, he held that the company's sinking-fund method of estimating this was a proper method to adopt in a going concern, especially where revenue is largely used for capital purposes, but it should not apply with value of plant as between a vendor and vendee. He therefore adopted the straight line method put forward by the Post Office, and took as a basis of the life of the plant the "physical" life, as contended by the company, and not the "effective" life, as contended by the Post Office; whereby they took into account probable expansion of business, obsolescence, and defective plant, &c. He held that the measure of the probable expansion of business did not enter into the calculation, and also that the assumption that the expansion would be at the same rate as in the past was not supported by any evidence other than that of hope and expectation. He did not think that there would be any great expansion unless the service were improved and rates lowered. As, however, some of the plant taken over was shown to be defective and other obsolete, he had been compelled to reduce the physical life somewhat. In this way he had allowed also for withdrawal of wayleaves, defective spare conduits in cement blocks, defective spare wires overloaded poles, and increased cost of maintenance of poles and struts in the later years of life, and absence of bonding at man-holes. The rejection of the company's method of reckoning depreciation is largely responsible for the great reductions in the total sums awarded.

According to *The Times*, it is probable that there will be an appeal on at least one point, this being on the cost of raising capital. The announcement of the award on the Stock Exchange caused a drop in the quotation of the company's deferred shares from about 138 to 109.



# ADAMS IGRANIC

Specialists in Electric Motor Starting and Control Gear.

Adams M<sup>rs</sup> C<sup>o</sup> L<sup>td</sup> Balfour House, Finsbury Pavement, London E.C. Works-Bedford.

## The Marconi Inquiry

The most important event in connection with the inquiry into the proposed Imperial wireless telegraph scheme by the House of Commons Committee since our last issue, is the presentation of an interim report by the Committee, in which they express the opinion that steps should be taken at once for the purchase of the sites mentioned in the contract, irrespective of whether the contract is finally adopted or not. They further state that in regard to the installations, either the Government must select a particular company, or else leave themselves free to adopt or reject from time to time any system. Whichever solution is ultimately recommended, however, the Committee point out that it is in their opinion necessary for the Committee or the Government to come to a conclusion as to the technical and scientific merits of the various systems. For this purpose it is believed that the best result will be reached by the immediate appointment of a highly qualified technical committee, apparently of a permanent character, as it is suggested that this committee would be able to advise not only as to the system to be adopted in the first instance, but as to any changes of system that might from time to time be necessary. Unless this course is adopted, the Committee state that they themselves will be compelled to enter upon a scientific inquiry, for which, however, they do not feel competent, quite apart from the fact that such an inquiry would involve very considerable delay in reaching any conclusion on the other matters before the Committee. The adoption of this report, it may be mentioned, was by 9 votes to 4, one member being absent. On this report being presented by the Committee on Monday, Mr. Herbert Samuel expressed the willingness of the Government to act upon the suggestion of the Committee, but in regard to the appointment of a technical committee, suggested that a time limit should be placed upon the receipt of their report, and that, at any rate, it should not come later than the final report of the Committee. The Government, he said, would not be justified in entering into any contract for a system which had not been submitted to adequate practical tests, and the question resolved itself into what systems were in a position to submit themselves to such tests within a comparatively brief period. The Government, he added, attached importance to three things: (1) getting the stations in operation quickly; (2) having stations which can be relied upon to work day and night; (3) having complete freedom to change the system from time to time. After this statement by the Postmaster-General, the Committee adjourned and met again on Tuesday, when, however, the proceedings were private.

At this private meeting slight modifications of the interim report were made. It is now suggested that the Committee should consist of independent experts, with a chairman of judicial or administrative capacity, and that it should report within three months. Further, the Committee desire the report endorsed by Parliament before they sit again.

Major Archer-Shee, in the House of Commons on Tuesday, asked the Postmaster-General whether an offer by Messrs. Siemens Bros. & Co. to supply a Telefunken wireless equipment having a range of 2,000 miles had been made and withdrawn owing to an arrangement with the Marconi Co. Mr. Herbert Samuel said that no tender had been made. It appears that, in the course of a conversation between a representative of Messrs. Siemens and the Secretary to the Post Office, a casual question was asked as to the cost of such a station, and a figure of £23,000 was quoted for a simplex plant delivered in this country. The offer did not include erecting, and generally was not intended to meet the conditions of the Imperial scheme.

A deputation from the Northern Scottish towns waited upon the Postmaster-General on Thursday with a request for an extension of the underground telegraph and telephone system. In such places as Dundee, Aberdeen, Arbroath and Montrose, the question of communication to the North of Scotland has been the subject of much complaint by business men there for many years, but even now they have received what is

tantamount to a refusal of the Post Office to do more than exists at present. The financial aspect of the question, the Postmaster-General pointed out, prohibits any large extension of the telegraphic and telephonic facilities with the North of Scotland. Underground cables have been put completely out of the question, but the use of "phantom circuits" is being experimented with in the hope of relieving the congestion which takes place from time to time.

It is announced that the Marconi Co. have been given a contract by the Brazilian Government for the provision of large wireless telegraph stations at Rio de Janeiro, Santa Martha, Bauru and Ladairo. These stations are to form the southern nucleus of the Brazilian internal wireless telegraph scheme which was outlined at the recent Radiotelegraphic Conference in London. The complete scheme comprises thirty stations.

According to the *Zeitschrift für Schwachstromtechnik*, the German Government contemplate the laying of an additional telegraph cable to relieve the traffic between England and Germany, from Norderney to Bacton (Norfolk). A sum of 1·8 million marks has been voted for the purpose.

Telegraphic conditions remained fairly quiet during the past week. On the 8th inst. the Bangkok-Kedah line was restored, as well as that between Teheran and Meshed.—The Bonny-Duala cable was in working order again on the 9th inst., and the Fao route was down beyond Bagdad on the 10th inst.—The Ottoman Government states that messages to Smyrna and some other places are subject to delay.

## LOCAL NOTES

**Altrincham: Street Lighting.**—The local electric supply company is designing a street lighting scheme.

**Belfast: The New Power House.**—It is not probable that the Corporation will accede to the request of the recent deputations of ratepayers to postpone the construction of the proposed new power house, the erection of which was recommended by the City Electrical Engineer, Mr. T. W. Bloxam, and supported by Mr. S. L. Pearce, of Manchester, who was consulted. The proposal to defer the matter until tests of a Diesel engine have been made at Messrs. Harland & Wolff's works seems rather ridiculous, especially as it appears that the engine in question has not even been built as yet. The building of this engine, we believe, is not being entrusted to any of the three makers of Diesel engines in this country well known to our readers, but we understand it will be of the Burmeister & Wain type, a large firm of Copenhagen shipbuilders with whom Messrs. Harland & Wolff have working arrangements.

**Blackrock: Electric Lighting.**—The Council have appointed Mr. S. L. R. Price, of Pembroke, to report upon the electric lighting scheme of the Dublin & Southern District Electricity Co.

**Dublin: Salaries of Shift Engineers.**—The Corporation have passed a recommendation of the Electricity Committee to the effect that shift engineers in the Corporation electricity works should be granted a maximum salary of £200 per annum, instead of £156 as at present. The Committee expressed the view that these members of the staff are not properly paid in Dublin, and that four good men have during the past three or four years left the service to take up similar positions in India and South Africa at much better salaries.

**Dundee: Addition to Power Load.**—Another large works has adopted electrical driving. Nearly 250 h.p. has already been installed, and an additional 300 h.p. is ready for connection to the Corporation mains.

**Edinburgh: Supply in Outside Districts.**—A sub-committee is considering the general question for supplying to districts outside the Borough boundaries, with a view to applying for the necessary parliamentary powers.

**Hove: Electricity Supply.**—There is likely to be some

## "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

### Specifications Published Jan. 9, 1913

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications. Names in italics indicate communicators of inventions from abroad.

28,459/11. **Flexible Low Pressure Armoured Cables.** M. KALLMANN. Flat thin conducting strips, e.g., copper tape, insulated from, and protected by, flat metal armouring, such as steel tape, are made up into a solid thin cable by an adhesive compound, and with a maximum of flexibility. In addition to the adhesive compound, braiding may be used. Six figures.

28,486/11. **Pressure Regulation of D.C. Dynamos.** BROWN, BOVERI. The excitation is pulsatingly varied. The oscillating system to effect this consists of a single electro-magnet, excited according to the pressure of the machine, together with an oscillating armature, whose period oscillation is less than that necessary for the regulation, and a retracting spring. The damping is supplied by a short-circuited winding on the field-magnet poles. The resistance to be short-circuited by the oscillating system is in the dynamo shunt field circuit. One figure.

535/12. **Tungsten Contacts.** B.T.-H. (*G. E. Co., U.S.A.*). Wrought tungsten is used for the contacts of X-ray or cathode tubes and other apparatus subjected to high temperatures.

1,903/12. **Transmitting Power from Windmills.** W. A. JACK. Magnets are mounted on the axle, and a wound stator is mounted in the head frame. A.C. or D.C. machines may be used. Two figures.

3,055/12. **Wireless Receivers.** MARCONI's and H. J. ROUND. To avoid the results of natural electric waves, commonly known as X's, two aeriels are used, one tuned to the signals to be received, and the other slightly different. The currents set up on the latter are led to the stator of an alternator whose rotor is rotated so as to bring up the frequency to that of the other aerial, which is coupled to the oscillating circuit containing the rotor. These two X frequencies are put in opposition in a third circuit, in which is the detector. One aerial with double tune may be used. Three figures.

3,445/12. **"Call-up" Signals for Wireless.** F. L. MUIRHEAD. The signal is made by a prolonged dash to distinguish it from atmospherics or those of ordinary working. The core of an electro-magnet is kept in slow constant rotation. A contact-maker on the armature normally rests on a stop, but is moved to a contact stop when the magnet is energised, and completes a signalling circuit. To cover the distance between the stops may require the armature to be energised for 50 seconds, so that the "dash" must be of at least this duration. Three figures.

3,532/12. **Parallel Working of Rotary Converters on A.C. and D.C. Side.** B.T.-H., H. W. TAYLOR, F. P. WHITTAKER, and H. N. SPORBOG. The alternator supplying the rotary has one insulated winding for each rotary. The windings may be of different voltages and provided with tapplings, no transformers being used.

12,134/12. **Speed Regulation of Induction Motors.** BERGMANN A.G. A rotary converter is fed from the slip-rings. Direct coupled to the induction motor is a D.C. motor fed by the rotary. The field of the D.C. motor is supplied by an exciter mounted on the shaft of the rotary. Two figures.

13,602/12. **Excess Current Meter.** E. SCHUPPISSE. On constant pressure circuits an electrolytic meter is connected across a shunt in the usual way, but a constant resistance is also connected between the anode and the positive main, and another between the anode and the negative main. Until a certain current is exceeded the P.D. across the meter is not sufficient to cause it to register. One figure.

18,632/12. **Short Range Wireless.** H. HEINICKE and M. JASPER. The secondary of the oscillation circuit is connected to an oscillator with its spark gap at the focus of a parabolic mirror. The circuits are adjusted so that the higher harmonics are transmitted into space. A thermopile is used for receiver. One figure.

### Specifications Published To-day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, E.C., at the price of 8d. each, post free. Summaries of some of the more important of these patents will appear in our next issue.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** B.T.-H. and YOUNG [Distributing] 627/12; HOLMES and AUTOMATIC ADVERTISING CO. [Electric control of electrically-driven apparatus] 1,569/12; PATON [Fixing aerial lines to insulators] 5,636/12.

**Electrochemistry:** R. HOE & Co. and LONGEE [Blackleading machines for electrotypers] 1,968/12.

**Ignition:** BENTALL and BINGHAM [Magnetos] 5,629/12; TOWNSON [Automatic timing] 6,077/12.

**Switchgear, Fuses, and Fittings:** GIBSON [Wall plugs] 28,837/11; TURNER [Motor controllers] 29,138/11; RAILING and STRACHAN [Switches] 4,577/12; WATSON [Combined switch and plug terminals] 6,673/12; OLIVER [Time switch for lamps] 23,993/12.

**Telegraphy:** PODGOURSKEY [Signalling presence of water in ships] 8,909/12.

**Traction:** ESTLER [Trolley collectors] 5,469/12; ALBERT THODE & Co. [Electro-magnetic brakes] 18,440/12.

**Miscellaneous:** FRIED. KRUPP [Magnetic separators] 29,224/11; EDMUNDSON'S, HIGHFIELD and GRIPPER [Portable battery lamps] 29,309/11; BEVILLE [Signs used with arc lamps] 229/12; LAWTON [Drying new multiple channel conduits] 2,348/12; QUERTIER [Indicating distance, time, speed, &c.] 7,617/12; Soc. COURTAUD, G. GARNIER, GIL. [Indicating] 7,780/12; MEYER & NEUHUTTEN VERWERTHUNGES GES. [Advertising] 12,133/12.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Distributing Systems, &c.:** CIE. GÉNÉRALE RADIOTÉLÉGRAPHIQUE [Charging condensers in parallel and discharging in series] 29,375/12.

**Dynamos and Motors:** HEYLAND [Improving commutation] 29,409/12; Soc. DITE S.T.A.R., 29,522/12.

**Electrometallurgy and Electrochemistry:** ERDMANN [Production of metallic oxides for catalytic reactions] 27,718/12; HENRI, HELBRONNER and VON RECKLINGHAUSEN [Sterilisation of liquids] 28,660/12.

**Ignition:** R. BOSCH [Starting systems] 24,533/12; KETTERING, 29,091/12; [Starting systems] 29,070/12, 29,071/12; and 29,083/12.

**Telephony and Telegraphy:** KRAUSE [Production of oscillations] 28,595/12; SIEMENS & HALSKE [Subscribers telephone connections grouped according to number of calls] 28,751/12.

**Miscellaneous:** Soc. L. BLÉRIOT [Electro-magnets] 28,864/12.

### Appeal from Comptroller's Decision

20,207/11. **Spark-plugs.** H. G. LONGFORD, W. W. LONGFORD, and W. A. CLARK. An appeal against the Comptroller's decision to grant this patent has been lodged.

### Expiring and Expired Patents

The following Patent expires during the current week, after a life of fourteen years:—

1,434 of January 21st, 1899. **Submarine Telegraph Relays.** S. G. BROWN. A tongue is fixed to one end of a relay circuit, and makes or breaks circuit with a rotary drum having insulated sections connected to the other end of the relay circuit. The object of the rotary drum is to reduce friction. If a varying zero is set up, a correcting current is set up in the relay through correcting segments and an auxiliary relay. The receiving instrument is short-circuited by coils of high self-induction but low-resistance. Condensers in series with the line are not required. For duplex working, the incoming current enters the shunt at its mid-point, so that it behaves as a pure resistance.

The following are the more important Patents that have become void through non-payment of renewal fees.

**Arc Lamps:** GEB. SIEMENS [Negative electrode for search-lights] 14,847/07.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** HENLEY's and W. H. NICHOLS [Junction box for metallic covered cables] 21,167/06.

**Electrochemistry and Electrometallurgy:** H. J. WESSELS [Sterilising liquids by ozone] 20,622/04; S. O. COWPER-COLES [Manufacture of seamless iron tubes and cylinders: a coating of another metal may be given] 21,081/06 and 21,082/06.

**Switchgear, Fuses, and Fittings:** D. J. O'BRIEN and T. A. ROTTANZI [Reflector casing for tubular lamps] 20,854/05; H. W. VAN RADEN and C. B. ROBINSON [Washer to prevent corrosion of primary and secondary battery terminals] 21,043/06; A. P. LUNDBERG, G. C. LUNDBERG, and P. A. LUNDBERG [Three-pin plug and socket combined with tumbler switches] 21,590/06.

**Traction:** B. T.-H. (*G.E. Co., U.S.A.*) [Regenerative braking with A.C. series motors] 21,004/06.

**Miscellaneous:** F. KLEINSCHMIDT [Storing live fish by injections of ozone into the tanks] 20,463/03.

# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 317 [Vol. IX., No. 4]  
*All rights reserved.*

THURSDAY, JANUARY 23, 1913.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES and TECHNICAL COLLEGE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

*Other Advertisement Rates on Application.*

*Latest Time for Receiving*

Letters for Insertion, Tuesday first post.

Small Advertisements and Official Announcements, Wednesday first post.

Displayed Advertisements, Tuesday first post.

Corrections in Standing Advertisements, Monday first post.

All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 208-206, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Circling, Fleet, London." Telephone No.: 5509 Holborn.

Cheques to be made payable to THE KILOWATT PUBLISHING Co., Ltd., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## CONTENTS

	PAGE
SUMMARY	45
Arrangements for the Week	46
The New Ferranti Steam Turbine	47
Electric Drive in a Woodworking Yard	48
Eckstein, Heap and Company's New Works	49
Municipal Wiring at Sheffield	49
The Prescott Automatic Starter	50
Switch and Lamp Circuit Demonstration Apparatus	50
Table Cooking by Electricity	50
Questions and Answers by Practical Men	51
Catalogues and Pamphlets Received	52
Electric Traction Notes	53
Telephony and Telegraphy (Including Wireless)	53
PATENT RECORD	54
Local Notes	55
Tenders Invited and Prospective Business	55
Tenders Received and Accepted	56
Miscellaneous Business Notes	56
Companies' Meetings, Dividends, Reports, &c.	56

## SUMMARY

THE Home Office has appointed a Departmental Committee to inquire into factory and workshop lighting. (Page 46.)

IN a lecture given last week at Greenock, Dr. S. Z. de Ferranti gave a few particulars of the high temperature steam turbine on which he has been experimenting for some time. By initial and interstage superheating, he has obtained a steam consumption of 7 lb. of steam per b.h.p.-hour, and the turbine is made able to stand these high temperatures by the use of electrically-welded blading. (Page 47.)

A DESCRIPTION is given of the electric driving arrangements in a wood-working establishment, and the

general conditions of motor control for this class of work are discussed. (Page 48.)

WE describe Messrs. Eckstein, Heap & Co.'s new works, and illustrate two interesting details in their switches and fuses. (Page 49.)

WE give the reasons why the House of Commons disagreed with the House of Lords' amendments to the Sheffield Corporation Bill, and wishes to grant the Corporation full wiring powers. (Page 49.)

A NEW automatic starter is described in an illustrated article entirely. (Page 50.)

THE selection of self-contained country house lighting plant is dealt with in our "Questions and Answers" columns. (Page 51.)

THE Mercedes-Stoll system of trolley omnibuses is being installed at Aberdare, and is also to be given a trial at Bradford. Further extensions of the Dundee trolley omnibus system have been postponed for three months. The proposed London Traffic Board was discussed at the L.C.C. meeting on Tuesday. (Page 53.)

MARCONI's Wireless Telegraph Co. have asked to be released from the proposed agreement for an Imperial wireless telegraph scheme.—The use of "phantom circuits," which was mentioned by the Postmaster-General at a recent deputation concerning communication with the North of Scotland, is not likely to be found applicable on these long-distance land-lines, but on the other hand it is also suggested for a new line to be constructed between New York and San Francisco.—A legal action is proceeding in London with regard to the extended use of the Marconi system in Russia. (Page 53.)

A PATENT specification by F. Braun relating to the use of long wave-lengths in wireless so as to get round obstructions more readily, expires during the present week after a full life of fourteen years. Among the specifications published by the Patent Office on Thursday last is one by P. S. Turner, covering a controller for D.C. motors whereby shunt and series armature resistance may be inserted to obtain creeping speeds and fine speed regulation. A combined switch and plug is protected by W. E. Watson, and the B.T.H. Co. and A. P. Young have a relay for protecting generators using Tirrill regulators from the effects of violent pressure changes. (Page 54.)

OPEN type arc lamps are being changed over to flame arc lamps for street lighting in Shoreditch.—An electric kitchen to cook for 100 people has been installed at Brighton.—The Scarborough Corporation contemplate the purchase of the local electric supply company.—Complaint is made at Lowestoft of the increasing tendency of the Local Government Board to reduce loan periods.—Electrical contractors at Edinburgh are complaining of the proposal of the Corporation to seek full wiring powers.—A large scheme of electric supply is being suggested for New South Wales.—Two Ljung-

# "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

## Specifications Published Jan. 9, 1913

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications. Names in italics indicate communicators of inventions from abroad.

- 28,459/11. **Flexible Low Pressure Armoured Cables.** M. KALLMANN. Flat thin conducting strips, e.g., copper tape, insulated from, and protected by, flat metal armouring, such as steel tape, are made up into a solid thin cable by an adhesive compound, and with a maximum of flexibility. In addition to the adhesive compound, braiding may be used. Six figures.
- 28,486/11. **Pressure Regulation of D.C. Dynamos.** BROWN. The excitation is pulsatingly varied. The oscillating system to effect this consists of a single electro-magnet, excited according to the pressure of the machine, together with an oscillating armature, whose period oscillation is less than that necessary for the regulation, and a retracting spring. The damping is supplied by a short-circuited winding on the field-magnet poles. The resistance to be short-circuited by the oscillating system is in the dynamo shunt field circuit. One figure.
- 535/12. **Tungsten Contacts.** B.T.H. (G. E. Co., U.S.A.). Wrought tungsten is used for the contacts of X-ray or cathode tubes and other apparatus subjected to high temperatures.
- 1,903/12. **Transmitting Power from Windmills.** W. A. JACK. Magnets are mounted on the axle, and a wound stator is mounted in the head frame. A.C. or D.C. machines may be used. Two figures.
- 3,055/12. **Wireless Receivers.** MARCONI'S and H. J. ROUND. To avoid the results of natural electric waves, commonly known as X's, two aeriels are used, one tuned to the signals to be received, and the other slightly different. The currents set up on the latter are led to the stator of an alternator whose rotor is rotated so as to bring up the frequency to that of the other aerial, which is coupled to the oscillating circuit containing the rotor. These two X frequencies are put in opposition in a third circuit, in which is the detector. One aerial with double tune may be used. Three figures.
- 3,445/12. **"Call-up" Signals for Wireless.** F. L. MUIRHEAD. The signal is made by a prolonged dash to distinguish it from atmospherics or those of ordinary working. The core of an electro-magnet is kept in slow constant rotation. A contact-maker on the armature normally rests on a stop, but is moved to a contact stop when the magnet is energised, and completes a signalling circuit. To cover the distance between the stops may require the armature to be energised for 50 seconds, so that the "dash" must be of at least this duration. Three figures.
- 3,532/12. **Parallel Working of Rotary Converters on A.C. and D.C. Side.** B.T.H., H. W. TAYLOR, F. P. WHITTAKER, and H. N. SPORBORG. The alternator supplying the rotary has one insulated winding for each rotary. The windings may be of different voltages and provided with tappings, no transformers being used.
- 12,134/12. **Speed Regulation of Induction Motors.** BERGMANN. A.G. A rotary converter is fed from the slip-rings. Direct coupled to the induction motor is a D.C. motor fed by the rotary. The field of the D.C. motor is supplied by an exciter mounted on the shaft of the rotary. Two figures.
- 13,602/12. **Excess Current Meter.** E. SCHUPPISSE. On constant pressure circuits an electrolytic meter is connected across a shunt in the usual way, but a constant resistance is also connected between the anode and the positive main, and another between the anode and the negative main. Until a certain current is exceeded the P.D. across the meter is not sufficient to cause it to register. One figure.
- 18,632/12. **Short Range Wireless.** H. HEINICKE and M. JASPER. The secondary of the oscillation circuit is connected to an oscillator with its spark gap at the focus of a parabolic mirror. The circuits are adjusted so that the higher harmonics are transmitted into space. A thermopile is used for receiver. One figure.

## Specifications Published To-day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, E.C., at the price of 8d. each, post free. Summaries of some of the more important of these patents will appear in our next issue.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** B.T.H. and YOUNG [Distributing] 627/12; HOLMES and AUTOMATIC ADVERTISING Co. [Electric control of electrically-driven apparatus] 1,569/12; PATON [Fixing aerial lines to insulators] 5,636/12.

**Electrochemistry:** R. HOE & Co. and LONGEE [Blackleading machines for electrotipers] 1,968/12.

**Ignition:** BENTALL and BINGHAM [Magnetos] 5,629/12; TOWNSON [Automatic timing] 6,077/12.

**Switchgear, Fuses, and Fittings:** GIBSON [Wall plugs] 28,837/11; TURNER [Motor controllers] 29,138/11; RAILING and STRACHAN [Switches] 4,577/12; WATSON [Combined switch and plug terminals] 6,673/12; OLIVER [Time switch for lamps] 23,993/12.

**Telegraphy:** PODGORSKY [Signalling presence of water in ships] 8,909/12.

**Traction:** ESTLER [Trolley collectors] 5,469/12; ALBERT THODE & Co. [Electro-magnetic brakes] 18,440/12.

**Miscellaneous:** FRIED. KRUPP [Magnetic separators] 29,224/11; EDMUNDSON'S, HIGHFIELD and GRIPPER [Portable battery lamps] 29,309/11; BEVILLE [Signs used with arc lamps] 229/12; LAWTON [Drying new multiple channel conduits] 2,348/12; QUERTIER [Indicating distance, time, speed, &c.] 7,617/12; Soc. COURTAUD, G. GARNIER, GIL. [Indicating] 7,780/12; MEYER & NEUBERTEN VERWERTHUNGES GES. [Advertising] 12,133/12.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Distributing Systems, &c.:** CIE. GÉNÉRALE RADIOTÉLÉGRAPHIQUE [Charging condensers in parallel and discharging in series] 29,375/12.

**Dynamos and Motors:** HEYLAND [Improving commutation] 29,409/12; Soc. DITE S.T.A.R., 29,522/12.

**Electrometallurgy and Electrochemistry:** ERDMANN [Production of metallic oxides for catalytic reactions] 27,718/12; HENRI, HELBRONNER and VON RECKLINGHAUSEN [Sterilisation of liquids] 28,660/12.

**Ignition:** R. BOSCH [Starting systems] 24,533/12; KETTERING, 29,091/12; [Starting systems] 29,070/12, 29,071/12; and 29,083/12.

**Telephony and Telegraphy:** KRAUSE [Production of oscillations] 28,595/12; SIEMENS & HALSKE [Subscribers telephone connections grouped according to number of calls] 28,751/12.

**Miscellaneous:** Soc. L. BLÉRIOT [Electro-magnets] 28,864/12.

## Appeal from Comptroller's Decision

20,207/11. **Spark-plugs.** H. G. LONGFORD, W. W. LONGFORD, and W. A. CLARK. An appeal against the Comptroller's decision to grant this patent has been lodged.

## Expiring and Expired Patents

The following Patent expires during the current week, after a life of fourteen years:—

1,434 of January 21st, 1899. **Submarine Telegraph Relays.** S. G. BROWN. A tongue is fixed to one end of a relay circuit, and makes or breaks circuit with a rotary drum having insulated sections connected to the other end of the relay circuit. The object of the rotary drum is to reduce friction. If a varying zero is set up, a correcting current is set up in the relay through correcting segments and an auxiliary relay. The receiving instrument is short-circuited by coils of high self-induction but low-resistance. Condensers in series with the line are not required. For duplex working, the incoming current enters the shunt at its mid-point, so that it behaves as a pure resistance.

The following are the more important Patents that have become void through non-payment of renewal fees.

**Arc Lamps:** GEB. SIEMENS [Negative electrode for search-lights] 14,847/07.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** HENLEY'S and W. H. NICHOLS [Junction box for metallic covered cables] 21,167/06.

**Electrochemistry and Electrometallurgy:** H. J. WESSELS [Sterilising liquids by ozone] 20,622/04; S. O. COWPER-COLES [Manufacture of seamless iron tubes and cylinders: a coating of another metal may be given] 21,081/06 and 21,082/06.

**Switchgear, Fuses, and Fittings:** D. J. O'BRIEN and T. A. ROTTANZI [Reflector casing for tubular lamps] 20,834/05; H. W. VAN RADEN and C. B. ROBINSON [Washer to prevent corrosion of primary and secondary battery terminals] 21,043/06; A. P. LUNDBERG, G. C. LUNDBERG, and P. A. LUNDBERG [Three-pin plug and socket combined with tumbler switches] 21,390/06.

**Traction:** B. T.H. (G.E. Co., U.S.A.) [Regenerative braking with A.C. series motors] 21,004/06.

**Miscellaneous:** F. KLEINSCHMIDT [Storing live fish by injections of ozone into the tanks] 20,463/03.

# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

NO. 317 [VOL. IX., No. 4]  
*All rights reserved.*

THURSDAY, JANUARY 23, 1913.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.  
SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES and TECHNICAL COLLEGE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

*Other Advertisement Rates on Application.*

*Latest Time for Receiving*

Letters for Insertion, Tuesday first post.

Small Advertisements and Official Announcements, Wednesday first post.

Displayed Advertisements, Tuesday first post.

Corrections in Standing Advertisements, Monday first post.

All letters to be addressed to "Electrical Engineering," at the EDITORIAL and PUBLISHING OFFICES: 206-206, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Circling, Fleet, London." Telephone No.: 5500 Holborn.

Orders to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## CONTENTS

	PAGE
SUMMARY	45
Arrangements for the Week	46
The New Ferranti Steam Turbine	47
Electric Drive in a Woodworking Yard	48
Eckstein, Heap and Company's New Works	49
Municipal Wiring at Sheffield	49
The Prescott Automatic Starter	50
Switch and Lamp Circuit Demonstration Apparatus	50
Table Cooking by Electricity	50
Questions and Answers by Practical Men	51
Catalogues and Pamphlets Received	52
Electric Traction Notes	53
Telephony and Telegraphy (Including Wireless)	53
PATENT RECORD	54
Local Notes	55
Tenders Invited and Prospective Business	55
Tenders Received and Accepted	56
Miscellaneous Business Notes	56
Companies' Meetings, Dividends, Reports, &c.	56

## SUMMARY

THE Home Office has appointed a Departmental Committee to inquire into factory and workshop lighting. (Page 46.)

IN a lecture given last week at Greenock, Dr. S. Z. de Ferranti gave a few particulars of the high temperature steam turbine on which he has been experimenting for some time. By initial and interstage superheating, he has obtained a steam consumption of 7 lb. of steam per b.h.p.-hour, and the turbine is made able to stand these high temperatures by the use of electrically-welded blading. (Page 47.)

A DESCRIPTION is given of the electric driving arrangements in a wood-working establishment, and the

general conditions of motor control for this class of work are discussed. (Page 48.)

WE describe Messrs. Eckstein, Heap & Co.'s new works, and illustrate two interesting details in their switches and fuses. (Page 49.)

WE give the reasons why the House of Commons disagreed with the House of Lords' amendments to the Sheffield Corporation Bill, and wishes to grant the Corporation full wiring powers. (Page 49.)

A NEW automatic starter is described in an illustrated article entirely. (Page 50.)

THE selection of self-contained country house lighting plant is dealt with in our "Questions and Answers" columns. (Page 51.)

THE Mercedes-Stoll system of trolley omnibuses is being installed at Aberdare, and is also to be given a trial at Bradford. Further extensions of the Dundee trolley omnibus system have been postponed for three months. The proposed London Traffic Board was discussed at the L.C.C. meeting on Tuesday. (Page 53.)

MARCONI's Wireless Telegraph Co. have asked to be released from the proposed agreement for an Imperial wireless telegraph scheme.—The use of "phantom circuits," which was mentioned by the Postmaster-General at a recent deputation concerning communication with the North of Scotland, is not likely to be found applicable on these long-distance land-lines, but on the other hand it is also suggested for a new line to be constructed between New York and San Francisco.—A legal action is proceeding in London with regard to the extended use of the Marconi system in Russia. (Page 53.)

A PATENT specification by F. Braun relating to the use of long wave-lengths in wireless so as to get round obstructions more readily, expires during the present week after a full life of fourteen years. Among the specifications published by the Patent Office on Thursday last is one by P. S. Turner, covering a controller for D.C. motors whereby shunt and series armature resistance may be inserted to obtain creeping speeds and fine speed regulation. A combined switch and plug is protected by W. E. Watson, and the B.T.-H. Co. and A. P. Young have a relay for protecting generators using Tirrill regulators from the effects of violent pressure changes. (Page 54.)

OPEN type arc lamps are being changed over to flame arc lamps for street lighting in Shoreditch.—An electric kitchen to cook for 100 people has been installed at Brighton.—The Scarborough Corporation contemplate the purchase of the local electric supply company.—Complaint is made at Lowestoft of the increasing tendency of the Local Government Board to reduce loan periods.—Electrical contractors at Edinburgh are complaining of the proposal of the Corporation to seek full wiring powers.—A large scheme of electric supply is being suggested for New South Wales.—Two Ljung-



strom turbines have been ordered by the North Metropolitan Electric Power Co. (Page 55.)

A 3,000 kw. turbo-alternator is to be put in at Aberdeen; the Hackney Council are to spend £21,700 upon new mains, &c.; a £13,000 loan has been sanctioned at Stepney, and £3,000 at Hammersmith; a new power station is recommended at Wallasey; a 500 kw. generating set is required at Long Eaton; a 250 kw. Diesel engine and generator at Clacton, and a scheme for the extension of the Lister Drive power station at Liverpool is under discussion. (Page 55.)

The British Thomson-Houston Co. has decided to remove its switchboard department from Rugby to Willesden.—The works of Ernest Scott & Mountain, Ltd., at Gateshead, have been purchased by C. A. Parsons & Co.—The Stearn Electric Lamp Co. has joined the Tungsten Lamp Association. (Page 56.)

### ARRANGEMENTS FOR THE WEEK

(TO-DAY) THURSDAY, JANUARY 23RD.

*Institution of Electrical Engineers.*

8 p.m. "The Use of a Large Lighting Battery in Connection with Central Station Supply," by F. H. Whysall.

FRIDAY, JANUARY 24TH.

*Physical Society.*

5 p.m. At Imperial College of Science. The agenda includes: (1) "The Electrical Conductivity and Fluidity of Strong Solutions," by W. S. Tucker; (2) "The Resistance of Electrolytes," by S. W. J. Smith and H. Moss.

*Manchester Electro-Harmonic Society.*

7.30 p.m. Smoking Concert at Albion Hotel.

*Royal Institution.*

9 p.m. Evening discourse. "Recent Advances in Scientific Steel Metallurgy," by Prof. J. O. Arnold, F.R.S.

*Association of Mining Electrical Engineers.*

East of Scotland Branch. Meeting at Dunfermline.

MONDAY, JANUARY 27TH.

*Institution of Electrical Engineers: Newcastle Students' Section.*

7.30 p.m. At Armstrong College. "The Application of Electricity to the Lighting of Residences, Business Premises, and Factories," by S. I. Ellis.

TUESDAY, JANUARY 28TH.

*Institution of Electrical Engineers: Manchester Section.*

7.30 p.m. At the University. "The Use of a Large Lighting Battery in Connection with Central Station Supply," by F. H. Whysall.

WEDNESDAY, JANUARY 29TH.

*Institution of Electrical Engineers: Students' Section.*

7.45 p.m. Victoria Embankment. "The Standardisation of a Line of Induction Motors," by E. T. Driver.

*Institution of Civil Engineers: Students' Section.*

Visit to Edgware Road-Paddington extension of the London Electric Railway.

### The London Electrical Engineers.

(TO-DAY) THURSDAY. C. Company.—Company Training, 7 to 10 p.m.

FRIDAY, JANUARY 24TH. D. Company.—Recruit Training, 7 to 10 p.m. Company Training, 7 to 10 p.m.

SATURDAY, JANUARY 25TH. A. Company.—Week-end run at Fort Coalhouse (as for D. Company last week). Headquarters open from 10 a.m. till 12 noon.

MONDAY, JANUARY 27TH. A. Company.—Recruit Training, 7 to 10 p.m. Company Training, 7 to 10 p.m.

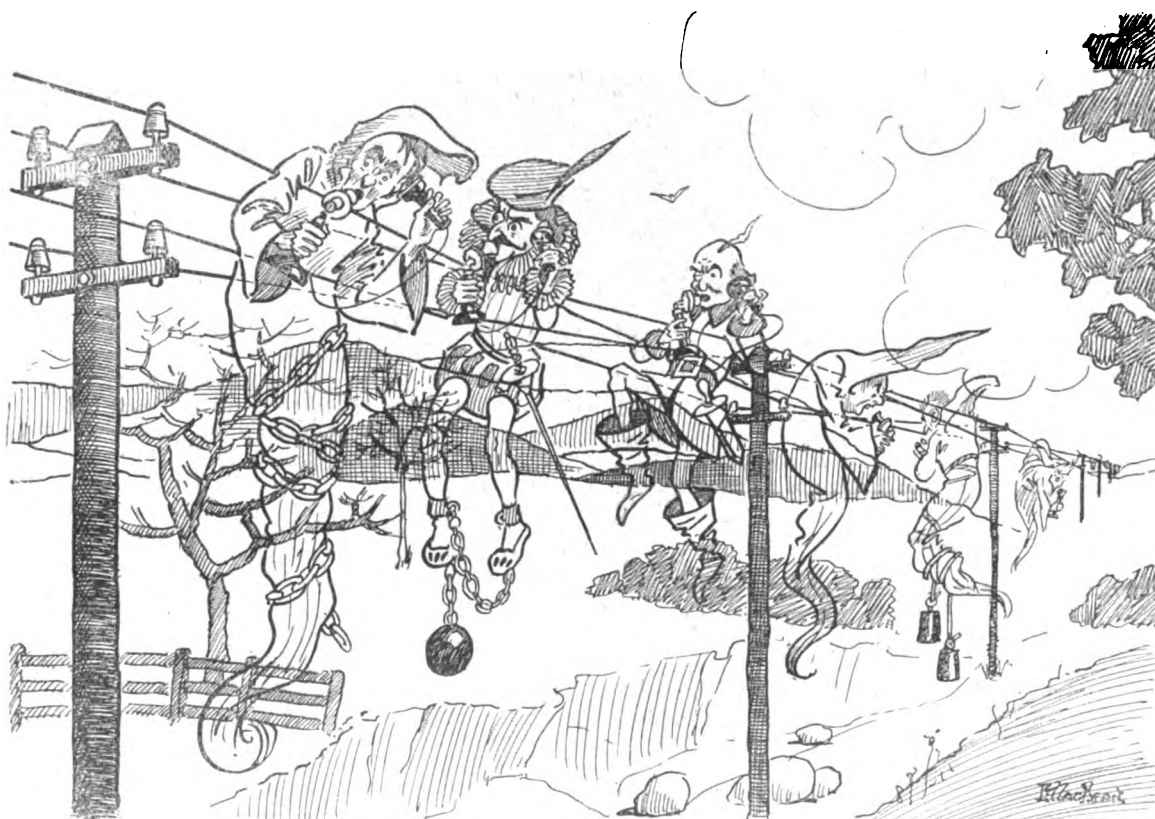
TUESDAY, JANUARY 28TH. B. Company.—Recruit Training, 7 to 10 p.m. Company Training, 7 to 10 p.m.

THURSDAY, JANUARY 30TH. C. Company.—Company Training, 7 to 10 p.m.

FRIDAY, JANUARY 31ST. D. Company.—Recruit Training, 7 to 10 p.m.; Company Training, 7 to 10 p.m.

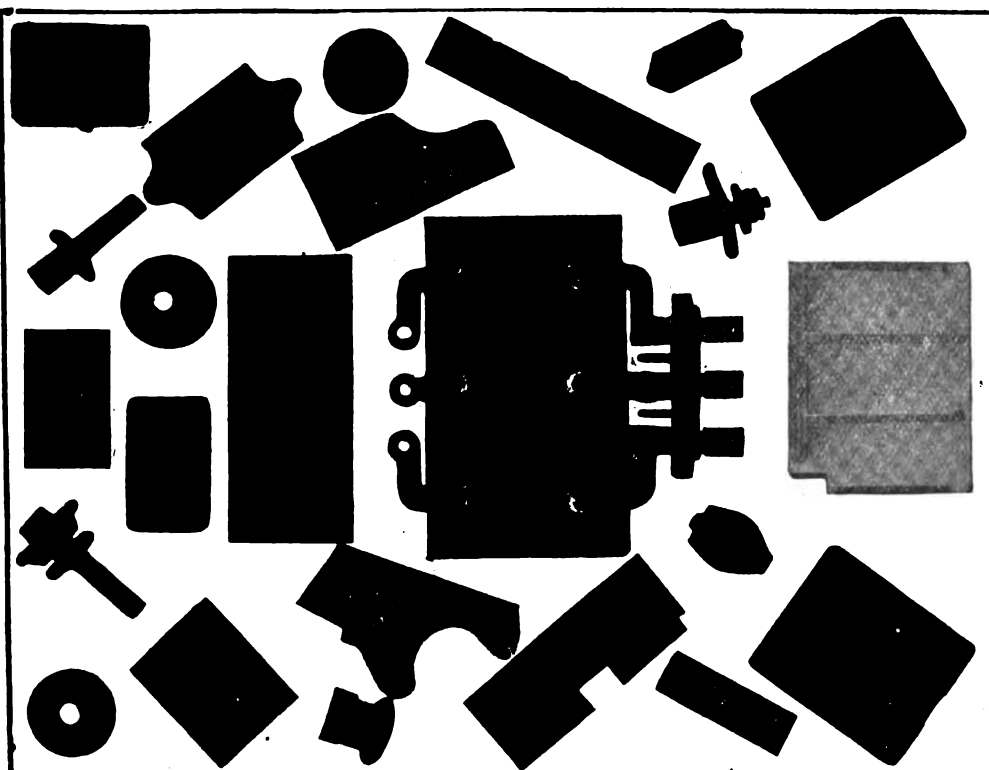
SATURDAY, FEBRUARY 1ST. B. Company.—Week-end run at Fort Coalhouse. Parade at Fenchurch Street Station, 8 p.m. Service dress. No arms. A. Company.—Lorry run. The Lorry Crew will parade at Headquarters at 2.30 p.m. Service dress. No arms. Headquarters open for Regimental business from 10 a.m. till 12 noon.

**Factory Lighting.**—The Home Office has appointed the following Committee to inquire and report as to the lighting of factories and workshops:—Dr. R. T. Glazebrook, F.R.S., Director of the National Physical Laboratory (Chairman); Mr. L. Gaster, Hon. Sec., Illuminating Engineering Society; Professor F. Gotch, F.R.S., Professor of Physiology, Oxford University; Mr. J. H. Parsons, Surgeon, Royal London Ophthalmic and University College Hospitals; Mr. W. C. D. Whettham, F.R.S., Lecturer in Physics; Trinity College, Cambridge, and Sir Arthur Whitelegge, K.C.B., Chief Inspector of Factories. The Secretaries are: Mr. D. R. Wilson, an Inspector of Factories, and Mr. C. C. Paterson, of the National Physical Laboratory. We regret that no representative of the electric lighting industry has been included, and we hope that the Industrial Committee of the Institution of Electrical Engineers will duly prepare evidence for the assistance of the new Home Office Committee.



According to the "Daily Telegraph," it is anticipated that by next year telephonic communication will be established between New York and San Francisco, a distance of 3,360 miles. Our contemporary adds: "This will be possible by the use of 'loaded phantoms' placed at regular intervals along the line, through which the current, in passing, gains strength." The above is our artist's conception of the loaded phantoms.





## INSULATING MATERIAL

FOR ALL PURPOSES.

Moulded parts of all kinds either with or without metal work.

**AMBROIN**  
**MARGOLIT**  
**VULCANIZED**  
**-ASBESTOS**  
**ISOSTABIL**  
**ASBESTOS**  
**-SLATE**

PRICES AND  
FULL PARTICULARS  
ON APPLICATION.

**The ELECTRICAL ENGINEERING & EQUIPMENT Co., Ltd.**

**109-111 New Oxford Street,**

**LONDON, W.C.**

Telephone: Gerrard 133.

Telegrams: "THERMOTYPE, WESTCENT, LONDON."



## THE NEW FERRANTI TURBINE

Seven Pounds of Steam per b.h.p.-hour

IT has been known for some time that Dr. S. Z. de Ferranti has been working on the construction of a new form of steam turbine, and the indications which he gave in the course of his "Watt" anniversary lecture at the Greenock Philosophical Society of the trend of his researches are of great interest.

After some historical notes on prime movers in general, the lecturer took up the general characteristics of the internal combustion engine and the steam turbine, emphasising the view that as the turbine became larger it was easier to construct and more economical, whereas as the gas or oil engine became larger, the difficulties increased. It was clear, he said, that for small powers the internal combustion reciprocating engine was in every way the best, but at the other end of the scale the turbine was the only means of filling requirements to-day. He had some hard words for those who were developing the Diesel engine for marine purposes.

The way to obtain increased economy with the steam turbine was to raise the working temperatures. He had now, after years of experiment, produced a turbine which at the highest temperatures and with great and rapid variations of temperature was quite free from mechanical troubles, ran with a blade clearance so small as to be negligible as regards leakage loss, and the fear of the possibility of stripping appeared to have been effectively removed.

"In this turbine," continued the lecturer, "I superheat the steam initially, and after the first expansion, and whilst it is still superheated, resuperheat it before it does its work in the second stage of the turbine. After this, it is exhausted in a superheated condition through a regenerator to the condenser. The whole of the blading is electrically welded so as to avoid the straining due to caulking at the high temperatures that are reached, and also the loosening that occurs due to the same cause. The blading is formed of mild steel, with a thin coating of pure sheet nickel elec-

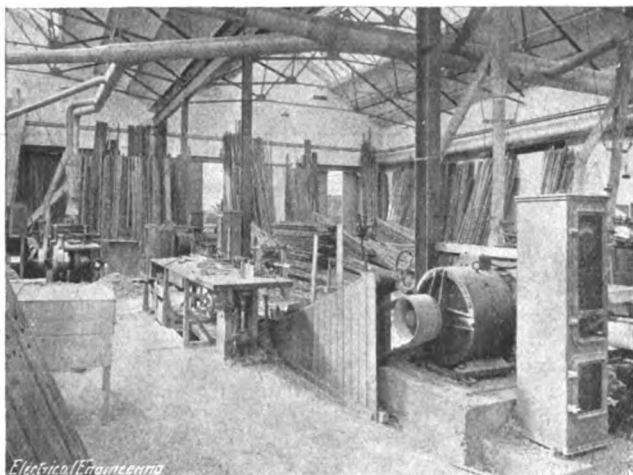
trically welded on to the surface. The blading is most accurately finished to shape by a process of step-by-step pressing under very heavy pressure. The blading, the sections of which are very exact, is welded in position with the accuracy of the automatic machine that is used for the purpose, and every opportunity is thus given for realising the best results. Although the turbine is of the reaction type, no balance dummy is used. The whole of the end load is taken on a specially constructed thrust, thus saving steam leakage. The steam is worked as a gas at high temperature throughout the turbine, and this, coupled with the many improvements above referred to, has given very good results.

"The 5,000-h.p. machine has now been running for some time, and when tested at a load of two-thirds full power has given a shaft h.p. on 7 lb. of steam per hour which, if supplied by an oil-fired boiler superheater system of 85 per cent. efficiency (this has already been exceeded in central station practice), would consume less than 0.625 lb. of oil per shaft h.p.-hour. From many tests already made it appears that when this turbine is run at full load under favourable conditions it will take less than 6 lb. of steam per shaft h.p.-hour, and that the system under the conditions named will have a thermal efficiency of over 24 per cent. corresponding to an oil consumption of about 0.55 lb. of oil per shaft h.p.-hour. The tests are being proceeded with, but as the turbine is run continuously in supplying power to a large works with a constantly varying load, it is not easy to do what is necessary to enable tests to be carried out. So far as I can see, this system when applied on a large scale will be capable of giving an overall thermal efficiency of 29 per cent."

Dr. Ferranti was enthusiastic on the future possibilities of the high temperature steam turbine. With such a machine generating electricity to supply power for all purposes on land, one had the advantage of a machine of the highest efficiency, which was not limited to oil for its fuel. He looked forward to the time when the whole of the coal used for firing these large units would be gasified, and the bye-products recovered, producing an ample supply of fertiliser for the land, a great quantity of tar oil suitable for naval firing purposes, and benzol for small motor requirements. This, he thought, was the realisation of the fuel problem rather than the production of alcohol on a large scale. The electric motor supplied from very large power stations was displacing all forms of small engines, and it was probable that in the future small prime movers would only be required to propel cars and boats, and that all stationary motors would be electric.

## ELECTRIC DRIVE IN A WOODWORKING YARD

THE application of electrical power did not, perhaps, make such early strides in the woodworking industry as in some other directions. It is suggested that this is partly due to the fact that in this class of work the waste products can produce all the power required, and proprietors have looked only for a decreased power bill, but have been unaware how electrical power would enable them to improve and quicken their processes, increase outputs, and reduce labour bills. Again, the waste products of woodworking factories have latterly become the raw material of other industries, with the result that they may be sold at a price considerably in excess of their value as fuel. Owners have thus been induced in many cases to consider other sources of energy, and where there is a public electrical supply available very advantageous terms can usually be arranged. But even when no public source of energy is at hand, the advantages of electric driving in efficiency of transmission and convenience of control are sufficient to warrant its adoption. Not only is there saving



VIEW SHOWING 30 H.P. MOTOR AND CONTROL PANEL.

in the cost of shafting and gearing, and the increased convenience of its absence, but important economies result from the more accurate control, which renders more easy and speeds up all the processes, and also from the ability to place each machine in the position where it will be most useful, instead of having to place it where it can be attached to the shafting which is to drive it.

To secure these advantages it is essential that the control gear should be suitable for the work to be done. Woodworking machines are very diverse in their characteristics. In nearly all cases the load is a very fluctuating one, while there is always the liability of sudden overloads. Gradual starting is a necessity, owing to their very high working speed and heavy starting load, as in four-cutter, planing, and moulding machines, and it is equally necessary to be able to stop immediately in cases of emergency even before the machine has been fully accelerated. The switchgear should be simple to manipulate and the operations of starting and stopping should be so easy that the workman need not take his eyes from his work to look at the controller. The motor must be protected against damage from failure of voltage or from overloads, and the switchgear must be capable of frequently opening circuit on the occurrence of dangerous overloads, without itself sustaining damage. It is also advisable to enclose the switchgear completely in one substantial housing, as the atmosphere is always more or less charged with dust.

A conspicuous example of what may be achieved by a well-planned installation, embodying the most suitable form of control, is afforded by Messrs. Latham's Lea Valley Mills, of which a description has been sent us by the Adams Manufacturing Co., Ltd. (London and Bedford). The whole lay-out was arranged by the engineers of the Hackney Borough Council's Electricity Installation and Sales Department. The total horsepower at present installed is 280, and the voltage 240 and 480 d.c. The largest unit is 50 h.p., and the smallest 2 h.p. All the motors are shunt-wound, fitted with interpoles, and of the enclosed ventilated type, by Messrs. J. H. Holmes & Co. (Newcastle-on-Tyne). One 50-h.p. motor drives a line of shafting, which drives four 36-in. circular saw-benches. The second 50-h.p. motor drives two log frames of the vertical reciprocating type, by Messrs. Robinson, of Rochdale, each machine being capable of making any number of vertical cuts up to 24 simultaneously from logs up to 30 in. square and 12 ft. long. One 15-h.p. motor drives a log-frame saw of the horizontal reciprocating type, by Messrs. J. Pickle & Son, of Hebden Bridge, which is capable of making one cut up to 48 in., cutting at the rate of 2 in. per minute. Four 30-h.p. motors each drive a length of shafting, from which various moulding and planing machines, vertical spindles, circular saws, and band saws are driven. Other smaller machines are fixed for working saw-sharpening tools, &c.

The control panels are all made by the Adams Manufacturing Co., and are of the "Adams Igranite Conspepe" type, similar to the one seen in the illustration. Each panel is enclosed in an iron housing of pillar form to exclude the dust.

In individual driving it is even more essential than in group driving to provide means for rendering sudden overloads harmless, because in individual driving the motor has only power sufficient for the one machine that it drives, and no assistance is available from flywheels or countershaft pulleys, while the amount of kinetic energy stored in the moving parts of the machine and the motor is small. Automatic stopping under an overload imposes a heavy duty upon the control gear, and the most satisfactory method of breaking a large overload current is to remove the actual break from the contacts of the starter altogether, and allow it to take place on a specially designed circuit breaker, which should be fitted with a powerful magnetic blow-out and carbon contacts. This method of breaking circuit is of special importance in a wood-working shop, where the blowing of an improperly protected fuse might lead to a fire. The fuses are not relied on to deal with overloads, and the Engineer of the Hackney Borough Council has stated that since this plant was installed over six months ago not a single fuse has been replaced.

In the "Conspepe" controllers the circuit breakers are self-resetting. They have no handle, the whole operation is entirely automatic, and no further attention is required to re-start the motor after being stopped by an overload than simply to reduce the load to safe dimensions, and start again in the ordinary way. Should any unforeseen adverse circumstances develop during starting, it should be possible to stop the motor by simply releasing or bringing back the starting handle. The panels are arranged so that a backward movement of the starter handle immediately stops the motor by opening the circuit breaker, thereby making the contacts dead, and protecting them against sparking and burning. The panels have the great advantage of having only one handle, so that there is no possibility of the various operations being performed in improper sequence. The circuit breaker and starter are so interlocked that the first movement of the starter handle in the direction for starting causes the circuit breaker to close automatically, and should an overload occur, either through too rapid starting or from any other cause, it will re-open, and no effort on the part of the operator will avail to keep it closed until the load is lightened. Furthermore, having opened, the circuit breaker will not close again until all the starting resistance has been re-inserted. The circuit breaker is so interlocked with the starter that the slightest backward movement of the handle, either from the first, or last, or any intermediate contact, causes the circuit breaker to immediately open, and so confines the duty of opening circuit always to the circuit breaker, thus preventing the starting contacts being burned or damaged. This is a valuable feature, particularly in connection with woodworking machinery. Each panel is provided with a stopping button at the side of the housing, arranged to open the circuit breaker, not to short-circuit the no-volt spools. This feature makes the panels equally suitable for stopping the machines as for starting them, as the main circuit is never broken on the starter contacts. Any number of these buttons may be fitted round the various machines, thus placing them entirely under the control of the workmen, so that the machine can be stopped immediately on emergency from any position.

We are indebted to Messrs. Latham & Co. for permission to publish the photograph, and for the particulars of the wood-working machines.

**I.E.E. Students' Section.**—Mr. G. W. P. Page (24 The Ridgeway, Enfield), has been elected honorary secretary of the Students' Section of the Institution of Electrical Engineers in place of Mr. J. Mould, who finds himself unable longer to devote adequate time to the office.

## ECKSTEIN, HEAP &amp; CO.'S NEW WORKS

WE announced in our last issue the registration of the firm of Eckstein, Heap & Co., Ltd., as a limited company. The Company has recently opened its new works, the Lancashire Switchgear Works, in Caroline Street, Broughton, Manchester, and is as active as ever under the same management. Mr. Eckstein is Managing Director and Chairman, and the other Directors are Mr. Hamer, Mr. D. B. Mellish and Mr. P. B. Hall, the two latter continuing as Managers. Mr. Heap left the firm some time ago to take up consulting work. It was in order to take in additional capital to cope with the increasing work that it was thought desirable to transform the business into a limited company.

The new works are well and conveniently arranged, the offices are roomy and comfortable, and the drawing office is large and well lighted. To facilitate the giving-out of material the stores are arranged in three floors; finished work is stored on the top floor, and on the ground and first floors are kept chiefly the stores required for the particular shops on the same level. The ground floor of the works is devoted to the machine shops, the assembling of mining switchgear units, and the switchboard shop; on the first floor are the oil-switch fitting shop, the inspection and test-rooms, the coil-winding shop, and the vacuum drying oven; and on the second floor the pattern, woodworking, enamelling, instrument fitting and circuit-breaker fitting shops.

Included among the work which we saw in process of construction during a recent visit were some 4,000-ampere A.C. oil-switches for low voltage furnace work. The solid construction and easy and sharp working of these was particularly worthy of note, and also the interchangeability of parts.

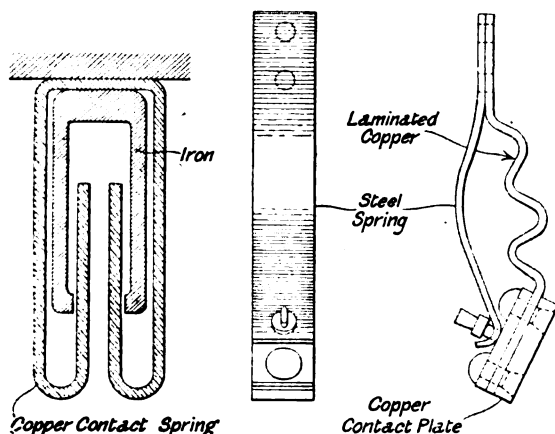


FIG. 1.—CONSTRUCTION OF FUSE CONTACTS.

FIG. 2.—CONSTRUCTION OF OIL SWITCH CONTACTS.

A standard form of fixed contact is employed, made up of a number of contact pieces, as illustrated above (Fig. 2). These are of identical pattern in most of the switches made by the firm, and are consequently absolutely interchangeable and easily replaceable. In the switches in question each row of these contacts for each phase contains three sets of 60. The construction is clearly indicated in the illustration, and the fixing of the steel spring to the waved copper strips and contact pieces is such that it should be practically impossible for anything to work loose. The contact bars are V-shaped and of drawn copper, and are actuated by a double toggle gear, and, of course, the switches are of the "free-handle" type, with no-voltage release, which can also be operated by a trip at the side of the switch.

Some reverse-current circuit breakers of very large capacity were also under construction.

An important part of the firm's manufactures is the construction of starters for A.C. motors, more particularly auto-transformer and star-mesh starters, which are made both with and without automatic devices. In all cases, however, the controlling switch is of the barrel type immersed in oil, and the transformers themselves may be either oil immersed or not as desired. In all designs the handle mechanism is so arranged that the starter cannot be put into the running position without first having been put into the starting position.

Among the other details we noticed was the design employed for the fixed contacts of fuses and certain classes of knife switches. The copper springs are bent round a piece of iron, as seen in Fig. 1, which, while allowing sufficient play, prevents the springs from getting a permanent set away from the blades after constant use.

The testing department contains three sets of motor-generators, a battery of secondary cells, and the necessary transformer equipment, enabling tests to be made up to 30,000 volts and 4,000 amperes, and there is also the requisite equipment for instrument calibration. For testing the heavier switches in the actual place in the shop where the gear is made up, two portable trolleys are being made, each containing the necessary transformers and gear, and they will be connected up with plugs as required at various points in the fitting shops, at which the current will be obtained at comparatively low pressure. One of these will be for pressure tests up to 40,000 volts, and the other for current tests up to 3,000 amperes.

There is no doubt that the works are well equipped for turning out apparatus of a very high class with rapidity, precision and economy.

## MUNICIPAL WIRING AT SHEFFIELD

THE House of Commons have published their reasons for disagreeing with the Lords' Amendments to the Sheffield Corporation Bill. When the Bill was originally before the House of Commons Committee in June the Corporation were granted full wiring powers, but the House of Lords Committee amended the Bill so as only to permit wiring and fitting work through a contractor. The House of Commons disagreed with this amendment, and their reasons are now published as an official paper:

In 1898 the Sheffield Corporation received Parliamentary sanction for purchasing this electricity undertaking. The price included for the wiring and fittings business was £13,344, and further capital to the extent of upwards of £7,000, borrowed with the sanction of the Local Government Board, has since been invested in it. In developing the business, the Corporation believed themselves to have the necessary powers until the beginning of this year, when the Courts decided otherwise, notwithstanding proceedings pending since 1906. There is only one electrical contractor in Sheffield who commenced business before the wiring department was established, and only fifteen who commenced business prior to the acquisition of the business by the Corporation. The business has never been a charge upon the rates, but has contributed towards the other portion of the electricity undertaking. The Committee of the House of Commons, after hearing opponents, gave most anxious attention to the principle embodied in the "model" clause, of avoiding municipal trading, but thought that this was an exceptional case which might be allowed.

At present the Bill is before the House of Lords, for their approval or otherwise of the House of Commons amendments.

**Lectures on Illuminating Engineering.**—A course of lectures on illuminating engineering is being held at the Regent Street Polytechnic on Fridays at 7.30 p.m. The remaining five of the course, commencing January 24th, will be by Mr. J. S. Dow, and will deal with photometry, colour, shades and reflectors and indoor and outdoor illumination generally. The fee for each lecture is two shillings.

**The Electrical Trades Benevolent Institution.**—A very successful whist drive was held by this institution on January 17th at Slater's Restaurant, 50 Cannon Street, E.C. This was organised by the staffs of the General Electric Co., the Sterling Telephone & Electric Co., and the Union Electric Co. 128 players were present, and Mr. Crow (Sterling Telephone Co.) acted as M.C. The prize fund was subscribed to by the General Electric Co., Mr. G. Burney, Mr. Justus Eck, and Mr. F. B. O. Hawes, and the prizes were given by Mrs. Ritchie. After the interval a short address was given by the secretary outlining the aims, objects and methods of working of the Institution.

**Electric Power in Norway.**—According to the *Electrotechnische Zeitschrift* there were in Norway, at the end of the official year, 1911-12, 1,230 electric generating stations, aggregating 417,607 kw. Of this amount 211,131 kw. is employed for electrochemical and electrometallurgical purposes, 126,568 kw. for mechanical, including electric traction, and the remainder for lighting and miscellaneous purposes. The lamps installed totalled to over 986,000 kw.

**BINDING "ELECTRICAL ENGINEERING."**—Vol. VIII. of "Electrical Engineering" (Jan.—Dec. 1912) closed with our issue of December 26th, 1912. Readers can have their volumes bound by their own bookbinder; or, they may send their numbers to THE KILOWATT PUBLISHING CO., LTD., Temple Chambers, London, E.C., carriage paid (with the reader's name and address), and a remittance of 4s. 6d. under separate cover. The volumes will then be bound and returned carriage paid to any address in the United Kingdom, or carriage forward to the Colonies or abroad. Binding Cases (including index, but not including binding) 2s. each, or post free 2s. 4d. (Abroad 2s. 6d.) Index alone, 1d. (Post free 2d.).

## THE PRESCOT AUTOMATIC STARTER

A NEW form of motor-starter, which cuts out the resistance automatically after the main switch is closed, independently of all external influences, has just been put on the market by British Insulated & Helsby Cables, Ltd. These are made in sizes suitable for controlling direct-current motors up to 50-amperes capacity and for pressures up to 500 volts. The arrangement essentially forms a complete motor-starter, and includes a D.P. main switch, overload and no-voltage cut-out, the latter being arranged to operate should any interruption take place either in the supply current or the motor field circuit. The apparatus, with the

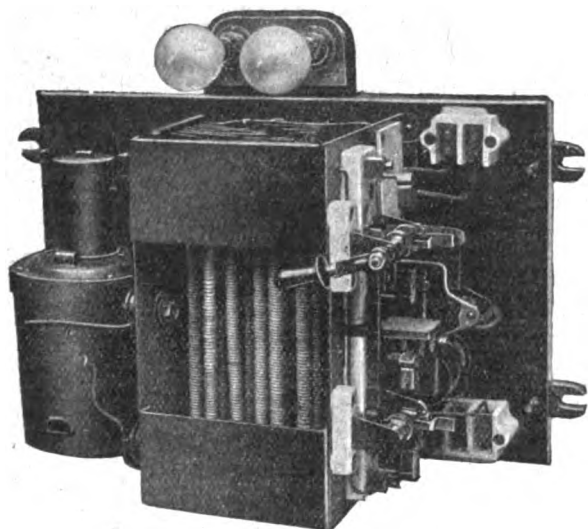


FIG. 1.—PRESCOT AUTOMATIC STARTER WITH COVER REMOVED.

cover removed, is shown in Fig. 1, while the diagram of connections in Fig. 2 will enable its action to be followed more readily.

The automatic system comprises a high-resistance solenoid connected across the motor armature and operating a soft iron plunger, which under normal conditions floats upon a column of mercury. On closing the main switch the armature commences to rotate, creating a back e.m.f. which correspondingly energises the controlling solenoid, thus depressing the plunger and displacing the mercury which flows into the contact chamber and consecutively short-circuits the resistance units. The displacement of the mercury is automatically regulated

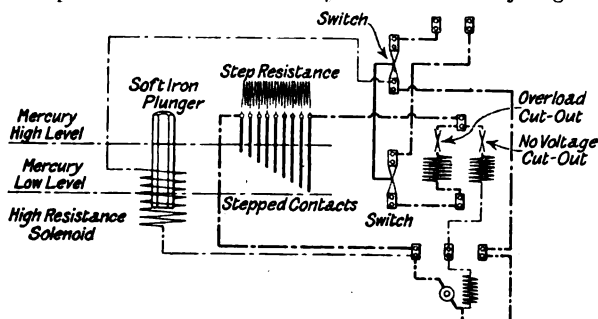


FIG. 2.—DIAGRAM OF CONNECTIONS.

by the back e.m.f. of the motor armature, the greatest displacement taking place when the motor has attained maximum speed and fully established the back e.m.f. On interrupting the main circuit, the solenoid is put out of action, thus causing the mercury to sink to its original level and re-insert the full resistance in the motor circuit. The starter has been so arranged that the resistance contacts do not break circuit, interruption of the current being made by opening the main switch. The starting current is maintained constant throughout the whole time the switch is in operation, and on account of the automatic action it is impossible for a sudden or excessive rush of current to occur.

The apparatus, in addition to securing the benefit of fully automatic action, has automatic releases which are free to open either during the starting period or afterwards. Again, the multiplicity of the resistance steps diminishes liability to sparking, and as the mercury is enclosed, no adjustment is necessary. Further, the current is maintained practically constant during the starting period and all sudden rushes of current are avoided.

## SWITCH AND LAMP CIRCUIT DEMONSTRATION APPARATUS

WE have received from Messrs. A. P. Lundberg and Sons (477 to 487 Liverpool Road, Islington, N.) a description, written by Mr. W. Perren Maycock, of a handily arranged set which has been devised to facilitate demonstration of the possibilities of the various systems of lamp control for the provision of apparatus for which Messrs. Lundberg's name is famous. Unlike the series of demonstration boards which the firm produced a little while back, the connection between the various lamp holders, switches, &c., are not permanent but are made by lengths of double- or triple-core flexibles provided with multiple pin connectors, so that each group of lamps or switches is on a separate board. Thus with one set of apparatus any desired combination may be made. The switches include the two-way, intermediate, "twinob" patterns, &c., and from a total of seven lamp-boards, eighteen switch items, and twelve flexibles, no less than twenty-four different kinds of circuits can be made up. Interesting examples are what are known as "master-switch controls," where a master switch can have one or sometimes two of the following functions:—To prevent lights being turned out at the other switches; to prevent lights being turned on at the other switches; to vary the number of lights in use. This demonstration apparatus is intended not only for lecturers on electric lighting and wiring, but also for the contractor's showroom, where it should greatly assist in spreading the use of many arrangements of wiring, the convenience of which would be much appreciated by consumers. Messrs. Lundberg are prepared to make up sets covering any group of circuits selected from their book on electric lighting connections.

## TABLE COOKING BY ELECTRICITY

THIS is the title of an attractive little booklet, the issue of which is a part of the vigorous campaign towards the popularisation of electrical methods being prosecuted by the General Electric Co., Ltd. (67 Queen Victoria Street). The booklet was, as we noted briefly at the time, issued just before Christmas, and shows well the rapid manner in which the company are developing this side of their business, and studying the requirements of the trade and the public by preparing combinations of apparatus at prices suitable to the pocket of every class of consumer. Notwithstanding the fact that most of the apparatus is of recent introduction, there is nothing experimental in any of the appliances, and their proved reliability goes hand in hand with an absence of crudeness in external design, forming further evidence of the result of steady development.

The collection dealt with in this particular booklet is devoted entirely to apparatus for use on the table, a large proportion of which has already been illustrated in our columns. First and foremost are two patterns of electric toaster, while following this is the "Just-for-two" cooker, which can boil, broil, fry, or toast, and the rather larger breakfast cooker, already illustrated and described in *ELECTRICAL ENGINEERING*, Nov. 28th, page 666, and October 10th, page 560, respectively. Another cheap and useful appliance is the "toaster hot-plate" shown on page 621 of our issue of Nov. 7th. A rather more powerful 6-in., 600-watt hot-plate, for boiling only, is also listed under the name of the "Magnet" hot-plate. A more ambitious combination set, embodying a coffee percolator, a chafing dish, and other utensils, which can be heated by the same element, is that described in *ELECTRICAL ENGINEERING*, Sept. 15th (page 500), and a breakfast set of rather different design, including a special egg boiler and a neat, small, square kettle, is that which we illustrated on Oct. 24th (page 584). The series is continued by the excellent "tea-ball" teapot and the coffee percolator, dealt with in an illustrated article on Aug. 29th (page 482), and the design of kettle with interchangeable heater depicted on page 517 of our issue of Sept. 19th. An ingenious and economical combination, in which an electric iron turned upside down is made to heat a kettle, saucepan, or frying pan, is also included. Two sizes of the "Magnet" iron (see *ELECTRICAL ENGINEERING*, Sept. 19th, page 518) are dealt with separately, and a handy miniature immersion heater is another item. Various accessories complete the list, which will be welcomed by contractors, consumers, and supply authorities.

**Lectures on Municipal Engineering.**—Professor S. M. Dixon, Professor of Civil Engineering in the University of Birmingham, has accepted an invitation to give a special course of lectures in municipal engineering at University College during the current term. The course will begin on Tuesday, January 21st, at 4 p.m.

**The "Northampton" Past Day-Students' Association.**—A very enjoyable smoking concert, under the chairmanship of Mr. S. M. Hills, was held on Friday last at the Cannon Street Hotel. There was a good attendance, and the various items, largely contributed by Old Students, and the annual topical song, composed and sung by Mr. E. L. M. Emtage, were much appreciated.

## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelopes.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,323.

Describe the best starting arrangement for the Latour-Winter-Eichberg single-phase commutator motor, using an autotransformer, so as to obtain the best distribution of current in the rotor and stator to give the maximum starting torque with the minimum K.V.A. taken from the mains. How does the design of the motor affect the adjustments of the apparatus?

(Replies must be received not later than first post, Jan. 30th.)

### ANSWERS TO No. 1,321.

A private self-contained installation is required for supplying about fifty 16-c.p. lamps in a private house, in which possibly two or three radiators and other miscellaneous domestic appliances may be required later. The plant is to be placed in a shed or outhouse to be built near the house. The generating plant is to run only a few hours each evening, and cells are to take the intermittent demand. State, with reasons, what plant you consider the most suitable, whether petrol, oil, gas, or steam driven, the most suitable voltage to adopt, and give comparative estimates of cost. Details of wiring not required. Replies not to exceed 1,000 words in length.

The first award (10s.) is given to "X" for the following reply:—

The question is somewhat vague, as it does not state whether the lamps are to be of the metallic filament type, or the number

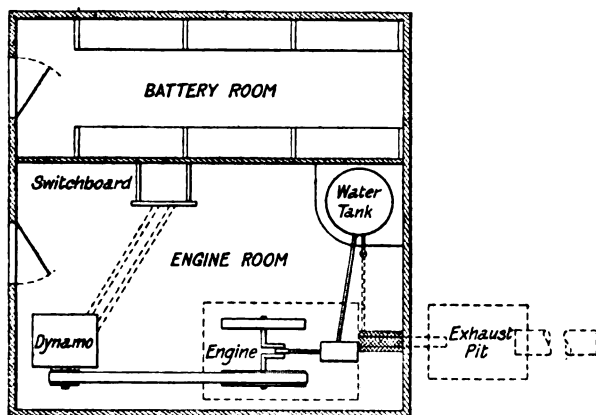


FIG. 1.

of heating and domestic appliances to be installed. It will be assumed for the purpose of this question that metallic filament lamps are to be used with, say, two radiators of 1 kw. each, and provision made for 2 kw. for other domestic purposes, making a total of 5 kw. in all. As a battery is to be installed, it will be sufficient to allow for a capacity capable of dealing with half the load for, say, 6 to 9 hours, seeing that it is proposed to run the engine each evening, and with suitable switching

arrangements the dynamo can be run in parallel with the battery on special occasions of heavy demand. Owing to the use of radiators and domestic appliances, the most suitable voltage for an installation of this size will be 100 volts d.c. The battery required will therefore consist of 53 7-plate cells having 180 amp. hour capacity, the charging current for which will be 18 amps. (see D.P. Battery List). The dynamo will be shunt wound, designed to give 140 volts  $\times$  18 amps. mounted on slide rails and running at a speed of about 1,100 r.p.m. (if belt-driven). A suitable shunt resistance which will be required for regulating the voltage. The horse-power of engine required to drive the dynamo will be approximately 4.5 b.h.p., taking into account all losses. The nearest standard size will doubtless be 5 b.h.p. If space is an object a direct-coupled set can be obtained at a slightly increased cost, the dynamo in which case would be of the slow-speed type.

The question desires four types of engine to be discussed. Steam, for this size of installation, can be put out of court at once, owing to the initial outlay, space required, and upkeep cost. If the residence is close to a gas main, and the charge for gas does not exceed 2s. 6d. per 1,000 cubic feet, it might be advisable to consider this type of prime mover in preference to oil or petrol. However, if it is a country residence, the choice most probably lies between oil and petrol. Good engines can now be obtained which start with petrol and afterwards run with paraffin. With regard to the oil engine, working on Russoline oil, the consumption of oil works out from  $\frac{1}{4}$  to 1 pint per b.h.p. hour, and it would appear that this type of engine would be the most suitable type to adopt, as the engine is easily managed and requires less attention than other types. The makers generally send out a sketch giving the lay-out of foundations, piping, &c. It is, however, well to keep in mind that the water-cooling tank should have a capacity equal to 62 gallons of cooling water per b.h.p. In the pipe arrangement, means must be arranged for emptying the cylinder jacket of water in frosty weather.

The battery room should preferably be separate from the engine room, having its own entrance door. Care should be taken to ventilate it; especially is this necessary when the cells commence to gas freely towards end of charge. The cells should be mounted on wood or brick piers. If wood, these should be painted with anti-sulphuric enamel. For compactness the cells may be mounted in two tiers, in which case ample headroom should be provided for taking out plate sections for inspection, &c. In this instance 8 ft. to 8 ft. 6 in. should be the height of room. The switchboard should be arranged with suitable switches and instruments, to provide for charging and discharging simultaneously. A cut in and out automatic switch should be provided, together with a six-way charge and discharge regulating switch, to which are connected the end regulating cells. With a 53-cell battery, the regulating cells should be Nos. 53, 52, 50, 46, 43, and 39. This arrangement will be found to give ample range of voltage regulation during charge.

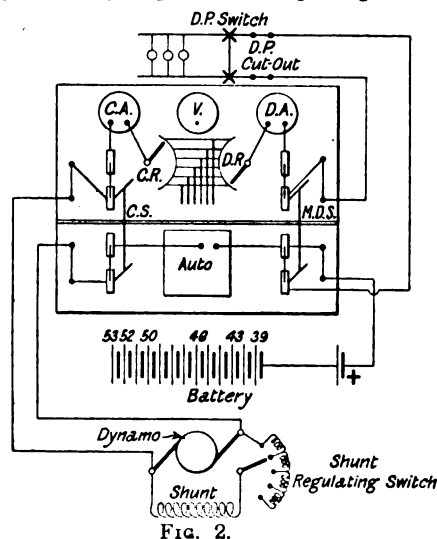


FIG. 2.

The sketches reproduced show the switchboard connections and also general arrangement of engine house. The mains from dynamo to switchboard should be run in iron pipes, and be rubber-covered and vulcanised, 7/16 size. The discharge mains from board to house should carry two-thirds the total load. These will be found to be 19/18 size, and should be lead-covered and armoured for laying direct in the ground. In general the engine house should be at least 60 yards from the house, so as



to avoid any possibility of smell or vibration, and with an oil engine it is advisable to take the exhaust pipe into a brick pit outside engine room from which is led a 9-in. earthenware pipe to 60 yards further away. With regard to the comparative costs, a plant of this size would cost £180 approximately for an oil engine, or £160 approximately for a gas engine.

The second award (5s.) is made to V. F. Bush, who writes as follows:—

The most suitable plant to adopt could only be definitely answered by a knowledge of the district in which it is proposed to install it, and of the price of oil or coal delivered to the house, or whether low generating costs could be sacrificed for a plant which is simple in construction and easy to start up at once, or run without any or very little skilled attention. It is assumed that the load will be a lighting one for the first year, and to keep down the initial cost of plant I would recommend a voltage of 25 be adopted for the lighting, and a separate circuit of 100 volts for power. The cells for the lighting to be of such a size that when more are added in series for the power circuit, the initial ones will be of sufficient capacity to supply the radiators, &c., or, if first cost is no object, make the power and lighting 100 volts. If a lower voltage than 100 were adopted for heating, the current which the wiring would be called upon to carry would be excessive, and also the various appliances might be difficult to obtain. The table shown below gives the capital and running costs for steam, producer gas, and oil plant, including accumulators and switchboard, it being left for reasons stated above for the querist to decide which will suit his purpose best. A 5-kw. set has been chosen, as this will cover any reasonable extensions. The tables of costs are worked out on an approximation of 3 b.h.p. running for 1,000 hours the first year; this will allow for incidental accumulator charging. Using the plant for power as well as light has brought up the capital cost considerably. A paraffin set to light sixty 16-c.p. 25-volt metallic lamps could be bought for £120, including switchboard, accumulators, &c., and the cost to run per hour would be approximately 1½d. Petrol sets have purposely been omitted, as the price of petrol has increased enormously of late years, the demand for it increasing daily may at any moment bring the price per gallon to a prohibitive figure.

**5-KW. OIL ENGINE PLANT (including Accumulators, Switchboard, &c.)—Capital Cost, £200.**

*Cost of Electric Light for one year (3 b.h.p. running 1,000 hours).*

	£	s.	d.
Paraffin oil, 375 gals. at 7d. ....	10	18	9
Lubricating oil, sundries ....	1	5	0
Renewal of lamps ....	1	0	0
Interest on £200 capital at five per cent. ....	10	0	0
Depreciation at 10 per cent. ....	20	0	0
	<b>£43</b>	<b>3</b>	<b>9</b>

**5-KW. GAS ENGINE AND PRODUCER PLANT (including Accumulators, Switchboard, &c.)—Capital Cost, £300.**

*Cost of Electric Light for one year (3 b.h.p. running 1,000 hours).*

	£	s.	d.
Coal at 21 lbs. per b.h.p. at 20s. ....	2	15	0
Lubricating oil, sundries ....	1	15	0
Renewal of lamps ....	1	0	0
Interest on £300 capital at 5 per cent. ....	15	0	0
Depreciation at 10 per cent. ....	30	0	0
	<b>£50</b>	<b>0</b>	<b>0</b>

**5-KW. STEAM ENGINE PLANT (including Accumulators, Switchboard, &c.)—Capital Cost, £205.**

*Cost of Electric Light for one year (3 b.h.p. running 1,000 hours).*

	£	s.	d.
Coal at 7 lbs. per h.p. at 20s. ....	9	0	0
Lubricating oil, sundries ....	1	15	0
Renewal of lamps ....	1	0	0
Interest on £205 capital at 5 per cent. ....	10	5	0
Depreciation at 10 per cent. ....	20	5	0
	<b>£42</b>	<b>5</b>	<b>0</b>

Another reply that may be mentioned is that of "M. M." who assumes a 6-kw. plant and puts the capital costs of the generating plant at £200 for town gas, oil, or petrol, £260 for steam, and £280 for suction gas, and of the battery (50 volts) at £100. He naively remarks, "Undoubtedly the best way is to have a proper specification drawn up and get tenders from reputable firms."

**ANSWERS TO No. 1,320.**

In awarding the first prize to "Phiy" last week, the examiner who dealt with the question approved of the clear manner in which the answer was given, but unfortunately overlooked some errors of decimal places in the course of the

calculations; the final figure given in the answer was correct. We consider that, in the circumstances, the first award should have been made to "J. E. R. R.," who was classed as second, and we have sent him a further remittance of 5s.

**CATALOGUES, PAMPHLETS, &c., RECEIVED**

**ELECTRIC HEATERS.**—We have received from the London Electrical Trading Co., Ltd., a copy of an effective show card which they have prepared to advertise their well-known "Pygmy" heaters, of which, we understand, nearly 10,000 have been sold since they were first placed upon the market last autumn. Copies of this card can be obtained either from them or through any of the agents dealing with Bastian electric heating apparatus.

**ELECTRIC HEATING.**—We have received a copy of an attractive little booklet on heating by electricity, which has been prepared with a view to spreading knowledge of its merits among consumers in Southampton. We must congratulate Mr. H. F. Street (Borough Electrical Engineer) on the way the subject has been presented, and we must also congratulate his consumers on being able to obtain the advantages of electric heating at ½d. per unit. The booklet is the result of co-operation between the Electricity Department, manufacturers, and local contractors.

*Readers desiring copies of catalogues or pamphlets should apply to the firms in question, referring to the notice in "Electrical Engineering."*

**JOINT-BOX COMPOUND.**—Two pamphlets from the Dussek Bitumen Co. (Canal Bank, Deptford, S.E.) deal with the company's "Trinidite" joint-box compound. One contains some results of tests and other information on the material, while in the second its extensive use is reflected by testimonials and lists of users. The company will be glad to forward copies to those of our readers who are interested in mains work.

**METAL FILAMENT LAMPS.**—The latest list of "Leuconium" metal filament lamps made (in England) by the Stearn Electric Lamp Co. deals with lamps ranging from 15 to 600 watts, for circuits of 200 volts and upwards, and from 8 to 300 watts for 100-120 volts. Lamps for lower voltages are also listed, including those for motor-car lighting and medical purposes, as well as lamps in flame and other special bulbs. These lamps are made under license under Patent No. 23,899/04.

**CALENDARS.**—We have received from the Bat Meter Co., Ltd. (3 Eden Street, Hampstead Road, N.W.), a copy of their office wall calendar for 1913, which bears a full-sized illustration of one of their meters.

The calendar which is being sent out to their friends by Callenders Cable and Construction Co., Ltd. (Hamilton House, Victoria Embankment, E.C.), bears a large and excellent photograph of the historic Kashmir Gate, Delhi, with the familiar sight of some of Callenders cable drums in the foreground.

**Scottish Local Section of the Institution of Electrical Engineers.**—At a meeting of this Section on January 14th, at Glasgow University, Messrs. J. S. Nicholson and B. Parker Haigh read their Paper entitled "A Single-phase Motor with Pole-changing Windings." (An abstract of this Paper, with a report of the discussion thereon in London, appeared in *ELECTRICAL ENGINEERING*, Vol. VIII., page 705, Dec. 19th, 1912.) The Chairman and Mr. J. Hally Craig thanked the authors for their valuable contribution, and as no member present offered to contribute to a discussion the meeting adjourned to the James Watt Laboratory, where Mr. Haigh explained the several winding arrangements of the motor, and demonstrated its running with eight poles as a plain repulsion motor, and with four poles as a compensated-repulsion motor with eight working brushes connected together in four pairs. The motor was run at variable speed and load, and, although started at 50 per cent. overload, it ran sparklessly under these conditions.

**Boycott of German Electrical Manufactures in Prague.**—Towards the end of December last the municipal electric supply undertakings of Prague issued circulars to the effect that they would in future only connect to their mains such installations the plant of which was of home manufacture (Czechish), which announcement practically corresponds to a boycott of German plant. In spite of vigorous protests, the authorities intend, according to the *Neue Freie Presse*, to pursue this policy, and there is a probability of its being extended to the districts outside Prague itself. According to the *Prager Tageblatt*, the reason for this policy is the poor quality of the imported electrical plant, and the competition of the latter with home manufactures. The imported plant in 1908 was 50 per cent. of the total, rising in 1912 to 80 per cent. This move of the authorities is condemned by the Prague Chamber of Commerce, and, as the *Elektrotechnische Zeitschrift* points out, is likely to do more harm than good to the Czechish local industries.



# ADAMS IGRANIC

Specialists in Electric Motor Starting and Control Gear.

Adams M<sup>rs</sup> C<sup>o</sup> L<sup>td</sup> Balfour House, Finsbury Pavement, London, E.C. Works-Bedford.

## ELECTRIC TRACTION NOTES

The Dundee Tramways Committee have decided to postpone for three months an extension of the trolley omnibus system over a distance of 1 mile 560 yards. The Tramway Manager, in reporting an estimated capital expenditure of £2,400 upon this route, expressed the opinion that it was doubtful whether it would pay, but that bearing in mind the extremely low working expenses of trolley omnibuses, the loss would not be very great, and was justifiable in view of the advantage to the public.

The Liverpool Tramways Committee, having considered the estimates for 1913, have felt justified in recommending that a sum of £97,000 be ear-marked for the relief of rates from the tramway profits for the current year.

The Bradford Corporation are to give a trial to the Mercedes-Stoll trolley omnibus system.

A commencement has been made with the installation of the Mercedes-Stoll system of trolley omnibuses in Aberdare, which is to be run in connection with the tramway undertaking.

The question of running a Sunday service of tramcars in Bournemouth, which has been one of acute controversy there for many years, has again been put to the vote of the rate-payers. Hitherto there has been a solid majority against Sunday cars. On this occasion, however, there is a majority of 448 in favour.

The London County Council, at its meeting on Tuesday, discussed a report by the General Purposes Committee which pointed out that the Government is apparently indisposed to appoint an independent Traffic Board for London. The discussion which took place was more or less on party lines, it being desired on the one hand that the London County Council itself should be the Traffic Board, whereas the Committee realise that an authority like the L.C.C., owning a large tramway system, is hardly the one to administer the needs of all classes of traffic in London. No resolution was passed however.

## TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

We have received a copy of the first issue of a new French monthly journal devoted entirely to wireless telegraphy and wireless telephony, and entitled "T.S.F." This is, we believe, the first publication of its kind excepting the periodicals issued by the leading wireless telegraph firms. Articles appear on various aspects of wireless telegraphy, on mercury coherers, and a general series of chapters on the applications of electric waves commences. The methods employed in Paris for wireless time signals are also described. From a list given it appears that French coast stations open to public service now exist at Ajaccio, Boulogne, Bouscat, Brest-Kerlaer, Cherbourg, Cros de Cagnes (Nice), Dieppe, Dunkerque, Fort de l'Eau (Algiers), Lorient, Quessant, Rochefort, and Saintes-Maries de la Mer.

The Postmaster-General, in reply to a deputation from the Northern Scottish towns (ELECTRICAL ENGINEERING, Jan. 16th, 1913, p. 41), said that the use of "phantom" circuits was being experimented with. We have reason to believe, however, that the Engineering Department of the Post Office is not particularly sanguine as to the likelihood of any large extension of this system on the long-distance telephone land lines. The congestion complained of only arises during bad weather, when some of the telegraph and telephone circuits are interrupted, and in such conditions it would not be practicable to work phantom. Any additional earth occurring would interrupt not only the circuit on which the fault occurred, but also the second circuit and the phantom circuit, so that three circuits might be interrupted instead of one. Phantom working is in extensive use for obtaining trunk connections, so that the line may be used at maximum load

factor for speaking, but it is not adopted, we believe, for subscribers, as it is always more or less noisy. On the other hand, in the case of underground lines in which each pair of wires in the cable has practically the same four line factors, resistance, inductance, capacity and insulation, phantom circuits are certainly applicable, and our readers will remember the excellent results obtained on the new Anglo-French telephone cable recently. According to a cable from the New York correspondent of the *Daily Telegraph*, a telephone line is to be put up from New York to San Francisco, a distance of 3,860 miles. Loading coils will, of course, be employed, as this will be the only method to overcome the distance, but it appears from the message that the use of a phantom circuit is also contemplated. This is referred to as a new discovery, but the possibilities of the phantom circuit were known and employed by the National Telephone Company on some of their junction and trunk lines sixteen years ago at least; in fact, the method was described in the *Electrician* of September 17th, 1897, in the course of a series of articles on telephony, by Mr. F. C. Raphael (who is now Editor of *ELECTRICAL ENGINEERING*). It may be, of course, that some new method of overcoming the difficulties in employing a phantom circuit on long land lines has been discovered by telephone engineers in the United States, and we look forward to further information with interest.

A little surprise was in store for the House of Commons Committee which is inquiring into the proposed Imperial wireless telegraph scheme, when it met on Monday, for the Postmaster-General handed the Chairman a letter which he had received from Marconi's Wireless Telegraph Co. in which they asked the Government to allow them to regard the proposed contract as no longer binding upon them. The reason adduced was that, owing to the delay entailed by the protracted inquiry, the Company's position is being prejudiced in other parts of the world, inasmuch as a large engineering staff is being detained in London while remunerative work is waiting to be done. The Company complain that a Committee should have been appointed to inquire into the contract after eight months' negotiations with the Government, and suggest that they had the right to expect that, after such lengthy negotiations, the agreement should have been ratified by Parliament. The letter was read by the Chairman of the Committee, but no comment was made upon its contents. Sir G. Croydon Marks, M.P., gave further evidence, and suggested that the Government should employ a firm of consulting engineers to prepare a specification for the scheme and to throw it open to the world for tender, the price to be a lump sum including the right to the use of patents. The suggestion previously made that the Government had made inquiries as to the purchase of the Poulsen patents was reiterated by Mr. V. Gandil, the representative in this country of the Poulsen interests, but Mr. E. W. Farnall, Assistant Secretary of the Post Office, explained to the Committee that inquiries were at the time made of the owners of the Poulsen patents on the question of purchase only with a view to seeing whether it would be possible for the Marconi Company to buy the Poulsen patents and so strengthen their hands against the Government. In connection with the interim report of the Committee, it is announced that the Government has expressed its pleasure in being able to give immediate effect to the recommendations contained in it.

An action is proceeding before Mr. Justice Scrutton, sitting as the commercial judge in the King's Bench Division of the High Court, between Marconi's Wireless Telegraph Co. and Messrs. Goukassoff & Co., in connection with the efforts of the Marconi Co. to acquire a controlling interest in the Russian Telegraph & Telephone Company. The case turns upon the construction of certain documents which had for their object the buying out of Messrs. Goukassoff & Co., who were large shareholders in the Russian Telegraph & Telephone Company.

On the 5th inst. the Fao cable route was down beyond Konia, and was restored the next day.—The Cayenne-Salinas cable was repaired on 17th inst. and the Paramaribo-Cayenne section on the 20th inst.—The new German cable from Monrovia to Lorne and Duala was opened for traffic on the 20th inst.

## "ELECTRICAL ENGINEERING" PATENT RECORD

*(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)*

### Specifications Published Jan. 16, 1913

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

20,917/11. **Improving Quality of Steels.** W. S. SIMPSON. Steel or iron surfaces are impregnated with metallic or carbon compounds for hardening, toughening, &c., by fusion in a vacuum. The alloying elements are added and carbonised by the introduction of iron carbides *in situ*. The furnace comprises a flat metallic base with rails on which runs a truck containing the iron to be treated. This truck may be racked laterally within a dome, which covers it and makes the chamber airtight, so that a vacuum can be maintained. The dome is cooled by water. Adjustable electrodes are suspended from the dome. They may be worked singly, in pairs, or all together. Four figures.

29,138/11. **D.C. Motor Controller.** P. S. TURNER. To obtain fine speed adjustment and creeping speeds on low loads, resistance is put in series with the armature, which is also shunted by an adjustable resistance. The controller is in two parts, one for the series and the other for the shunt resistance. These are interlocked, so that the shunt circuit cannot be completed or broken unless the series controller is in one of certain positions. Similarly the series controller can only be moved within limits depending on the amount of shunt resistance in circuit. Four figures.

29,224/11. **Magnetic Separators.** KRUPP A.-G. In separators where a number of fixed magnetic poles are arranged in a circle round a vertical axis, a non-magnetisable rotating cylinder is used, so that it shields the magnet poles and the air gaps from the material under treatment. All the magnet poles, and the armatures, if used, assist in holding the material to the cylinder. Two figures.

627/12. **Supplementary Protection to Tirrill Regulator.** B.T.-H. and A. P. YOUNG. In order to keep the generator pressure at a safe value in the event of abnormal pressure rise or fall on the system, an electromagnet is connected across the supply mains. This magnet controls an armature carrying a contact connected to an exciter bus-bar, against controlling springs, so that normally it is free of an upper and lower fixed contact connected to one end of the winding of the magnet and to the second exciter bus-bar respectively. The armature of the magnet is carried by a pivoted lever retaining catch for a spring-controlled switch, which is released by excessive pressure variations. It prevents further action of the automatic regulator by breaking the relay circuits, and makes connection with intermediate portions of the generator field resistances. Three figures.

5,469/12. **Trolley Collectors.** E. P. B. ESTLER. When two or more trolley lines are used the trolley arms are mounted one above the other on the same vertical axis, so that they each act independently. Three figures.

6,673/12. **Combined Switch and Plug.** W. E. WATSON. The detachable portion of the plug fouls the switch handle when it is in the closed position, so that it must be moved to the open position before the plug can be withdrawn from or inserted in the socket. Two figures.

7,780/12. **Indicating Movement at a Distance.** SOC. COURTAUD. G. GARNIER GIL. The opening and closing movements of valves, &c., are reproduced at a distance on a reduced scale. Motion of the operating handle controls contacts whereby current is fed into the receiver, and reproduces in front of an aperture the amplitude of the movement at the transmitting end. The receiver comprises a shaft controlled for each direction of rotation by a ratchet wheel meshing with a boss or cam keyed upon the shaft. The pawl of this ratchet is influenced by the electromagnet. The shaft carries the revolution indicator and a pinion acting on a rack, which carries the slide, which moves in front of the aperture. Sixteen figures.

18,440/12. **Electromagnetic Brake.** ALBERT TRODE. The brake has a series of poles serving as brake shoes disposed behind one another along the rail. The gaps between the poles and the rail are inclined, so that the magnetic lines are distributed over a cross-section greater in width than the normal, whereby the area of the top of the rail open to saturation is increased. The braking power is consequently greater. Three figures.

### Specifications Published To-day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, E.C., at the price of 8d. each, post free. Names in *italics* indicate communicators of inventions from abroad. Summaries of some of the more important of these patents will appear in our next issue.

**Arc Lamps:** QUINT [Enclosed flame] 3,065/12.  
**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** BUTLER [Manufacture of conduits] 29,390/11.  
**Electrometallurgy:** BALLY [Induction furnaces] 16,040/12.  
**Heating and Cooking:** TOWNSHEND [Elements] 387/12.  
**Incandescent Lamps:** BARTLEY [Storage battery lamp] 71/12.  
**Instruments:** MURRAY [Testing circuit connections] 26,337/12.  
**Switchgear, Fuses, and Fittings:** WHYMAN [Switches] 27,254/11; SEFTON-JONES (*American Automotoneer Co.*) [Controllers] 523/12; BYNG and COLLINGS [Supporting lamps] 7,137/12.  
**Telephony and Telegraphy:** MARCONI and FRANKLIN [Receivers for wireless] 86/12; BROWN [Telephone receiver holder] 416/12; MARCONI's and PRINCE [Aerials] 2,456/12; SIEWERT [Telescopic masts] 26,914/12.  
**Traction:** B.T.-H. (*G.E. Co., U.S.A.*) [Locomotives] 3,231/12; MARINO [Petrol-electric system of power transmission] 13,780/12; MAGNET BREMSSEN Ges. [Electro-magnetic track brakes] 26,295/12.  
**Miscellaneous:** SAHNER [Locking of locks] 26,341/11; HACKETT and WHATTAM [Equipment for roundabouts, scenic railways, &c.] 28,899/11 and 27,046/12; BATES, KELLY and CORBIN [Cinematograph targets] 29,083/11 and 15,031/12; KRUPP A.-G. [Magnetic separators] 29,201/11; ULLRICH [Magnetic separators] 29,230/11; DICKIE [Safety lamps] 29,334/11; SPARKES [Safety lamps] 78/12.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Arc Lamps:** KORTING & MATHIESEN [Differential converging carbon] 26,318/12.  
**Fuses:** CHRISTIANS, 19,533/12.  
**Heating:** SCHAEFFER [Hot air douches] 20,191/12.  
**Telephony:** TELEPHONFABRIK BERLINER [Secret intercommunication] 16,084/12.  
**Traction:** PIEPER [Petrol-electric] 29,636/12.

### Amendment to Specification

9,363/12. **Pressure Regulator for Variable-speed Dynamo.** W. E. LAKE (*U.S. Light & Heating Co.*). As a result of the extended investigation under Sect. 8, this specification has been amended by way of disclaimer.

The following Amended Specification may now be obtained.  
 15,725/11. **Telephone Mouthpiece.** C. F. KILLAR.

### Expiring and Expired Patents

The following Patent expires during the current week, after a life of fourteen years:—

1,862 of January 26th, 1899. **Wireless Telegraphy.** F. BRAUN. To render the radiations used in wireless telegraphy able to negotiate obstacles in their path, it was proposed in this specification to use radiations of considerable wave-length and low frequency. Connections utilising Leyden jars with or without induction coils in circuit with a spark gap and antenna are described.

The following are the more important Patents that have become void through non-payment of renewal fees.

**Dynamos and Motors:** B.T.-H. (*G.E. Co., U.S.A.*) [Rotor (primary) of 3-phase A.C. motor has slip rings and commutator. Three brushes take slip currents to stator] 21,873/06.

**Electrochemistry and Electrometallurgy:** W. SIMM and H. SIMM [Resistance furnace on wheeled truck for producing zinc oxide from ores] 21,787/06; M. RUTHENBERG [Electrodes for resistance furnace] 21,876/06.

**Ignition:** E. DENIEPORT [Magnetos and timing gear] 21,699/07.  
**Incandescent Lamps:** B.T.-H. (*G.E. Co., U.S.A.*) [Supports for and method of connecting metal filaments to] 21,668/06; [Jointing metal filaments to one another] 21,669/06.

**Instruments and Meters:** ELEKTRIZITÄTS A.-G. [Maximum demand indicators] 21,467/07.

**Miscellaneous:** F. W. HOLICK [Capstan with vertical motor: brake, lubricating, and other details] 21,453/02.

## LOCAL NOTES

**Barking: Bulk Supply.**—The Council have approached the West Ham Corporation with a view to obtaining a supply of electricity in bulk, but the West Ham Lighting Committee do not feel in the position to recommend their Council to negotiate with regard to the matter.

**Brighton: Electric Cooking.**—An electric kitchen is being fitted up by Messrs. Stafford in Crown Street capable of cooking for 100 people. The Corporation have supplied the electrical apparatus.

**Chatham: Street Lighting.**—The Kent Electric Power Co. have started upon the work of installing centrally hung lamps in the High Street. The capital cost to the Corporation will be £357 and the annual cost £450. The lamps, which are twenty-three in number, are each fitted with a 600-c.p. Osram lamp, with reflectors 2 ft. 6 in. in diameter. Time switches have been fitted.

**Cromer: The Electricity Undertaking.**—Contrary to the position at Hove, where the ratepayers object to the purchase of the local electric supply company, the Council are in conflict with its ratepayers as to the transfer of its undertaking to Messrs. Edmundsons' Corporation. Several ratepayers' meetings have voted against the proposal, and the Council have now decided to take a poll of the ratepayers on the matter.

**Edinburgh: Municipal Wiring.**—A deputation of electrical contractors waited upon the Corporation last week, objecting to Clause 164 of the Provisional Order which has been deposited for next session of Parliament, which gives the Corporation full wiring powers. It was urged that no complaint had been made against the electrical contractors in the city, and Bailie Stevenson said he understood that the Corporation's clause would prohibit them from doing the work direct.

**Gillingham: The New Diesel Engine.**—A new Diesel engine and generator having been ordered by the Council, subject to the consent to the necessary loan being given by the Local Government Board, the makers have not felt justified in putting the work in hand until the consent is actually received. As the plant is urgently needed, however, and in order to avoid the delay of waiting until the Local Government Board give their sanction, the Council have agreed with the makers to buy the set in any case, and if the Board's sanction is withheld, to pay for it by twelve equal quarterly instalments with interest at 5 per cent. per annum on the balance remaining unpaid.

**Grimsbay: Street Electric Lighting.**—By the end of January 1,192 gas lamps will have been replaced by electric lamps for street lighting. The Electricity Department have also converted 712 single electric lamps into two-light standards.

**Hove: Purchase of Supply Co.**—Although the Hove Council have decided by a majority to proceed with the Bill for the purchase of the Hove and District Electric Lighting Co., a statutory meeting of ratepayers confirming the promotion of the Bill has resulted in an adverse vote. Already a meeting of ratepayers has given a similar verdict, and it remains to be seen whether these two decisions of the ratepayers against the Council's proposal will in any way modify the position.

**London: Shoreditch: Street Lighting.**—We reported in our columns some time ago that all the incandescent street gas-lighting was to be superseded by incandescent electric lighting, and of the 1,500 gas lamps in side streets 400 have been changed over to metal filament lamps, and the balance will be changed over during the present year. In addition to these, there are 322 12½-ampere open-type arc lamps in the main thoroughfares, and with a view to economy and at the same time greater efficiency, the Council have decided to change over ninety-six of these lamps to 8-ampere flame arcs. Of these forty-eight will be of the General Electric Co.'s "Angold" type, and forty-eight of Messrs. Johnson and Phillips "Mero-flam" type. This is in the nature of an experiment, and upon the results of it will depend the future of the remaining open-type arc lamps. The financial saving on the new arc-lamp scheme is estimated at £476 per annum, and the candle power will be 2,500 against 1,500 for the old lamps.

**North Metropolitan Electric Power Co.: Ljungstrom Turbines.**—The North Metropolitan Electric Power Supply Co. have on order one 5,000-kw. and one 1,000-kw. Ljungstrom steam turbine, the rights in this country for which, as recently announced in our columns, have been acquired by the Brush Electrical Engineering Company.

**Scarborough: Purchase of Supply Co.**—A Special Committee has been appointed to consider whether the Corporation

should exercise their right to purchase the Scarborough Electric Supply Co.

**Suffolk: The Electric Supply Co.**—The shareholders of the Suffolk Electricity Supply Co. have sanctioned the proposal for the sale of the Company in accordance with the offer recently made by Dr. Leibbrand.

**Torquay: Smoke Nuisance.**—The Corporation have been summoned by members of the Royal Torbay Yacht Club for allowing the emission of black smoke from the Electricity Works chimney. It appears that similar proceedings were taken some eight years ago, and on a promise to abate the nuisance the case was withdrawn. Mr. C. W. Salt, the Borough Electrical Engineer, in his evidence stated that a twenty-five days' test showed a total duration of the emission of smoke of eleven-and-a-half hours. The real cause of difficulty appears to be the shortness of the chimney which precludes the possibility of a good natural draught. The machinery, it was contended, is up-to-date in every respect. After hearing the evidence, the Bench expressed the opinion that the matter might rest where it is, pending the raising of the height of the chimney. An application on behalf of the Yacht Club for a case to be stated was not allowed by the Bench.

**Wolverhampton: Borough Electrical Engineer's Resignation.**—At the last meeting of the Council, Mr. C. E. C. Shawfield's resignation, referred to in our last two issues, was received with regret. Mr Shawfield, in tendering his resignation, mentioned that he had been associated with the Electricity Supply Department for seventeen years, and that he was able to hand over to his successor an undertaking which has obtained some reputation for soundness as to its equipment and its financial stability.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

## Generating Stations, Sub-Stations, Mains, &amp;c.

**Aberdeen.**—Mr. J. A. Bell, the Borough Electrical Engineer, has presented a report in which he recommends important extensions at the power station. There is at present installed 5,580 kw. of plant, and assuming an increase in the current year of 75 per cent. of the past year's increase, this will only leave spare plant amounting to 205 kw., which is regarded as a dangerously low margin. It is therefore recommended that a 3,000 kw. turbo-alternator with condensing plant should be installed at an estimated cost of £9,750, together with 1,500 kw. of converting plant, £3,600, and switchboard, £750. The scheme is to dismantle the two 200 kw. sets, which are now eleven years old.

**Bolton.**—Turbo-alternators and condensing plant, water-tube boilers, economisers, switchgear and steam feed-pumps. Borough Electrical Engineer. Feb. 13th. (See an advertisement on another page.)

**Claughton-on-Sea.**—A 250-kw. Diesel engine, generator, &c. Borough Electrical Engineer. Jan. 29th.

**Hoylake and W. Kirby.**—High-tension switchgear and a 50-k.v.a. single-phase transformer. Borough Electrical Engineer. Jan. 31st.

**Liverpool.**—The Electrical Sub-committee has before it a lengthy report by the Electrical Engineer on proposed considerable extensions at the Lister Drive power house.

**London: Hackney.**—Estimates for the first part of the system of ring mains, sub-stations and sub-feeders in connection with the new power scheme of the Council have been prepared, and show that an estimated cost of £21,700 is necessary. Six-way fibre ducts laid in concrete have been included in order to make provision for the future, and to avoid the re-opening of trenches once the ducts are laid. These ducts will accommodate cables for 12,000 kw.

## THE RECORD ELECTRICAL Co., Ltd.

LONDON OFFICE:  
CAXTON HOUSE,  
WESTMINSTER, S.W.  
Telephone:  
3057 Victoria.

Telegrams & Cablegrams:  
"Infusion,  
London."

MEASURING  
INSTRUMENTS.

RECORD'S PATENT.

Write for Prices & Particulars.

WORKS:  
BROADHEATH,  
MANCHESTER.

Telephone:  
164 Altrincham.  
Telegrams & Cablegrams:  
"Infusion,  
Altrincham."

**Hammersmith.**—A loan of £3,000 for electrical extensions is to be taken up.

**Stepney.**—The loan of £13,000 which has been sanctioned is to be applied for by the Council, and is in no way concerned with the supply to Bethnal Green, which will, of course, involve a further expenditure.

**Long Eaton.**—A 500-kw. generating set and additional water-tube boiler are to be supplied at an estimated cost of £8,000.

**Shanghai.**—High and low-tension cable delivered c.i.f. Messrs. Preece, Cardew and Snell, 8 Queen Anne's Gate, Westminster. Jan 30th.

**Wallasey.**—The Electricity Committee are recommending to the Council the erection of a new power station involving an expenditure of £65,000. The site recommended is in Poulton where there are a large number of industrial undertakings which, it is anticipated, will become power users. Recently the demand for current for power purposes has been greater than the Committee have been in a position to supply, one application having been for an annual supply of 3,000,000 units.

**Whitehaven.**—A loan of £1,565 is to be applied for, principally in connection with mains extensions. Of this, however, £665 is excess expenditure over previous loans.

#### Wiring

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Aberystwyth.**—New town hall.

**Airdrie.**—New police station.

**Altrincham.**—Cinematograph theatre.

**Bacup.**—Six shops. Architects, Smith and Cross, Town Hall Chambers, Rochdale.

**Bexley.**—New school.

**Hanley.**—New factory. Architect, E. L. Maddock and Sons.

**Huddersfield.**—Municipal art gallery in Greenhead Park.

**London:** St. Mary's Hall, Hottam Road, Putney.—Cinematograph Hall, High Street, Eltham.

**Preston.**—Fire station. Architect, T. B. Maxwell, Ribby Road, Kirkham.

Headquarters for East Lancashire Territorial Force Association.

**Rochdale.**—Considerable extensions at infirmary.

**Warrington.**—Public baths. Borough Electrical Engineer. Feb. 3rd.

**York.**—£50,000 church extension scheme.

#### Miscellaneous

**Leeds.**—Tenders are invited for annual supplies of various stores for the electricity undertaking. (See an advertisement on another page.)

**London.**—A three years' supply of main switches, main fuses, &c., is required by H.M. Office of Works. Hammersmith Borough Council invite tenders for meters and other electrical supplies and general stores. (See advertisements on another page.)

### APPOINTMENTS AND PERSONAL NOTES

Mr. John Coates, M.Inst.C.E., senior partner of the firm of John Coates and Co., Ltd., 25 Victoria Street, S.W., has been appointed to carry out the work of the inspection of material purchased for the Commonwealth railway construction and rolling stock in connection with the Australian Trans-Continental Railway.

Herr W. Braun, of Frankfurt, one of the founders of the well-known firm of Hartmann and Braun, and brother of Dr. Braun of Strassburg, died last month. Herr Braun was Chairman of the Board of Directors of Hartmann and Braun and was long connected with the Elektrizitäts A.G. vormals W. Lahmeyer and Co.

Owing to the appointment of Mr. J. M. Dawson (late Engineer-in-Charge, Hanley Electricity Works) to the position of Engineer-in-Chief to the Bethnal Green Board of Guardians, and to another vacancy due to the completion of the new Stoke-on-Trent power house, Mr. F. Hurst (Charge Engineer, Runcorn) and Mr. F. McK. Kissack (British Westinghouse Co.) have been appointed Charge Engineers under Mr. C. H. Yeaman.

It is recommended that the salary of Mr. J. W. Dugdale, Manager of the Oldham Corporation Tramways, be increased from £350 to £400 per annum.

Switchboard attendant is required at Newport (Mon.). (See advertisement on another page.)

Applications are invited for the post of Engineer and Manager of the Wolverhampton Corporation Electricity undertaking, at a commencing salary of £600 per annum. (See advertisement on another page.)

The Hon. T. H. W. Pelham, C.B., is retiring from the Assistant Secretaryship of the Harbour Department of the Board of Trade, under the age limit. This Department has charge of all work under the Electric Lighting Acts, and in this connection Mr. Pelham has held a large number of local inquiries when these have been necessary owing to there being more than one application for provisional orders. Mr. Garnham Roper, at present principal clerk in the Harbour Department, has been appointed to succeed Mr. Pelham, and the electric lighting work is, as hitherto, under the charge of Mr. H. Booth.

### TENDERS RECEIVED AND ACCEPTED

**Heywood.**—400 new condenser tubes are to be purchased from Messrs. Isaac Storey and Sons.

**Keighley.**—The Electricity Committee's recommendation that the tender of Messrs. Willans and Robinson should be accepted at £5,827 for a 2,000-kw. turbo-alternator with exciter and surface condenser, has been agreed to by the Corporation. The alternator will be of the Dick-Kerr type.

**London: Battersea.**—The contract with Messrs. Callender's Cable and Construction Co. for a supply of cable has been renewed for the ensuing twelve months.

**L.C.C.**—The tender of Messrs. T. Bolton and Son, at £109 4s. per mile for 3½ miles of grooved trolley wire has been accepted.

**Salford.**—The following tenders have been accepted by the Corporation:—Electric lighting and bells at new offices, Willoughby and Wilcox (Salford), £142 10s.; electrical fittings for board room, laundry and clerk's office, G. Matthews (Manchester), £25 7s.

### MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. G. Smith and Son, of 5 Philpot Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night, was £74 10s. to £75. (Last week £78 10s. to £79.)

**The Tungsten Lamp Association.**—We are informed that the Stearn Electric Lamp Co., Ltd., have now joined the Tungsten Lamp Association and now manufacture their "Leuconium" lamps under licence under Patent No. 23,899 04.

**The Sun Electrical Co.'s Souvenir.**—The Sun Electrical Co., Ltd. (118-120 Charing Cross Road, W.C.), ask us to state that, in consequence of the large demand for the souvenir pencils which, as we announced on Jan 2nd (p. 9), they are giving to their friends, the stock is quite exhausted and they regret their inability to comply with all the requests.

**The Phoenix Electric Heating Co.**—We are informed that this Company (11 Mornell Street, Tottenham Court Road, W.C.) has acquired the goodwill, stock and plant of Plumstead and Co., brass finishers and electrical fittings manufacturers, together with the services of Mr. F. Plumstead.

**Ediswan Lamps.**—The Edison and Swan United Electric Light Co., 35 Queen Street, E.C., has received the honour of Appointment to Her Majesty Queen Alexandra for the supply of metal filament and carbon filament lamps.

**Removal of the B.T.-H. Switchgear Department to Willesden.**—The switchgear department of the British Thomson-Houston Co. is to be transferred from Rugby to the Company's works at Willesden, and the lamp manufacture will be concentrated at Rugby. The change will take place within the next two months and will involve the removal of the engineering staff connected with the department and some workmen. The remaining men will be engaged at Willesden.

**Ernest Scott and Mountain, Ltd.**—The works of this firm at Gateshead have been purchased together with most of the plant and the goodwill by C. A. Parsons and Co. (Heaton Works, Newcastle). The works will be chiefly engaged in assisting their general manufactures as well as continuing the business carried on by Ernest Scott and Mountain.

# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

NO. 318 [VOL. IX., No. 5]  
*All rights reserved.*

THURSDAY, JANUARY 30, 1913.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.  
SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.  
Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES AND TECHNICAL COLLEGE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

*Other Advertisement Rates on Application.*

*Latest Time for Receiving*

Letters for Insertion, Tuesday First post

Small Advertisements and Official Announcements, Wednesday First post.

Displayed Advertisements, Tuesday First post.

Corrections in Standing Advertisements, Monday First post.

All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 308-306, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Circling, Fleet, London."

Telephone No.: 5509 Holborn

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## CONTENTS

	PAGE
SUMMARY	57
Arrangements for the Week	58
The I.M.E.A. Presidency	58
The Large Central Station Battery at Manchester	59
The British Electrical and Allied Manufacturers' Association	60
The Myriawatt	61
Extensions at the Blackburn Electricity Works	61
Condensing Plant	62
The "Tricity" Ship Heater	62
The "Point Fives"	62
Questions and Answers by Practical Men	63
The Indra System of Lighting	64
Porcelain Handle Fuses	64
A New Folding Scaffold	64
Electric Traction Notes	65
Telephony and Telegraphy (Including Wireless)	65
PATENT RECORD	66
Local Notes	67
Tenders Invited and Prospective Business	67
Tenders Received and Accepted	68
Miscellaneous Business Notes	68

## SUMMARY

MR. J. E. EDGCOMBE, Borough Electrical Engineer of Kingston-on-Thames, has been elected President of the Incorporated Municipal Electrical Association, in place of Mr. C. E. C. Shawfield, who has resigned. (Page 58.)

THE results of the working of the large battery at the Dickinson Street Station of the Manchester Corporation were described in a paper by Mr. F. H. Whysall, read before the Institution of Electrical Engineers last Thursday, when the use of large batteries was discussed generally. (Page 59.)

THE Report of the Council of the British Electrical and Allied Manufacturers' Association for the past year records considerable activity. Among the questions dealt with were sub-contractors' tenders, the effect of the Unemployment section of the National Insurance Act, and the question of railway rates for the carriage of electrical equipment. The Annual Dinner, held on the 24th inst., was very well attended. The speeches dealt largely with the advantages of co-operation between manufacturers and supply authorities and financiers. (Page 60.)

THE Institution of Electrical Engineers has now definitely decided to establish a lending library. (Page 60.)

THE suggestion has been made in America to adopt the "myriawatt" (1,000 watts) for the rating of boilers, engines, &c. (Page 61.)

A NEW 2,000-kw. turbo-alternator, complete with condensing plant, switchgear, &c., has been taken into use at Blackburn, and a second similar set is under erection. (Page 61.)

A PAPER by Mr. W. H. Dexter, discussed recently by the Yorkshire Local Section of the Institution of Electrical Engineers, surveyed some recent developments in the design of condensing plant. (Page 62.)

THE arrangement of two auto-transformers in V connection is discussed in our "Questions and Answers" columns. (Page 63.)

A NEW heater for shipboard use is described on page 62.

THE standardisation of a cheap electric cooking set is being considered by the "Point Fives." (Page 62.)

A NEW form of electric light fitting, some porcelain handle fuses, and a folding scaffold, are described on page 64.

A H.T. CABLE breakdown on the L.C.C. tram system caused surges and a serious temporary suspension of service, besides burning out five motor-generators.—The Directors of the London Brighton & South Coast Railway have definitely decided to equip practically the whole of their suburban lines as far as Croydon for electric traction on the single-phase system.—Sir H. A. Yorke's report on the recent Tube railway accident attributes the collision to failure of the train-stop and negligence of the driver, and states there is no reason for suggesting that automatic signalling has proved a failure. (Page 65.)

THE Government has appointed a Committee of Experts to consider the competing systems of long-distance wireless telegraphy.—The action between the Marconi Co. and a Russian firm has just been concluded.—An address on the subject of automatic telephones was given recently by Mr. W. Aitken before the members of the Western Local Section of the Institution of Electrical Engineers. (Page 65.)

THE Specifications published by the Patent Office last Thursday included one dealing with enclosed flame arcs



by B. A. Quint, and one for a heating element, consisting of a resistor wound on a pipeclay carrier, by E. Townshend, as well as two connected with wireless telegraphy. The first, by G. Marconi and C. S. Franklin, covers the use of a series dynamo with a detector and two relays to increase the strength of received signals, and the second covers the use of two closed antennæ at right-angles to determine the direction of the sending station by equalising or comparing the currents produced. This Specification is by the Marconi Co. and C. E. Prince. (Page 66.)

A SPECIAL Committee at Manchester has fixed the proportion of profits that can be devoted to relief of rates at one per cent. of the capital expenditure.—The Woolwich Council have made an offer to give a bulk supply to Erith.—An electrical exhibition is under consideration at Glasgow.—The tariff for lighting has been increased, but for heating and cooking has been decreased at Ayr. (Page 67.)

New generating plant will probably soon be required at Erith; tenders are being invited for a 1,000-kw. turbo-generator and other plant at Grimsby; rotary-converters are required at Stalybridge; the London County Council are to reconstruct part of the tracks recently acquired from the London United Tramways Company. (Page 67.)

### ARRANGEMENTS FOR THE WEEK

FRIDAY, JANUARY 31st.

*Electrical Engineers' Ball.*

At Hotel Cecil.

TUESDAY, FEBRUARY 4th.

*Institution of Electrical Engineers: Manchester Students' Section.*

7.30 p.m. At Municipal School of Technology. "Winding of Electrical Machinery," by A. T. Robertson.

*Institution of Electrical Engineers: Glasgow Students' Section.*

8 p.m. At the Royal Technical College. "Electrical Estimates and Opportunities," by N. C. Woodfin.

*Rugby Engineering Society.*

8 p.m. At Benn Buildings. "High-speed Bearings," by J. C. K. Balfry.

WEDNESDAY, FEBRUARY 5th.

*Institution of Electrical Engineers: Students' Section.*

7.45 p.m. At Victoria Embankment. "Low and Mixed Pressure Turbine Plant," by Chas. H. Goulden.

*Royal Society of Arts.*

8 p.m. "The Economic and Hygienic Value of Good Illumination," by Leon Gaster.

### The London Electrical Engineers.

(To-day) THURSDAY, JANUARY 30th. C. Company.—Company Training, 7 to 10 p.m.

FRIDAY, JANUARY 31st. D. Company.—Recruit Training, 7 to 10 p.m.; Company Training, 7 to 10 p.m.

SATURDAY, FEBRUARY 1st. B. Company.—Week-end run at Fort Coalhouse. Parade at Finchurch Street Station, 3 p.m. Service dress. No arms. A. Company.—Lorry run. The Lorry Crew will parade at Headquarters at 2.30 p.m. Service dress. No arms. Headquarters open for Regimental business from 10 a.m. till 12 noon.

MONDAY, FEBRUARY 3rd. A. Company.—Recruit Training, 7 to 10 p.m.; Company Training, 7 to 10 p.m.

TUESDAY, FEBRUARY 4th. B. Company.—Recruit Training, 7 to 10 p.m.; Company Training, 7 to 10 p.m.

THURSDAY, FEBRUARY 6th. C. Company.—Company Training, 7 to 10 p.m.

### THE I.M.E.A. PRESIDENCY

THE Presidency of the Incorporated Municipal Electrical Association, rendered vacant through Mr. C. E. C. Shawfield leaving municipal employment (as announced in our issue of Jan. 9), has been offered to Mr. J. E. Edgecome, who has accepted it. Mr. Edgecome is Borough Electrical Engineer of Kingston-upon-Thames, and has been President of the Association once before—in 1906. He is also Honorary Treasurer of the Association.

Mr. Edgecome assumes the Presidency at once, and will remain in office until the close of the Annual Convention this summer, which will be held in London as previously arranged, after which it may be assumed that he will be succeeded by Mr. R. A. Chattock, City Electrical Engineer, Birmingham, who is Senior Vice-President. We understand that Mr. Chattock was first invited to take up the Presidency, but preferred not to accept it for this year's meeting. In the ordinary course he will be elected to the Presidency at the Annual General Meeting which is held at the close of the Convention, and next year's meeting will take place in Birmingham.



NEWLY-ELECTED MEMBER OF ELECTRICITY COMMITTEE:—I presume this is the battery which was stated in a paper read at the Institution of Electrical Engineers to be "a sound commercial proposition when considered in connection with a large lighting load."

INTELLIGENT YOUTH (rising to the occasion):—Yes, sir.



## THE LARGE CENTRAL STATION BATTERY AT MANCHESTER

IN a paper entitled "The Use of a Large Lighting Battery in Connection with Central Station Supply," discussed at last Thursday's London meeting of the Institution of Electrical Engineers, Mr. F. H. Whysall gave some results of the working of the 12,000-ampere-hour Tudor battery installed in 1910 at the Dickinson Street Station of the Manchester Corporation. A full description of the battery and of the booster and switchgear in conjunction with which it is worked was given in *ELECTRICAL ENGINEERING*, Vol. VI., p. 261 (April 21st, 1910), and the leading particulars are recapitulated below.

There are 210 cells in pitch-pine, lead-lined boxes (6 ft.  $1\frac{1}{2}$  in. long, 2 ft.  $2\frac{1}{2}$  in. wide, and 3 ft.  $4\frac{1}{2}$  in. high), each containing 38 positive plates ( $20\frac{1}{2} \times 29 \times 0.4$  in.) of Planté formation cast in one piece, and 39 box-type negative plates (0.31 in. thick) composed of half grids riveted together, with the spaces between them filled with active material. Treated wood separators are used, and a free space of 8 in. is left at the bottom of each cell for accumulation of deposit. The guarantees were as follows: Discharge rate, max. 15,000 amps., one hour 8,400 amps.; charging rate 4,100 amps. normal, 6,500 amps. max.; max. charging voltage, 2.75 volts per cell; ampere-hour efficiency, 90 per cent.; watt-hour efficiency, 66 per cent. at 1-hour rate, 75 per cent. at 3-hour rate (3,900 amps.); final voltage per cell, 1.67 volts at 1-hour rate, 1.78 volts at 3-hour rate; weight of each cell, 2 tons 19 cwt.; of complete battery, 620 tons; floor space occupied, 5,966 sq. ft. The battery is regulated by three Turnbull-McLeod boosters run in parallel at times of maximum discharge. Each of these is capable of a maximum boost of 80 volts at 5,600 amps. It is not necessary to repeat here all the details of the switchgear. It is, naturally, of very substantial nature, and extensive use is made of aluminium.

An important feature is the provision of two substantial circuit-breakers inserted in the main cables as close as possible to the battery house. These circuit-breakers are of the magnetic blow-out type, and are capable of carrying 15,000 amperes continuously. Each is enclosed in a separate concrete cubicle, so as entirely to shield it from all other parts of the station, and each is electrically and independently operated from the switch-board by means of solenoids. (It will be remembered that the absence of some similar precaution to this in the Salford generating station was largely responsible for the serious fire recently, when it was found impossible to prevent the battery continuing to discharge into the faults.) (See *ELECTRICAL ENGINEERING*, January 2nd, page 9.)

The chief duty of the battery is to take 3,000 kw. off the lighting peak. It was originally intended to charge the battery on traction, thereby providing a constant load for one 1,800-kw. traction generator, and enabling it to do the whole of the traction load for the city area by discharging over the traction peaks; also to change the battery over to lighting for the lighting peak. It was found, however, that at certain times of the year the traction and lighting peaks were coincident.

It was anticipated from a consideration of typical winter load curves that the battery would increase the load factor of the steam plant from 32 per cent. to 43.5 per cent., but curves are reproduced in the paper to show that actually the battery brought the load factor up to 67 per cent. in summer and 49.1 per cent. in winter. This improvement in load factor, besides effecting other economies, brought the coal consumption down to 2.79 lb. per unit sent out. The commercial efficiency of the battery was for the first year 70.6 per cent., and for the second year 71.1 per cent.

An interesting case is mentioned of a storm load when the maximum demand (ignoring traction) was 44.5 per cent. greater than the boiler capacity at the commencement of the darkness; and the battery was able to take care of the rising peak load, ahead of the extra boilers which had to be got into commission. Without the battery it would have been impossible to get these extra boilers up in time.

The actual capital cost of the battery plant was £21,567 (which the author compares with a cost of £51,000 for equivalent steam plant). The interest and sinking-fund charges he gives as £2,642 (as against £3,698 for the steam plant). The cost per kw. of the battery plant works out at £7.1875 (which the author compares with £17 for steam plant).

Regarding the running costs, it is necessary to take into consideration the fact that the most uneconomical units are reserved for peak duty, also that these sets will not be run at their most economical load. Bare fuel cost per 1,000 kw. standby for this peak-load duty the author has estimated at £1 8s. per day. This latter charge becomes in

the case of a 3,000-kw. battery £4. 4s. per day for the bare one-hour rating of the battery. But when considering the effect of the battery on load factor it is unfair to credit the battery with standby savings on its bare capacity only; in the storm-load curve referred to it was demonstrated that the battery saved standby to the extent of 44.5 per cent. on the total boilers under steam at the beginning of the day, also that more boilers are necessary to meet sudden demands than can comfortably cope with an equivalent load applied gradually. It may be assumed that on this occasion a 3,000-kw. battery saved standby for its own capacity plus 44.5 per cent. of the boiler capacity prior to the storm, which was 7,200 kw. On this, continues the author, 44.5 per cent. is 3,200 kw. Calculating at the same rate without allowing anything for the increased price of coal, we see that our 3,000-kw. battery for the five summer months is equal to steam standby at the rate of £8 8s. per day. Reckoning on the basis of five days per week gives £924. Adding £630 to this on account of the standby saving for its own capacity for the other seven months, we have a yearly standby saving of £1,554. Comparing bare fuel cost per unit generated, and crediting the battery with a commercial efficiency of 70 per cent., we get a cost per unit (reckoning 2.5 lbs. of coal per unit at 12s. 5d. per ton) of 0.237d. against a cost of 1.55d. taken from the actual results shown on the load-factor curve for 8 per cent. load factor. The peak-load units discharged by the battery since its installation, calculated at the rate of five complete discharges per week—31st March, 1910, to 31st March, 1912—are 1,560,000, and represent an annual saving of £8,534. The total saving in running cost thus comes out at £10,088—a figure agreeing closely with the £10,166 obtained by the author from a consideration of the effect on the load factor only.

The paper concludes with some notes on the records kept in connection with the battery and its care and some general points on the advantages and disadvantages of central station batteries, and remarks that it is now being recognised that, provided the battery is installed to reduce generating plant, it is a sound commercial proposition when considered in connection with a large lighting load. A suggestion is further made that some consumers might find it pay to charge a battery at power rates during the day to use for lighting.

In opening the discussion, Mr. J. S. Highfield (Chief Engineer, Metropolitan Electric Supply Co.) said that in stations supplying large distribution systems the first usefulness of a battery was to give security and the second to relieve the peak load. The two requirements, however, somewhat interfered with each other, as a battery was of less use as a stand-by when it had been nearly discharged on the peak. He was in favour of hand-regulated boosters for large batteries. All boosters should have a short-circuiting switch so that they can be cut out instantly on emergency, and should be capable of very great overloads. This point of view was agreed to by several other speakers, but some, including Mr. W. Fennell (Borough Electrical Engineer, Wednesbury), who had experienced a bad booster breakdown, were in favour of the cell-regulating switch control largely practised on the Continent, and slides showing heavy current switches of this nature were shown by Mr. A. Hutt (Siemens Brothers Dynamo Works, Ltd.). Mr. Whysall, in his final reply, expressed a preference for booster control for peak-load work and regulating switches for emergency supply conditions. Mr. Highfield also complained that the usual system of charging for maintenance unduly penalised the careful user, who had to pay for the carelessness of others, but Mr. E. Jacob (Tudor Accumulator Co.) thought that there were difficulties in allowing for this, as all battery owners would declare themselves the most careful. Mr. E. C. McKinnon (Ghloride Electrical Storage Co.) said that maintenance charges, instead of being based on time, should take into account the number of charges and discharges. He considered the paper a little optimistic in that it dealt only with the first year's use of the battery, and was inclined to think that, on the whole, a heavier type of battery might have proved more durable. He made the valuable suggestion that a recording hydrometer should be used instead of the half-hourly reading taken at Manchester. Mr. A. M. Taylor (Birmingham Electricity Department) ran over Mr. Whysall's figures of saving due to the battery with enthusiasm, and seemed to think that the saving in coal bill alone, if capitalised, would even purchase another battery of equal size, which would save even more coal. Their battery at Birmingham worked out at a capital cost of £2 10s. per kw., and occupied  $1/20$  sq. yd. of floor space per kw. It was controlled by three double-ended boosters, which could be connected in series or parallel, or cut out by special switchgear. Finally, he commended the

use of batteries in conjunction with converters for stand-by purposes on A.C. schemes. Mr. Jacob thought that the comparative capital costs in the paper were to some extent vitiated by a ten-year period being taken for the battery and twenty years for the steam plant. He also thought that the relatively higher final scrap value of the battery should have been taken into account. Several other speakers, notably Mr. Fennel, deplored the shortness of the seven-year period allowed for battery loans by the Local Government Board. Experience with large batteries for railway work were dealt with by Mr. P. V. McMahon (Chief Engineer, City and South London Railway) and Mr. Roger T. Smith (Chief Electrical Engineer, Great Western Railway). The former showed some instructive load curves demonstrating the part played by his sub-station batteries, and the steadiness of the input to some of these sub-stations was confirmed by Mr. C. P. Sparks (Engineer-in-Chief, County of London Electric Supply Co.). Mr. Roger Smith gave some particulars of recent tests of the effect of the G.W.R. sub-station batteries. A maximum load on the generators (3 sets) of 2,720 kw. at a load factor of 58 per cent. with the batteries in action corresponded to 3,870 kw. (5 sets) without batteries at a load factor of 41 per cent. The most economical proportion of the load to be dealt with by the batteries was from 15 to 20 per cent., and with large traction loads, plant-load factors of 85 to 95 per cent. could be reached. The presence of a battery also allowed lighting and traction to be taken off the same H.T. bus-bars with a voltage within 4 per cent. If they had not put in batteries they would have needed 66 per cent. more steam plant and 13½ per cent. higher steam consumption. Mr. Sparks regarded the sub-station as the proper place for a battery, although there were special reasons for putting it in the generating station at Manchester. Great difficulties were introduced by the rapid growth of the load, which soon made a battery too small.

### THE BRITISH ELECTRICAL AND ALLIED MANUFACTURERS' ASSOCIATION

THE report of the Council of the British Electrical and Allied Manufacturers' Association for the year 1912 was presented on Friday afternoon last. There were 109 members on the register at the close of the year—an increase of fourteen since 1911.

The report states that the text of the general conditions of contract most commonly in use by engineering purchasers has been very thoroughly amended. Agreement is hoped for between the Association and the kindred bodies. Printed copies of certain vital clauses can be obtained from the Secretary. Copies of the complete text will be available shortly. A scheme by which sub-contractors would tender direct to the purchaser has been devised, and is embodied in the Cross-Tendering Agreement. The Committee dealing with the revision of standards for electrical machinery had completed its investigations on standard pressures and frequencies, high potential tests, classification of machines, rating, overloads, and heating. The findings will shortly be presented to the Engineering Standards Committee. The Committee on Electrical Accessories will also present recommendations to the Electrical Accessories Section of the Engineering Standards Committee. The National Insurance Act, particularly Part 2 relating to unemployment insurance, threw a considerable amount of work upon the Association, and the Secretary attended on several occasions before, and otherwise communicated with, the Umpire, and argued cases on behalf of members, securing in several instances the exclusion of certain branches of the industry. A new Railway Bill was proposed by the Government, but was dropped in favour of a short one-clause Bill. A Bill to extend the present powers of municipalities under the Electric Lighting Acts was promoted by the I.M.E.A., and may be passed in a form agreeable to the conflicting interests. Arrangements are on foot for the formation of a Joint Exhibition Committee, composed of representatives of the Association, of the I.M.E.A., and the Supply Companies. The Railway Companies having made alterations in their rates and in the method of packing goods, a deputation of the Association in respect of the carriage of switchgear will shortly visit the Railway Clearing House. The carriage of electric heating-stoves has already been dealt with. The points of difficulty in both cases may shortly be settled. A Joint Committee of the Association and the Contractors' Association is now discussing rules to govern the relations between members of the respective Associations. The question of the usefulness of the existing trade directories is under consideration. A contribution of £250 has been made to the Electrical Trades' Benevolent Institution.

The annual dinner was held in the New Banqueting Hall of the Savoy Hotel last Friday evening. Lord Ampthill, President of the Association, occupied the chair. The number of members and guests present was at least three hundred.

The toast of the British Electrical and Allied Manufacturers' Association was proposed by Mr. Samuel Insull (President, Commonwealth Edison Co., Chicago). He spoke of the lack of co-operation between electrical manufacturers and supply authorities in this country. In the United States and Canada the closest co-operation between the two sides of the business and a regard for the interests of the consumer was practised. London, with a population of 7¼ millions, uses 750 million units a year, whereas Chicago in 1912, with a population of only 2¼ millions, generated 800 million units.

Mr. A. Bruce Anderson (Chairman of the Council), who replied, speaking of the achievements of the Association, said that where it had been necessary for them to speak for one individual or for the whole Association, they had always been heard with consideration. The Association had had a remarkable growth, due to their endeavour to establish a spirit of reliance, without impairing the old spirit of self-reliance. The committees endeavoured to work for the benefit of everyone. Mr. Anderson then paid a tribute to the organising ability and never-failing tact of their secretary, Mr. D. N. Dunlop. This year they had, he said, been fortunate in obtaining the services of Lord Ampthill as president. In proposing the toast of British industry, Mr. L. Worthington Evans, M.P., spoke on the very necessary co-operation between Capital and Brains, and the necessity for enough capital remaining at home. The lack of development in the past could be rectified by more co-operation between the different interests. The tendency of present-day trade was towards combination in all departments.

Lord Ampthill replied. He was, he said, like a casual labourer on odd classes of public work. There was a time when England was the workshop of the world—Mr. Cobden thought it always would be; but as other nations had not seen fit to copy our methods, we ought to adapt ourselves to theirs. Government schemes did not do anything to promote British industry. He likened the B.E.A.M.A. to a trade union, maintaining a right for a "fair reward for their labour." The remedy for the present unrest was, he said, social reform in the form of "work" obtained by a far-sighted promotion of British industry. In his reply to a later toast, "The Chairman," he said that in olden times the "figure head" was often used as a battering-ram, and, if they wished, the Association was at liberty to use him as such.

Dr. S. Z. de Ferranti (Vice-president), in proposing the toast of the kindred institutions and guests, took the opportunity of reminding those present that the Institution of Electrical Engineers has now taken on the duty of looking after industrial interests. Mr. Insull was a great benefactor for showing what wonderful results could be obtained by co-operation. Thus similar failures to that of the Rand Power scheme could be avoided in future.

Mr. W. Duddell, F.R.S., and Col. Sir N. J. Moore (Agent-General for Western Australia) responded. Mr. Duddell said that if we compared the "Kindred Institutions" *per capita* instead of the energy used *per capita*, we would find that this country was far ahead of any other in the world. It would be a good thing to evolve some scheme for the co-operation of the institutions. Col. Sir N. J. Moore dealt with our Colonial trade as improved by preferential tariffs.

Mr. Hugo Hirst (vice-president), in the course of a speech proposing the toast of "The Chairman," said that when the whole country co-operated, then the manufacturer could appear in foreign countries as a strong and not as a negligible unit. If they gave Lord Ampthill the work and material, he would see that they got their rights in the long run.

An excellent programme of music enlivened the proceedings.

**The I.E.E. Library.**—It was announced at last Thursday's meeting of the Institution of Electrical Engineers that the Council have decided to render their large collection of electrical books of greater use to the membership by forming a lending library. The details are under consideration, and as soon as the scheme has been organised members will receive notice of the methods to be adopted.

**High-Tension Transmission on the Panama Canal.**—A committee has been appointed to review the plans for a high-pressure transmission line across the Isthmus of Panama, to consider the possible disturbance to signal systems, the probability of the future electrification of the Panama Railway, and to make recommendations relative to the best and most economical construction to be employed.

**Manchester Electro Harmonic Society.**—This society is making extremely good progress, and a feature in which it differs from the Electro Harmonic Society of London is the inclusion of a very considerable amount of highly classical music in the programmes of some of the concerts. Last Friday's concert was one of these "classical" evenings, and about 200 were present. Mr. Dorman (Dorman & Smith) was in the chair. At the conclusion of the concert Mr. Fred Sells (Director, General Electric Co.) proposed a vote of thanks to the Chairman in a few well-chosen words. Such reunions of members of all sections of the industry cannot fail to promote an *esprit de corps* and to foster a spirit of co-operative effort. It is to be hoped that similar societies will be formed in other large industrial centres in the provinces.

### THE MYRIAWATT

A JOINT committee of the American Institute of Electrical Engineers and the American Society of Mechanical Engineers has adopted resolutions in favour of the term "myrowatt," or "myriawatt" (10,000 watts), as a unit of thermal or mechanical power in dealing with the performance of boilers, steam and gas engines, engines and turbines, and the discontinuance of the use of the term "boiler-horse power." This latter unit, which appears to be in more general use in America than here, is considerably different than the ordinary horse-power, and the myriawatt would be only 2 per cent. larger. The official abbreviation suggested is *mw*. The inconvenience of rating the input to a generating set in "boiler-horse-power" and the output in kilowatts is rightly pointed out, and the remedy proposed is to express the input in myriawatts and the output in kilowatts. Those who were accustomed to think in the ordinary horse-power of 746 watts, and not in the larger units, will perhaps not see the necessity for the proposed new input unit of ten times the value of the output unit, and would prefer the further step of expressing both input and output in kilowatts. The suggestion was originally due to Mr. H. G. Stott, and was brought before the "prime movers" committee of the International Electrotechnical Commission at their meeting this month at Zurich by Mr. C. O. Mailloux.

### EXTENSIONS AT THE BLACKBURN ELECTRICITY WORKS

PART of the new plant which forms the latest extension at the Jubilee Street Works of the Electricity Department of the County Borough of Blackburn was formally inaugurated by the Mayor on Friday last. Of the two turbo-alternators forming the extension the one then "started up" has already been on load but has not yet been officially tested, while the second one is on its bed with the exception of the alternator, which is expected early in February.

Each set is capable of giving an output of 2,000 kw. under continuous working conditions, and runs at 3,000 r.p.m. They have been manufactured by the British Westinghouse Electric and Manufacturing Co. (Trafford Park, Manchester). In addition to the usual fittings, &c., a small automatic steam-driven oil-pump is provided for flushing the bearings before starting up; a Lea recorder is also provided for each set, and a Triplex Fournier recorder for giving temperatures of condensing water inlet and outlet, together with the extraction water. Steam is taken at 180 lb. per sq. in.

The condensers, designed for 190,000 gallons of cooling water per hour, are fixed directly under the turbine and are of the Leblanc type, each with its own Leblanc air-pump driven by a small vertical turbine exhausting into the low-pressure end of the main turbine. The steam supply to the auxiliary turbine is arranged for starting up from the main platform of the turbine, so that it is not necessary in case of emergency to go down into the basement to start up the condenser. The water for the condensers will be taken either from a tank over the boiler-house, direct from the reservoir, or from a cooling tower, supplied by the Davenport Engineering Co. of Bradford, capable of dealing with 200,000 gallons per hour, which is in course of erection. The pumps for the latter are being supplied by the Rees Roturbo Co., Wolverhampton, and the water-piping by the Stanton Iron-Works Co., and the work of laying the pipes is being carried out by the Electricity Department.

The alternators generate three-phase alternating current at a pressure of 6,600 volts with a periodicity of 50 cycles per second. The rotors are of the two-pole cylindrical type with Prof. Miles Walker's patent compensated windings, and with fans attached for ventilating purposes which draw the air by means of ducts from filters fixed outside the engine-room through the windings of the machine, and the warm air can then, by means of a plate placed on the top or bottom of the alternator casting, exhaust either upwards into the engine-room or downwards into the basement. Two 800-kw. Westinghouse rotary-converters with transformers have been fixed adjoining the turbines, capable of supplementing the existing 440-500 volt direct-current supply for lighting, power or

traction purposes. These run at 600 r.p.m. and are started up from the direct-current bus bars, and can be run inverted for extra high-tension loads when the turbines are not working.

The whole of the new switchgear was provided by the British Westinghouse Co. The extra high-tension control board is fixed in the main gallery, and is of the electrically operated remote-control desk-type, divided into nine panels made up of two turbo panels, two rotary-converter panels, four feeders and one bus-bar coupler. Two rotary-converter direct-current control boards are also fixed in the main switch-room, on which are fixed throwover switches for supplying the lighting or traction bus bars. The extra high-tension switchgear is built up in brick cubicles in a special room in another building situated about sixty yards from the control desk. Already four feeders have been laid to two mills situated a mile-and-a-half and half-a-mile distant respectively from the works, the demand from which will ultimately exceed 1,000 kw., and arrangements are now well in hand for further extensions to supply another 1,000 kw. demanded by several engineering concerns.

The extensions carried out have been designed and the installation of the plant carried out to the specification and under the supervision of Mr. P. P. Wheelwright (Borough Electrical Engineer). The new plant completes the possibilities of giving further supply from the present generating station, as the limit of the supply of water for condensing purposes has been reached and in the very near future another generating station will have to be built where coal can be delivered by rail or canal and better provision for water is possible.

**Day Students' Union Magazine, Northampton Polytechnic.**—We have received a copy of the first issue of a new magazine which has been established by the Day Students' Union of the Northampton Polytechnic Institute (Clerkenwell). The objects of the Students' Union are set out in an article, and the technical contents include abstracts of Papers read before the College Engineering Society on electrical instruments and locomotive valve gears, as well as articles on efficient lighting by Mr. W. H. Date, and on wireless telegraph systems by Mr. C. M. Dowse, together with a considerable amount of institute news.

**Institution of Electrical Engineers.**—The following is the result of the ballot for new members and transfers from one class to another at the meeting on Thursday:—*Members:* J. C. Smith, J. J. Stewart. *Associate Members:* J. Allan, A. Aspinall, C. T. Astbury, F. Birch, J. W. Burleigh, H. T. Byford, G. Cardwell, A. Clark, H. Cochrane, W. R. Cooper, H. T. Cort, W. J. Cross, E. L. Eastgate, F. T. C. Emberton, F. A. Fitzpayne, F. M. Fletcher, L. V. Fox, W. C. Fripp, E. A. Gatehouse, W. P. Gauvain, W. Grant, G. W. Harris, S. T. Jameson, E. C. Jennings, W. Lawson, W. C. Moore, R. L. Morrison, E. Müller, J. C. Murray, W. F. T. Pinkney, J. T. T. Randles, C. C. Rattey, A. R. Reeves, H. N. Rodgers, C. W. Salt, H. R. Schultz, R. Scrivener, W. Shead, F. G. Shrewsbury, B. H. Smith, G. H. Spittle, H. E. Street, G. Sykes, W. E. Turner, R. Weaving, T. Welch, F. H. Wigner, D. M. Williamson, P. Wood, W. Wood. *Associates:* H. L. Downes, Sir H. Norman, P. F. Rowell, E. Sinkinson. *Graduates:* W. H. Griffin, C. C. Higgins, S. B. Howard, T. W. Howard, G. E. Pearson, S. C. Potts, E. B. Roscoe, U. P. Roy, J. O. Spong, D. G. Thomson, J. W. Treherne, T. E. Ward, W. M. Wyatt. *Students:* J. T. Bedford, A. E. W. Butler, V. L. F. Davis, A. H. Deimel, E. Edminson, F. Frost, W. Gwemap, H. V. Higby, H. Honey, G. A. Keith, R. G. Kilburne, H. W. Looker, A. T. Mahon, V. H. Maurel, J. H. Meacock, J. N. Metcalf, A. K. Motawi, S. E. Pritt, J. Renton, H. Riley, B. S. S. Rockey, J. R. Rutherford, M. Sadick, C. S. Sarkar, C. A. Smiles, H. R. Sparrow, L. C. Speed, A. F. Sykes, K. B. Taylor, H. R. Tuppen, R. H. N. Vaudrey, C. N. Vernon, A. J. Waugh, S. B. West, G. B. Whitaker, A. Willcock, C. V. C. Wright. *Candidates Transferred:* *Associate Member to Member:* F. A. Bond, P. V. Gray, J. Josephs, F. E. Kennard, W. L. Maxwell, A. J. Mayne, F. S. Robertson, L. A. Smart, R. Stanley, G. Stevenson, H. D. Symons, J. P. Tierney, R. N. Torpy, W. B. Woodhouse. *Associate to Member:* F. H. Clough, E. H. Freeman, C. W. Neele, D. T. Powell, J. B. Shield. *Associate to Associate Member:* G. Bradwell, E. G. Brown, H. Dean, A. Eddington, T. Gillies, A. C. Gilling, F. C. Knowles, P. W. Paget, T. G. Smith, F. T. Wright. *Associate to Graduate:* L. O. Monson. *Student to Associate Member:* D. Betts, V. F. Bush, W. E. Flower, D. Harrop, H. F. Jefferson, L. W. Johnson, R. O. Kapp, H. Kingsbury, A. Lewin, P. T. Maybury, E. Orloff, J. H. Palmer, G. C. C. Sharples, B. S. Smith, H. A. Stewart, G. H. Taylor, M. O. Teague, R. A. S. Thwaites, L. N. Vine, A. G. Warren, J. Warren, E. Whitehouse. *Student to Associate:* H. Greenwood. *Student to Graduate:* M. B. Baker, E. G. Bowers, W. Bridger, W. G. Conner, A. D. Mackinnon, R. W. Manifold, J. Miller, R. A. Nuttall, D. V. Oppenheim, D. E. Parton, A. C. Smith.

## CONDENSING PLANT

A PAPER by Mr. W. A. Dexter, entitled "Comparative Notes on Independent Steam Condensing Plant," was read on Jan. 15th at a meeting of the Yorkshire Local Section of the Institution of Electrical Engineers. For low-speed reciprocating engines, the attached condenser with the air pump driven from the crosshead was favoured. In such work a vacuum of about 26 in. is sufficient, or for high-speed engines 26½ in., but for steam turbines, especially of the low-pressure type, a high vacuum is really essential. Even here, however, it is possible to aim at too high a vacuum for overall efficiency where there is not a good supply of cooling water at low temperature.

In the course of his general description of surface condensing plant, the author referred to the liability to corrosion of condenser tubes by local electrolytic action, stray electrical currents, &c. It requires only very slightly acidified condensing water to convey these electrical currents from one part of the tube to another. This trouble had been found most prevalent where cooling towers were used. Curves were given of good allowances of temperature difference for various inlet water temperatures and vacua. Thus, for 28 in. vacuum, inlet water temperature 75°, the temperature differences would be 7° F., and with water at 50° it would be 17° F. Considerations of the proportions of air and vapour in the condenser suggest a conical or peg-top shape for a surface condenser, or, considering the disposition of the tubes, a condenser, the cross-section of which is wedge- or pear-shaped, arranged longitudinally, so that the tubes are of equal length. The steam inlet branch should be large and follow the contour of the top part of the condenser body. Directing plates may be fitted to direct the steam equally over the whole surface of the tubes; the air and uncondensed vapour should, as near as practicable, be drawn off equally from the full surface of the tubes at the outlet end. If the water of condensation, or condensate, is withdrawn by a pump separate from that which deals with the air, and is to be used for feed purposes, it should be removed at as high a temperature as possible consistent with the vacuum desired. If, however, one set of pumps is used to deal with both air and water, then it may be advantageous to cool the condensate by allowing it to submerge a few of the bottom rows of tubes. Special means for obtaining high rates of heat transmission, such as cores to break up the flow through the tubes may be used, but there are objections to these devices. The best diameter for the tubes depends on the conditions of the water supply. With very clean water a ¾ in. tube may be used, but where the water is dirty it may be necessary to increase the diameter to one inch or even more. Where the water contains a large amount of foreign matter a jet condenser is admirable.

The jet condenser is cheaper than the surface condenser, but generally requires more power for the pumps. In the low-level type the injection water is usually drawn into the condenser by the vacuum, but it is necessary to withdraw it by a pump. A separate pump should be used for dealing with the incondensable gases. In the barometric type it is necessary to pump the water into the condenser, but no pump is required to extract it. The pumping power will be smaller than with the low-level type, as the full effect of the vacuum can be utilised in raising the water. The design of low-level jet and barometric condensers is similar. In practically all cases the water enters at the top and is discharged at the bottom of the condenser. Reference is given to a cylindrical shape with the axis vertical.

The paper then passes on to a consideration of the volume of air for which airpumps should be designed. For example, for a single turbine and attached condenser for a vacuum of 27 in., barometer 30 in., an actual air displacement of 0.175 cub. ft. per lb. of steam should be allowed. The well-known Edwards and Wier pumps were described, as well as a dry air pump of the Mirlees Watson Co., in which the inlet of the air to the cylinder is controlled by the mechanically operated slide-valve, and the ports are so arranged that when the piston reaches the end of its stroke communication is made between the two ends of the cylinder, allowing an equalisation of pressure. This obviates the losses due to clearance space. The air is discharged through non-return valves fixed on the back of the slide-valve. A full description was also given of the Leblanc rotary air pump which is now coming so much into use, especially for the high vacuum required for turbines.

In the concluding portion of the paper a number of actual installations were described by aid of a series of excellent general-arrangement drawings.

In the discussion, Mr. R. H. Campion (Borough Electrical Engineer, Dewsbury) suggested that corrosion of condenser

tubes was often due to bad tubes thrown on the market by the stringency of Admiralty specifications, as well as the acid condition of the water. He thought that the author was rather severe upon the pit condenser, and he did not regard the danger of flooding of low-level plants which had been referred to in the paper as serious. In replying, Mr. Dexter recommended the addition of a certain amount of lime to counteract acidity in the cooling water, and mentioned a case where he had even found an electrolytic deposit of copper at the bottom of a cast-iron casing. Mr. A. E. L. Scanes (British Westinghouse Co.) did not quite agree with Mr. Dexter's figures of temperature differences and vacua, and thought that it was never necessary to exceed 15° F. Deflecting plates, in his opinion, resulted in an appreciable loss of vacuum. Low-level jet plants with Leblanc air pumps were quite free from danger of flooding. Mr. McLay (Leeds) regarded as the common-sense way of building condensers bringing in the steam at the bottom, passing it up, and taking the air off at the top and the condensate at the bottom, an arrangement which Mr. Dexter agrees with in principle, but found difficult to follow with turbine plant.

## THE "TRICITY" SHIP HEATER

ELECTRIC heating for cabins, saloons, &c., on board possesses manifest advantages over other methods, and the special form of electric heater for the purpose which has been brought out by the British Electric Transformer Co., Ltd. (Hayes), in collaboration with Archibald Watson & Co., Ltd. (Glasgow), will be of interest to shipowners and others. The aim has been to produce a strong, non-luminous heater with no lamps to renew, no fine wire coils, and working at a low temperature, precluding any danger from fire or risk to passengers in confined spaces. The heater unit consists of a strong, heavily webbed, cast-iron grid, containing the



PEDESTAL FORM OF HEATER.

"Berry" Patent element, giving an effective heating surface of about 4½ sq. ft. This grid breaks up the air particles to give the best heating of the air by convection. The grids attain a temperature of about 500° F. in about fifteen to twenty minutes, at a consumption of 250 watts, and the apparatus is covered by an ornamental cover or guard, to form the funnels for the heated air. The heaters are made in the pedestal form illustrated in a modified design for attachment to bulkheads, or in an inclined pattern for fixing in groups under settees, &c., with a headroom of only 8 in.

## THE "POINT FIVES"

AT a meeting of the "Point Fives" (which, as many of our readers know, is an association of managing engineers of public electricity supply undertakings which charge one halfpenny per unit for heating, cooking, and other domestic uses, either as a flat rate or in addition to a reasonable fixed charge), a formal code of rules was adopted as to procedure for election of members, meetings, &c. Mr. W. H. Cooke (Luton) was in the chair. There are to be four meetings a year, including one during the I.M.E.A. convention, and the members are to take the chair in rotation. Visitors will be admitted. The next meeting is to be held at Bradford, with Mr. T. Roles in the chair. Mr. Cooke gave an address in which he advocated the standardisation of a compact, reliable, and low-priced complete cooking outfit, which would meet the requirements of the average family of six to eight persons. He suggested that the society should adopt a standard specification for a complete cooking outfit, and arrange with the manufacturers for the purchase of a certain quantity over a given period, and he submitted a draft specification. After this complete outfit had been standardised, the society could turn their attention to the standardisation of other articles for cooking and heating.

# QUESTIONS AND ANSWERS BY PRACTICAL MEN

## RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelopes.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,324.

What is the best method to follow in the construction of a generator for use in connection with a Tirrell or other voltage regulator, where wide variations in the load take place, and where these are sudden and frequent, and sometimes of very short duration?—B. T.

(Replies must be received not later than first post, Feb. 6th.)

### ANSWERS TO No. 1,322.

Show the relative current values, &c., in the transformer windings, motor, and mains of two auto-transformers "V" or open-delta connected, and used for starting a 3-phase, 3-wire motor by means of 60 per cent. voltage tapping. Also show why these transformers must have a total capacity of 115.6 per cent. when compared with 3 star-connected transformers used for the same purpose.—A. J.

The first award (10s.) is given to MATT for the following reply:—

The currents in the windings of the induction motor and in the leads will be identical whichever method of connection is employed for the transformer, and will be determined by the electrical design of the motor and the percentage of voltage applied. "A. J." does not give sufficient particulars to determine the actual currents, but probably the momentary current rush on a 60 per cent. voltage tapping would be about  $1\frac{1}{2}$  times full-load current in the line. Since the losses and magnetising current of the transformer will be quite small compared with the motor current, they may be neglected to simplify the explanation, i.e., we will assume the input and output of the

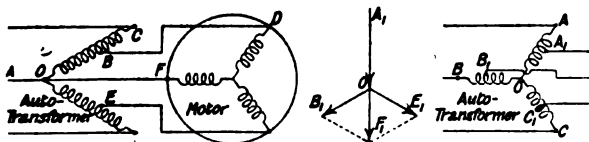


FIG. 1.

FIG. 2.

FIG. 3.

transformer to be equal, also that the current in each line between transformer and motor is in phase with the current in the corresponding line of the supply mains. Both these assumptions are very nearly correct. The following simple explanation will apply both to the initial rush of current and to the steady current when the motor has run up to speed.

First consider the V-connected transformer. Since the motor constitutes a balanced load, the currents will be equal in each phase. Call the phase current in the supply mains C, and the voltage between phases V. Then the transformer input is  $\frac{1}{\sqrt{3}}$  C V. Since the transformer secondary voltage is 0.6 V, neglecting losses (as explained above), the current in the motor leads will be 1.67 C. Referring to Fig. 1, the current in C B must evidently be the line current=C. Since this is in phase with the current in B D, it will supply 60 per cent. of it, and the remaining 40 per cent. (=0.67 C) must flow in the winding O B. In the vector diagram (Fig. 2), O B, and O E, are the currents in O B and O E. Since these are 120 deg. out of phase, their resultant O F, = O B, = 0.67 C. This resultant will be in phase with the line current A, O, and added to

it will give the current A, F<sub>1</sub>, which is 1.67 C, i.e., the current in the motor lead O F. Now the voltage across O B=0.6 V, and across B C=0.4 V. Hence the k.v.a. rating of this leg of the transformer will be  $C \times 0.4 V + 0.67 C \times 0.6 V = 0.8 CV$ . The same reasoning will apply to the other leg, giving a total rating of 1.6 C V for the transformer.

In the case of the star-connected transformer (Fig. 3), by similar reasoning it will be seen that the current in A A<sub>1</sub>=C, and therefore that in O A<sub>1</sub>=0.67 C, also that the voltage across O A =  $\frac{1}{\sqrt{3}}$  V, that across O A<sub>1</sub> =  $\frac{0.6}{\sqrt{3}}$  V, and across A A<sub>1</sub> =

$\frac{0.4}{\sqrt{3}}$  V. Hence the k.v.a. rating of each leg of the transformer

is  $0.67 C \times \frac{0.6}{\sqrt{3}} V + C \times \frac{0.4}{\sqrt{3}} V = \frac{0.8}{\sqrt{3}} CV$ , and the rating of the

whole transformer is  $3 \times \frac{0.8}{\sqrt{3}} CV = 1.385 CV$ . Therefore the

rating of the V connected transformer =  $\frac{1.6}{1.385} = 1.156$  times that

of the star-connected transformer.

From the foregoing it follows that when the transformer is in circuit, the current in the leads between transformer and motor is at all times 1.67 times the current in the supply mains. The makers of the motor can doubtless advise "A. J." of the initial current, and the steady current at any load of the motor when running on a 60 per cent. voltage tapping. The currents in the motor windings themselves will be the same as those in the leads between transformer and motor if the motor is star-connected, and  $\frac{1}{\sqrt{3}}$  times this value if the machine is delta

connected. The currents in the transformer windings have been dealt with above.

The second award (5s.) is given to "H. S." who writes as follows:—

Fig. 4 gives the connections diagrammatically. Let I = current in motor leads. It will be practically the same in each, and let V = voltage between each pair of motor leads. Then, as the transformers have a 60 per cent. tap, the line voltage =  $\frac{100}{60} V = 1.67 V$ .

The line current can be obtained by considering the auto-

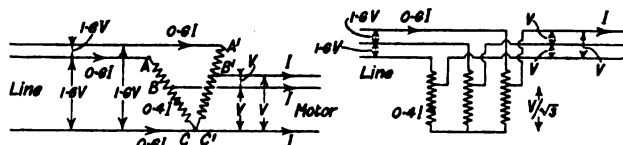


FIG. 4.

FIG. 5.

transformer across one phase. It will bear to the motor current the same relation that the motor voltage bears to the line voltage, that is, line current =  $I \times \frac{V}{1.67 V} = 0.6 I$ .

The line currents will be balanced. The currents in the windings AB and A'B' are the line currents. The currents in the windings BC and B'C' are the difference between the motor and line currents. Or current in BC =  $I - 0.6 I = 0.4 I$ . To obtain the capacity of the arrangement, multiply the voltage across each winding section by the current in that section, and add the products. This gives us capacity = 1.67 VI.

Fig. 5 shows the arrangement of 3-star connected auto-transformers. Denoting by I and V the same quantities as before, and proceeding as above, we obtain for this arrangement capacity = 1.39 VI.

∴ capacity of "V" connected =  $\frac{1.67 VI}{1.39 VI} = 115.6$  per cent.

**Answers to Question No. 1,321.**—Owing to a clerical error, the estimated consumption of oil was given in the first reply as  $\frac{1}{4}$  to 1 pint per B.H.P.-hour. This should have been 1 to  $1\frac{1}{4}$  pints.

## ANSWERS TO CORRESPONDENTS

A. V. JONES.—(1) Putting the coils in parallel in the way you suggest would not reduce the flux, but would probably damage them. A resistance would have to be used in series in any case, and the coils had better be kept in series. (3) Probably the leading electrical contractor in your district could recommend a pattern of heating element on seeing the



hot plates of your printing machinery; we do not know of a book that would meet your requirements. (2) The contractor could advise you at the same time as to the amount of power necessary to drive your machinery, or if you are thinking of hiring a motor, the Corporation Electricity Department would advise you as to the size required. Tables of the approximate power needed to drive different classes of machinery are to be found on page 76 of the "Mechanical World" Electrical Pocket Book for 1913, a copy of which we can send you for 8d. (post free).

### THE INDRA SYSTEM OF LIGHTING

WE are informed by the Electrical Engineering and Equipment Co., Ltd. (109-111 New Oxford Street), that they have now acquired the patents for the "Indra" system of lighting, and are putting the fittings for this on the market in this country. The arrangement is different in principle from the various indirect and semi-indirect methods which have now become so popular, but has similar objects in suitable distribution and avoidance of glare. With the "Indra" system of lighting, the actual source of light is not seen, yet the bulk of the light is directly reflected through clear glass. A simple fitting consists of a combination of specially designed upper reflector and lower distributor. The upper reflector is preferably of opal glass, but, in some cases, where the whole of the light is required in a downward direction, an aluminium reflector is supplied. The lower plate (as seen in Fig. 1) is provided with alternating rings of clear and etched glass. The etched glass rings are at right angles to the direct rays emanating from the lamp, and are of translucent or etched glass, while the clear glass rings are arranged in such a manner that the rays of light reflected from the top reflector pass straight through. By this means many of the advantages of

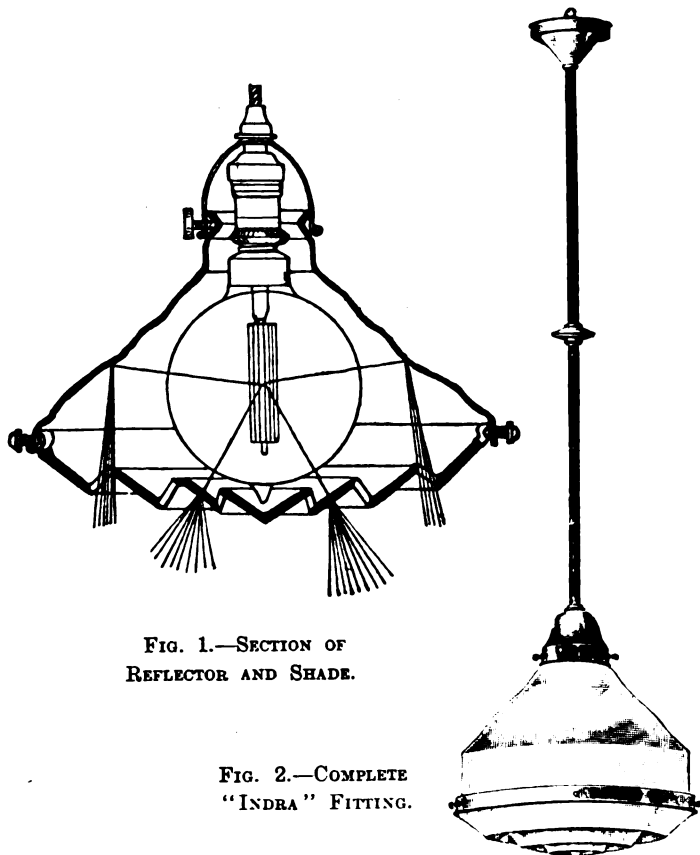


FIG. 1.—SECTION OF REFLECTOR AND SHADE.

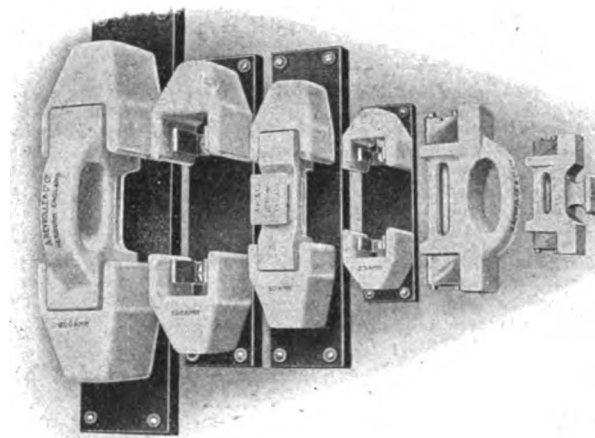
FIG. 2.—COMPLETE "INDRA" FITTING.

indirect lighting are obtained without its loss. No dust can collect in the fitting, and a very much greater efficiency is obtained. As is well known, the bulk of the rays of light from metal filament lamps emanate at right angles to the filament. These rays strike the reflector and are directed through the clear glass rings of the distributor. The rays which strike the distributor direct are diffused through the translucent or etched surface glass rings, so that a very high general illumination is secured without eye strain. From photometric tests it has been shown that the light is greater when the "Indra" fitting is used than that from an ordinary lamp with reflector, the eye is not blinded by the brilliant glare, and the general illumination is improved. The fittings

are made in a number of forms, one of which is shown in Fig. 2. They can be supplied to focus the light in a given spot or spread it over desired areas, or to give a general illumination, and are made up in various designs suitable for banks, railways, theatres, public buildings, stores, offices, and private house lighting. The fittings are supplied in various sizes from 8 in. to 20 in., and are suitable for metal filament lamps having candle-powers ranging from 50. to 1,000.

### PORCELAIN HANDLE FUSES

THE accompanying illustration represents the latest improved pattern of porcelain fuse handles which are being manufactured by A. Reyrolle and Co., Ltd. (Hebburn-on-Tyne). It will be noted that these are not now fitted with buttons on the front as formerly. On the earlier design of self-aligning fuse handle the bolt which secured the contact to the porcelain was carried through to the front of the porcelain, and a porcelain button was screwed over the



NEW DESIGN OF PORCELAIN HANDLE FUSES.

shank. There was a possible disadvantage in this design, inasmuch as there was always the danger of the porcelain button being broken, although the Company assure us that they have never had a case brought to their notice. In order to obviate any objection on this account the porcelain is now made solid, and the bolts securing the contacts are screwed into nuts let into the porcelain. Even in the smaller sizes there is not less than about half an inch of porcelain between the hand and the live metal.

### A NEW FOLDING SCAFFOLD

MESSRS. J. H. HEATHMAN & CO. (Parson's Green, Fulham, S.W.), have sent us particulars of a new pattern of very convenient telescopic folding scaffold trestle, which can be stored in a very small space and easily carried about premises to the position where it is to be used. The ladder composing the trestle is set up on a base mounted on castors, forming a trolley, and is attached by set screws. The single-sliding vertical ladder forming the upper part is then adjusted to the proper height. The whole can be carried upon a barrow or cart, and is made in three or four sections, so that they may be used for very low as well as high rooms, and further, the ladders can be used quite independently of the trolley base to lean against walls, as three separate ladders to each set, or as self-standing trestles, while the trolley can be used for moving light goods. Two sets can be used conjointly with scaffold boards and protection rails, or one scaffold used separately, as circumstances necessitate.

**Tramways & Light Railways Association.**—The Annual Dinner and Smoking Concert will be held on Thursday, February 27th, and the annual Congress at Blackpool, probably on June 11th.

**The Society of Engineers (Incorporated).**—The Council announce that arrangements are being made for holding the Fellowship examination of the Society during the second week of June next. Intending candidates should apply to the Secretary of the Society, 17 Victoria Street, Westminster, S.W., for full particulars.

**Callender's Hospital and Distress Fund.**—We have received a copy of the tenth annual report of Callender's Hospital and Distress Fund in connection with the Belvedere Works. Contributions totalling £250 have been made to hospitals and other institutions out of the fund during the year, a large number of hospital letters, &c., and other assistance have been given.



# ADAMS IGRANIC

## Specialists in Electric Motor Starting and Control Gear

Adams M<sup>rs</sup> C<sup>o</sup> L<sup>td</sup> Balfour House, Finsbury Pavement, London E.C. Works-Bedford.

### ELECTRIC TRACTION NOTES

A considerable disorganisation of the London County Council tramway system occurred on Monday for about half an hour between 8 and 9 p.m., primarily caused by the breakdown of a high-tension feeder. At 8.25 p.m. a violent short-circuit occurred on the high-tension side, which was subsequently found to have been in the joint of one of the high-tension mains somewhat close to the Greenwich Power House. Although the relay on this feeder was set very closely at the time and operated in about four seconds, there was a very abnormal rise of pressure which brought down the bus-bar volts, stopping certain of the station auxiliary plant driven by induction motors, and at the same time shutting down 14 of the 24 sub-stations through the relays. By 8.40 everything was re-started and switched on again, but another serious short and surge took place, this time cutting out again 8 sub-stations. Everything, however, was finally got in order, and the supply permanently restored at 8.57 p.m. The surge was sufficiently serious to burn out five motor-generators in the sub-stations, which were comparatively old, and, therefore, not in quite so good a condition as the more recent ones to withstand the strain. The cable in question had been in service for about six years.

The London, Brighton & South Coast Railway Co. have definitely decided to extend their single-phase railway to that portion of their main lines running as far as Stoot's Nest on the East Croydon and Purley main line, and to Cheam on the Portsmouth main line. This involves the addition of 120 miles of electric line, and the conversion is to be carried out within four years. The work, however, will be completed in sections, and each section put into operation as soon as completed. This decision has been arrived at in view of the excellent results obtained from the short lengths of single-phase lines now being worked by the company. Power will, we understand, be supplied by the London Electric Supply Corporation as hitherto, and this will naturally involve large extensions at this company's Deptford station, which will make it one of the largest of the London power houses. Current for lighting the Norwood sidings, &c., is being supplied by the Croydon Corporation, who also now supply power to the railway repair shops in Croydon. In all probability, also, the station lighting will be arranged for locally, so as to be independent of the main power supply to the line.

Lieut.-Col. Sir H. A. Yorke has now presented his report on the "Tube" Railway collision which took place at Caledonian Road Station on the G.N.P. & R. Rly. on Sept. 4th, 1912. A Board of Trade inquiry was opened at once and was reported in our columns at the time: *ELECTRICAL ENGINEERING*, Vol. VIII., Sept. 12th, p. 508, and Oct. 24th, p. 586. Sir H. A. Yorke finds that the driver of the train which ran into a stationary train was not paying proper attention to his duties and ran past the signals when they were at "danger," that the train-stop was out of adjustment and had not fully resumed the danger position at the time the train passed. Also the trip-cock on the train was half an inch out of gauge. The signals were found to be working normally immediately before and after the accident. The evidence showed that the brakes on the colliding train were not applied until the moment before the accident. On investigating the allegations of signal failures at "clear" it was found that only one such case was on record (July 9th, 1910). This was due to broken copper bonds in the track circuit. Flexible copper is now used. There is no reason, says Sir H. A. Yorke, for suggesting that automatic signalling has proved a failure. It is the safest and, in fact, the only system whereby the dense traffic on the "Tubes" could be conducted. The fact that no telescoping of the coaches occurred is attributed to the fact that they are steel built.

The half-yearly report of the Great Northern & City Railway Co. shows that the net revenue was insufficient to meet fixed charges by £5,086, which sum has been provided from other sources. As already announced, the Company is seeking

Parliamentary sanction for the sale of the undertaking to the Metropolitan Railway Co., and the necessary meetings for obtaining the shareholders' sanction will be held after the half-yearly meeting.

It is anticipated that the electrical working of the East London Railway will be commenced in April.

A Sub-committee of the Aberdeen Tramways Committee is now considering the introduction of trolley omnibuses as supplementing the tramway system.

### TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

The Government have lost no time in appointing a Committee of experts recommended by the House of Commons Committee which is considering the Imperial wireless telegraph scheme. The chairman of this Committee is Mr. Justice Parker, and the other members are Mr. W. Duddell, F.R.S., President of the Institution of Electrical Engineers; Dr. R. T. Glazebrook, F.R.S., Director of the National Physical Laboratory; Sir Alexander Kennedy, F.R.S.; and Mr. James Swinburne, F.R.S. The Committee have been requested to report as soon as possible, and in any case within three months, on the merits of different systems of wireless telegraphy. Possibly Mr. Duddell may not accept the nomination, as he owns the fundamental patent for the "singing" arc upon which the Poulsen system is based, but in the ordinary course this patent is due to expire next year after a life of 14 years.—Before communicating with the Marconi Co. as to their wish to regard the proposed contract as not binding upon them, the Committee have decided at first to hear Mr. Marconi and Sir Alexander Kennedy, and the Secretary to the Post Office, on the matter. They will possibly also ask the advice of the Solicitor-General.

The action of the Marconi Co. against Messrs. P. O. Goukassoff & Co., referred to in our last issue, came to an end on Friday, when judgment was delivered. Messrs. Goukassoff, who had a controlling interest in the Russian Telegraph & Telephone Co., agreed to give the Marconi Co. the first opportunity of purchasing the shares which they held, and the allegation was that this had not been done. At the conclusion of the evidence, Mr. Justice Scrutton offered Messrs. Goukassoff the opportunity of still handing over certain shares which would have enabled them to comply with certain agreements between the parties, but this had not been done, and damages were assessed at £6,000.

Mr. Wm. Aitken (Automatic Telephone Manufacturing Co., Ltd.) delivered an address on automatic telephones before the Western Local Section of the Institution of Electrical Engineers on Jan. 13th, in which he described the Strowger system. This was fully dealt with in *ELECTRICAL ENGINEERING*, Vol. VII., May 25th, 1911, p. 293, and Vol. VIII., May 23rd, 1912, p. 273. The author then gave some details of meters used on measured rate systems, space required, maintenance, &c., as compared with C.B. exchanges. As regards maintenance, recent experiments indicated a life of 30 to 50 years with little cost for renewals.

Mr. A. T. Kinsey (Assistant Superintending Engineer, P.O. Telegraphs, Bristol), Mr. B. Waite (District Manager, P.O. Telephones, Cardiff), and Mr. C. J. Youngs (P.O. Telegraphs, Cardiff) mentioned that with an automatic system there would be no favouritism to callers, no mistaken numbers, service always available, no overhearing of conversations, and no relays of assistants required. Mr. C. J. Youngs was inclined to question the life of the apparatus. His experience with polarised coin boxes was not very favourable. He understood that party lines had to be kept down to four, which was, in his opinion, a great disadvantage. Mr. J. H. M. Wakefield (P.O. Telegraphs, Newport) questioned the figures given for maintenance and the space taken up. It was impossible wholly to check the use of unsuitable tools in effecting repairs. Trouble might be anticipated with sticky relays and demagnetisation. Mr. Aitken (in reply) stated that the power required to work an automatic exchange was about 25 per cent. less than that required for a C.B. manual exchange of the same capacity (50 amp-hours per 1,000 lines per day at 48 volts). Figures from America showed that on an

## "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

### Specifications Published Jan. 23, 1913

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

29,083/11 and 15,031/12. **Cinematograph Targets.** B. W. BATES, H. W. KELLY, and D. H. CORBIN. The picture is projected on a perforated screen, the bullet hole being illuminated by a rear light. The film is stopped as soon as the shot is fired by a movable diaphragm in a sound collector near the gun, which completes an electrical circuit and brakes a controlling shaft. The machine is automatically restarted by a timing relay in the brake circuit. After every few stoppages the screen is automatically moved on a certain distance. Four figures each.

29,207/11. **Magnetic Separators.** KRUPP A.-G. A non-magnetisable ring is rotated round a fixed magnet and a rotating armature at the same or a different speed to the latter. Two figures.

29,223/11. **Temperature Regulation of Molten Metal or other Fluids or Solids.** L. WIGERT-STERNE. The invention applies primarily to stereotype metal. Solenoids controlling the position of air and gas valves are actuated by contacts in a pressure gauge communicating with the heated chamber. Three figures.

27,254/11. **Tumbler Switches.** J. H. WHYMAN. The switch lever moves parallel to the base plate. A flanged cover with no projections is secured to the base by a recess in the flange for engaging a spring on the case. The flange is sprung past the part on the base through which the lever works. Two figures.

86/12. **Wireless Receivers.** G. MARCONI and C. S. FRANKLIN. A series characteristic dynamo, with its magnetic parts unsaturated, is connected in series with a battery and a Fleming valve, carborundum, or other crystal detector. The dynamo at a certain speed causes the increase of current, which always takes place at a certain P.D. to become much more rapid. The strength of signals in the receiver is thereby greatly augmented, due to the increase in pressure produced by the incidence of a wave. The increase in current is only limited by the saturation current of the detector, but it does not decrease again on the removal of the extra applied P.D., so a second relay is inserted in the indicating circuit to break the dynamo and detector circuit as soon as the current in it is sufficient to work the first relay. Two figures.

387/12. **Heating Element.** E. TOWNSHEND. The resistor in the form of a wire is wound on a carrier of pipe-clay or similar material, which becomes red hot. Applied to a kettle, a disc carrier is enclosed within a casing lined with asbestos or uraltite, and attached to the under-side of the kettle, so that the pipe-clay carrier is in actual contact with the bottom of the kettle. Three figures.

2,456/12. **Directive Receiving Aerials.** MARCONI'S and C. E. PRINCE. The aerial consists of an unearthed closed circuit preferably arranged as a rectangle with two sides horizontal, and the receiver in the lower side, with tuning condensers. The wave-length should considerably exceed the base-line of the aerial. The maximum effect is obtained with waves perpendicular to its plane, and zero effect with waves in its plane. To determine the direction of a sending station two aerials set in planes at right angles are used, and the currents produced in each are compared or equalised. Two figures.

3,065/12. **Enclosed Flame Arc Lamps.** B. A. QUINT. A metallic chamber with external fins is arranged above the globe, in which the heated gases from the arc are cooled, and the fumes condensed on the walls. No tubes are required. Two figures.

13,780/12. **Self-contained Electric Vehicles.** P. MARINO. A hot-air engine on the vehicle drives a dynamo, whether the vehicle is stationary or moving, and charges accumulators which in turn supply energy to the driving motor. When moving, the live axle is connected through gearing to the hot-air engine, so that any excess power is transmitted back to the dynamo. Two figures.

17,393/12. **Coal Conveyor for Discharging Barges, &c.** P. H. SUISTED. Two figures.

### Specifications Published To-day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, E.C., at the price of 8d. each, post free.

Names in italics indicate communicators of inventions from abroad. Summaries of some of the more important of these patents will appear in our next issue.

**Arc Lamps:** RIGBY [Hand regulated] 19,099/12; KORTING & MATHIESEN [Differential lamp with inclined carbons] 26,318/12, [Solenoid] 27,024/12.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** PECK and ECKMANN [Operation of D.C. motors] 1,365/12; BECKER [Decreasing capacity effects in cables] 6,061/12; DUSSAUD [Lighting apparatus] 8,087/12; EARL [Regulation] 11,871/12.

**Dynamos, Motors, and Transformers:** HINKSMAN [Magnets]

15,704/12; SIEMENS SCHUCKERT. [Sparkless commutation in rotaries coupled to A.C. boosters] 23,285/12.

**Electrometallurgy and Electrochemistry:** ASHCROFT [Alloys of light and heavier metals] 1,001/12, [Light metals and reaction products] 1,003/12, [Anhydrous caustic alkalis] 1,004/12, [Alkali metals] 1,005/12; STOBIE [Furnaces] 2,081/12; ELEKTRO-MAGNETISCHE GES. [Wet separation of ores] 10,619/12; HELBRONNER, VON RECKLINGHAUSEN, and HENRI [Sterilisation of milk] 14,835/12; SOC. GEN. DES NITRURES [Revolving furnace for manufacture of aluminium nitride] 16,406/12.

**Heating and Cooking:** BALLY [Transformer boilers] 16,043/12.

**Ignition:** BAUER and ECKMEIER, 9,492/12; FORRESTER (*Marshalltown Motor Material Mfg. Co.*) [Spark plugs] 12,809/12; ROTHSCHILD, 14,738/12; COOK [Igniters] 16,664/12; BOSCH [Auto-time adjuster] 17,029/12.

**Switchgear, Fuses, and Fittings:** DAY [Lampholders] 750/12; MARKT [Two-way switch] 4,498/12; B.T.-H. and HASTINGS [Controllers] 7,704/12; HOSFORD [Contacts] 13,432/12; WESSEL and GYSLER [Auto. elect. mag. cut-outs] 14,120/12; FARMER and KOHLSTEDT [Junction boxes] 16,622/12; MURRAY [Connections] 19,535/12; B.T.-H. (*G.E.Co., U.S.A.*) [Cable connectors] 25,775/12.

**Telephony and Telegraphy:** JOHNSON, VARLEY, MICHAELIS, POWER, and JOHNSON SECRET WIRELESS SYNDICATE [Printing telegraphs] 22,079/11; SOC. INDUSTRIELLE DES TÉLÉPHONES [Using power mains] 412/12; DERRIMAN (*Auto. Elec. Co.*) [Telephony] 687/12; DAWSON and BUCKHAM, 777/12; LOGAN [Telephone transmitter interruptors] 1,168/12; HAMMER [Telephones] 4,358/12; HENSMAN [Grapnel for raising submarine cables] 7,996/12; SIEMENS & HALSKE [Radiographs] 9,499/12; FEENEY (*Nat. Wireless Co.*) [High-frequency currents] 14,735/12; SIEMENS BROS. and PETITHORY [Cord plug holders] 21,946/12.

**Traction:** ICARD [Auto. block signalling] 5,352/12; BERGMANN [Trolley lines] 15,930/12; OERLIKON [Loco's, boats, &c.] 19,890/12.

**Miscellaneous:** VOGT [Clocks] 27,291/11; BEVILLE [Illuminated signs] 2,566/12; HALDEN [Photographic copying] 5,278/12; WHITTLE [Locking doors and starting mechanism for lifts, &c.] 9,352/12; BLATHY [Rotary magnets] 16,538/12; HUNT [Portable hand lamps] 17,850/12; WARD [Cinematograph accessory] 18,072/12; LE MAITRE [Targets] 28,260/12.

The following Specification is open to inspection at the Patent Office before Acceptance, but is not yet published for sale.

**Miscellaneous:** GAMPER [Facilitating packing of magnetic material] 28,233/12.

The following Amended Specifications may now be obtained.

**Distributing Systems, &c.:** W. E. LAKE (*U.S. Light & Heating Co.*) [Regulator for variable-speed generator] 9,365/11; CIE. INTERNATIONALE D'ELECTRICITE [Vehicle lighting from variable-speed generator] 21,364/11 (*void*).

**Miscellaneous:** VEIFA-WERKE and F. DESSAUER [Induction-coil regulator] 21,333/11 (*void*).

### Expired Patents

The following are the more important Patents that have become void through non-payment of renewal fees.

**Distribution Systems, &c.:** P. G. B. COLLYER [Lead or other non-corrosive casing for earthed wires] 22,500/06.

**Dynamos, Motors, and Transformers:** B. T.-H. and R. C. CLINKER [Booster series winding in series with transformer primary and in shunt with secondary] 21,902/04; B. T.-H. (*A.E.G.*) [Series motors. Series starting resistance connections] 22,203/07; J. E. NOEGGERATH [Brushes and holders for high-speed dynamos] 22,301/07.

**Ignition:** H. STYCZYNSKI and S. LINDA [Influence machine with condensers and igniting switch] 21,802/03.

**Incandescent Lamps:** W. E. LAKE (*G. Michaud and E. Delasson*) [Squirted metallic filaments: manufacture of and furnace for] 22,036/07.

**Switchgear, Fuses, and Fittings:** C. W. ATKINSON [Quick-break switch-fuse in interlocked case] 20,595/05; J. C. ETCHHELLS [Lift controlling] 22,465/06.

**Telephony and Telegraphy:** M. G. KELLOGG [Telephone exchange: divided multiple board quadrupling previous capacity—27 figures, 60 claims] 18,031/00; SIEMENS BROS. (*Siemens & Halske*) [Paper-perforating mechanism for automatic telegraph transmitters] 21,493/03; J. J. CHISWELL [Adjustable table telephone bracket] 21,966/07; H. S. MARTIN [Compound powder for microphone] 22,478/07.

**Traction:** B. T.-H. (*A.E.G.*) [Motor control by resistance in parallel with field winding] 22,131/07.

**Miscellaneous:** LORD KELVIN, F. W. CLARK, and KELVIN & JAS. WHITE [Ship compass suspension] 22,031/02; J. T. DAWES [Magnetic ore separators] 21,324/03; L. N. WILLIAMS [Electromagnetic lock for miners' safety lamps] 21,809/04; A. PHILIP and L. J. STEELE [Catalytic gas detector] 22,129/06.

average one man per 1,000 lines was required for maintenance. Automatics were cheaper than magneto boards, which were commonly considered to be cheaper than C.B. boards. He advocated leaving the adjustment of groups of contacts to individuals on account of greater uniformity, a matter of considerable importance. Although it was quite possible to operate as many as eight party lines on the automatic system, more than four was not recommended, as it was difficult to keep a sufficiently perfect state of insulation. A 2d. coin box was being experimented with. Constant voltage was very much more important than exceptionally good earthing.

The December issue of the *Telefunken Zeitung*, which has been sent us by Siemens Brothers and Co. (Woolwich), opens with some notes on the recent International Radiotelegraphic Conference and the conference on time signals in Paris, and contains descriptions of various forms of wireless equipment supplied by the Gesellschaft für drahtlose Telegraphie, including 1-kw. ship outfits, 5 to 20-kw. land stations, a thunderstorm indicator and military apparatus used in the Swedish cavalry manoeuvres. Other articles and notes deal with "Telefunken" installations in Siberia, Sayville (New York), New Zealand, and other parts of the world.

At Epsom the Postmaster-General has met with the somewhat unusual experience of being compelled to lay a telegraph line underground. The proposal was to erect poles across Bookham Common, but the County Court judge has made an order that the line should be laid underground.

At the House of Commons on Thursday, the Postmaster-General entertained at dinner a large number of those concerned with the Post Office case in the telephone arbitration proceedings.

## LOCAL NOTES

**Ashton-under-Lyne:** *Fire at Electricity Works.*—Some exaggerated accounts have appeared of a fire which occurred at the generating station last Thursday. There was certainly a fire at about 9 p.m., which could not be put out without the brigade, and which did considerable damage to the generator and other cables in the basement. It was found practicable, however, to restore the whole of the general supply, i.e., private and public lighting and power, all on the three-wire system, by midnight, and the traction and alternating supplies by 8.30 the following morning. The investigation as to the cause is not completed.

**Australia:** *New South Wales Power Scheme.*—Mr. W. Corin, Electrical Engineer, Public Works Dept., Sydney, has presented a report in which he recommends the establishment of a large power station on the southern coal fields in New South Wales as the commencement of a number of power stations in various parts of the city, from which a supply of electrical energy for all purposes will be given at very cheap rates. The scheme includes the utilisation of the State's water-power resources.

**Ayr:** *Lighting and Heating Tariffs.*—In consequence of an increase in the price of coal by 33 per cent., and the reduction in the demand for current owing to the use of metallic filament lamps, the Lighting Committee has recommended an increase in the flat rate for lighting from 3½d. to 4d. per unit, and a reduction in the price for cooking from 1½d. to 1d. per unit.

**Blackrock:** *Electric Supply.*—The Council have decided not to give their consent to the Dublin Southern District Electric Supply Co. to include their districts in the provisional order now being promoted by the company. It is felt that better terms can be arranged with the Pembroke Urban District Council than are offered by the company.

**Brighton:** *Electric Cooking.*—With reference to our Note last week as to the large electric cooking outfit which is being installed in the premises of Messrs. Staffords, the Electric Supply Committee arranged to provide this apparatus for free use until the end of twelve months, when Messrs. Staffords will pay the net cost, viz., £55, if satisfactory. Mr. Christie, the Borough Electrical Engineer, attaches great importance to having a large apparatus of this character on show, and confidently anticipates that equally good results will be obtained to those already given by the large number of small electric cooking outfits in use in Brighton. At the last meeting of the Council the proposal met with some criticism, but it was eventually agreed to.

**Dorchester:** *Electric Supply.*—The County of Dorset Electric Supply Co. anticipate being able to give a supply in May, and are endeavouring to arrange with the Council as to street lighting.

**Dundee:** *Electricity Works Extension.*—The Chairman of

the Electricity Committee and Mr. H. Richardson, Engineer and Manager of the electricity department, are to visit the principal engineering works on the Continent in view of the extensions to the electricity undertaking.

**Erith:** *Bulk Supply.*—We mention in our Tenders Invited column certain recommendations for dealing with the increasing demands upon the power station. At the same time the Woolwich Council have offered to supply in bulk, and the Town Clerk has been instructed to ask for the Woolwich Council's terms.

**Glasgow:** *Electrical Exhibition.*—A sub-committee has been appointed to consider the proposal made by a number of firms to organise an electrical exhibition.

**Knighton:** *Electric Supply.*—The ratepayers have discussed whether they shall undertake an electric lighting scheme or give facilities to a company, and their decision is in favour of the latter course.

**Lowestoft:** *Electric Lighting Loans.*—In his report upon the past year's trading, the Engineer calls attention to the increase in the interest and sinking fund charges due to the short loans now granted by the Local Government Board. He points out that whereas originally fifteen to twenty years were granted for certain plant, periods of only six and eight years are now allowed.

**Manchester:** *Trading Profits and Rates.*—A report by the Trading Profits Special Committee, which was presented as far back as last October, was again discussed at the special meeting of the City Council last week. The Committee fixed the percentages of profits from the trading departments of the Corporation, which it recommends should be paid over in relief of rates, and the contribution of the Electricity Committee is fixed at 1 per cent. upon the capital expenditure. The Committee's recommendation was that the various percentages should hold good for three years, but an amendment reducing this to one year was carried.

**Moffat, N.B.:** *Electric Lighting.*—A Committee has been appointed to go into the question of electric lighting, and to obtain expert advice.

**Pocklington:** *Electric Lighting.*—A meeting of ratepayers has passed a resolution urging the Council to enter into an agreement with Messrs. Crompton & Co. for the erection of an electricity supply works.

**Southampton:** *Electric Supply in Woolston.*—Two alternative schemes of supply in Woolston have been placed before that Council by the Corporation. The first one, that current shall be supplied at 2½d. per unit for lighting, and 1d. per unit for power and heating purposes, with a minimum of £200 on a 12 years' contract. In the second scheme these charges are reduced somewhat on condition that the Council provide the cables to the Southampton Corporation boundary from the various feed points.

**Watford:** *Extension to Bushey.*—Terms have been arranged for the supply of electricity in Bushey by the Corporation.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

### Generating Stations, Sub-Stations, Mains, &c.

**Egypt.**—Electric lighting installation at Damietta. Particulars from Sir A. L. Webb, K.C.M.G., Queen Anne's Chambers, Broadway, Westminster, S.W.

**Erith.**—The Borough Electrical Engineer has reported with regard to the general development of the electricity undertaking, and assuming that the Council does not desire to increase the present buildings, he recommends the replacement of the three small sets now in one part of the station by a 750-kw. reciprocating engine set. The probable cost of this, together with a rearrangement of the steam and feed mains, economiser, &c., is put at £12,000. This suggestion, however, he thinks, will only carry on the undertaking until 1914, and having this in mind he throws out the suggestion as to whether the time has arrived when it will be more advantageous in every respect to build a new power-house

FOR  
**STEAM JOINTS**  
USE



JOHN HUDSON & CO.'S SUCCESSORS, Mansell St., London, E.

on the river front, where the handling of coal and ashes could be more economically dealt with, and an unlimited supply of water would be available for condensing purposes, the present power-station would then be used as the main distributing point for the district. We refer to an offer for a supply in bulk by the Woolwich Council in our Local Notes column.

**Grimsby.**—A 1,000-kw. mixed-pressure turbine and continuous-current dynamo with condensing plant. Borough Electrical Engineer. February 11th. (See advertisement on another page.)

Mains extensions aggregating a cost of £200 have been sanctioned.

**South Africa.**—The Paarl Municipality propose to raise a loan of £34,465 for an electric supply scheme.

**Stalybridge Joint Board.**—The Stalybridge, Hyde, Mossley & Dukinfield Joint Tramways Committee require rotary converters.

### Wiring

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Barking.**—Electric lighting and fitting of Ripple School. Architect, C. J. Dawson, 16 Cambridge Road, February 7th.

**Barrow-in-Furness.**—Council school, Hindpool. Borough Engineer.

**Cork.**—Cinematograph theatre, King Street. Architects, A. & H. Hill, 22 George Street.

**Coventry.**—Considerable extensions to public baths.

**Dartmouth.**—Isolation hospital.

**Dartford.**—Cinematograph theatre. Architects, Withers & Meredith, 50 Cannon Street, E.C.

**Falkirk.**—Sanatorium.

**Hyde.**—Electric lighting of public baths. Architect, J. H. Fletcher, 45 Clarendon Place.

**Penzance.**—New school.

**St. Helens.**—Council school in Liverpool Road. Architects, Biram & Fletcher, George Street.

**Swinton.**—All Saints' Church. Architects, Cunliffe & Heywood, John Dalton Street, Manchester.

### Miscellaneous

**Beckenham.**—Annual supply of house service boxes, cut-outs, flame arc lamp carbons, &c. Town Clerk, February 19th.

**Belfast.**—A twelve months' supply of miscellaneous stores for the Electricity and Tramways Department. City Electrical Engineer, February 24th. (See advertisement on another page.)

**Bristol.**—Twelve months' supply of arc lamp carbons; joint, junction, and fuse boxes; A.C. wattmeters; D.C. mercury type ampere hour meters. Friday, February 14th. (See an advertisement on another page.)

**London: L.C.C.**—Tenders are to be invited from selected firms for metallic filament traction lamps.—The sum of £16,100 is to be spent on the reconstruction of tramway tracks recently acquired from the London United Tramways, Ltd., in Goldhawk Road and King Street, Hammersmith.

**South Africa.**—The Paarl Town Council have adopted an electric lighting scheme at an estimated cost of £34,465. Water power is to be used. The scheme has been drawn up by Mr. Thomas Stewart.

**Stirling.**—The Town Council are considering the installation of an electric tramway system.

## APPOINTMENTS AND PERSONAL NOTES

Mr. Lee Murray, who recently retired from the position of General Manager of Messrs. Bruce Peebles & Co., Ltd., engineers, Edinburgh, has started business on his own account at 10 Norfolk Street, Strand, London, W.C., as Engineering Representative (buying, inspecting, &c.), for firms and corporations in the Colonies and abroad.

The salary of Mr. W. H. Cooke, Borough Electrical Engineer, Luton, is to be increased from £500 to £600 per annum by two increments of £50 each.

The salary of Mr. W. C. P. Tapper, the Borough Electrical Engineer at Stepney, is to be increased by £100 per annum immediately, making his salary £850, with a further increase of £50 in 1914.

A mains and meter superintendent is required by the Taunton Electricity Committee at a salary of £2 per week.

Mr. F. Riley, of Rawtenstall, has been appointed Borough Electrical Engineer at Todmorden at a salary of £150 a year.

An electrical engineer is required capable of preparing lighting and power installation schemes. (See advertisement on another page.)

Instrument maker improver wanted by Foster Instrument Co. (See an advertisement on another page.)

## TENDERS RECEIVED AND ACCEPTED

**Preston.**—The tender of Messrs. Dick, Kerr has been accepted for the supply of 60 tons of rail at £7 17s. 9d. per ton.

**Southend.**—Subject to the sanction of the Local Government Board, an order has been placed with Messrs. Bellis & Morcom for a 500-kw. generating set (Crompton dynamo) at £2,900.

## MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. G. Smith & Son, of 5 Philpot Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night, was £74 15s. to £75 5s. (last week £74 10s. to £75).

**Osram Lamps.**—Owing to the rapid increase in sales, the General Electric Co. have found it necessary to double the counter room for dealing with Osram Lamps at 67 Queen Victoria Street. They have also acquired additional premises at their Osram stores in Union Street, where they are now able to hold twice as large a stock as heretofore.

**Advertising Service.**—We have received a circular from Marcus Heber Smith, 4 Racquet Court, Fleet Street, E.C., advertisement advisers and designers, describing a scheme for acting as advertising consultants, including copy-writing, preparing type lay-outs, proof reading, and engravers supervision at a fixed charge of five guineas per month. The firm do not act as advertisement agents in the ordinary way, but are in a position to place their experience at their clients' disposal.

**Dissolution of Partnership.**—J. A. Boshier and R. S. Belsten, trading as the Electrical Wiring & Accessories Co., Boot Buildings, Market Street, Aberdare, have dissolved partnership.

**Patents for Sale.**—The owners of patents for electrical controlling valves and regulating devices for direct-current dynamos are desirous of working them in this country. (See advertisement on another page.)

The proprietors of a patent for improvements in a steel-refining process desire to work it in this country.

**Credenda Conduits.**—This company last week issued a prospectus offering 30,000 £1 shares at par.

**Aluminium Cables.**—The British Aluminium Co. have sent us an extract of a report by Mr. E. D'Hoop, of the Brussels Tramways, presented before a recent congress. The author remarks that the following eight undertakings have aluminium cables in use: Copenhagen Municipal Tramways, Geneva Tramways Co., Lausanne Tramways, Lyons Tramways and Omnibus Co., Nuremberg Municipal Tramways, Nogentais (Paris) Co., the Paris General Omnibus Co., and the Société Nationale des chemins de fer Vicinaux, of Belgium. The proportion between the useful section of aluminium cables, in comparison with copper cables of the same conductivity, is about 1.65. The useful section of cables used for low tension frequently exceeds 1,000 sq. mm., the maximum mentioned reaching 1,700 sq. mm. The Siemens Schuckert firm have installed a cable, with a single aluminium conductor for single-phase current at 60,000 volts, on the Muldenstein-Bitterfeld section of the Prussian State Railways. The first application of these cables was at Rennes in 1901. All who have adopted these cables state that no practical drawbacks have been experienced. The making of the joints and connections, however, necessitates care. The ends should be cleaned carefully, and branch sleeves of large contact surface used, and the joint made as rapidly as possible, so as to limit the effects of the air. There is special advantage in using aluminium for cables of large section for continuous current. In some instances the economy thus secured exceeds 14 per cent. According to a formula worked out by the Copenhagen Tramways, the use of aluminium is advantageous when the price of aluminium in pounds per ton is lower by  $2.08 \times \text{price of copper} - 30$ . Independently of the question of price, aluminium cables have the advantage, in the case of very high tensions, when it is necessary to augment the section of the conductors in order to increase the dielectric rigidity.

# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 319 [Vol. IX., No. 6]  
*All rights reserved.*

THURSDAY, FEBRUARY 6, 1913.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES and TECHNICAL COLLEGE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

Other Advertisement Rates on Application.

Latest Time for Receiving

Letters for Insertion, Tuesday first post

Small Advertisements and Official Announcements, Wednesday first post.

Displayed Advertisements, Tuesday first post.

Corrections in Standing Advertisements, Monday first post.

All letters to be addressed to "Electrical Engineering," at the EDITORIAL and PUBLISHING OFFICES: 208-206, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Circling, Fleet, London." Telephone No.: 5509 Holborn

Subsides to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## CONTENTS

	PAGE
SUMMARY	69
Arrangements for the Week	70
International Electrotechnical Commission	71
Overhead Transmission Lines	72
A New Pump and Blower	72
Illuminated Hoardings	72
ELECTRICAL ENGINEERING IN THE MINING AND METAL INDUSTRIES:—	
Commercial Iron Smelting at Trollhättan	73
Electric Pumping Plant at Dover Colliery	73
Electricity v. Compressed Air for Coal Cutting	74
The Home Office Regulations	74
Electrical Mining and Metallurgical Patents of January	75
Questions and Answers by Practical Men	77
Catalogues and Pamphlets Received	78
The Sheffield Wiring Department	78
Electric Traction Notes	79
Telephony and Telegraphy (Including Wireless)	79
PATENT RECORD	80
Local Notes	81
Tenders Received and Accepted	81
Tenders Invited and Prospective Business	82
Companies' Meetings, Dividends, Reports, &c.	82
Miscellaneous Business Notes	82

## SUMMARY

CERTAIN proposals regarding symbols, rating and prime movers were made at recent meetings in Zurich of committees of the International Electrotechnical Commission, and await ratification of the forthcoming meeting in Berlin. (Page 71.)

AT a recent meeting of the Western Local Section of the Institution of Electrical Engineers, the discussion on transmission lines was concluded, and reference was made to the success of aluminium for the purpose. (Page 72.)

A FORM of illuminated advertisement is illustrated. (Page 72.)

A PUMP or blower combining the principle of the reciprocating pump with the high speed of the centrifugal pump is described. (Page 72.)

AN account is given in our monthly section on "Electrical Engineering in the Mining and Metal Industries" of the results of the electric iron-smelting installation at Trollhättan. (Page 73.)

A RECENT paper by Dr. R. Herzfeld describes some interesting features of the electric pumping plant now in use at the Dover Colliery. (Page 73.)

A PAPER by Mr. G. Blake Walker read recently in the Midlands points out the superiority of electric power over compressed air for coal cutting. (Page 74.)

THE Home Office electric rules for mines are being re-issued under the requirements of the new Act. (Page 74.)

AN agreement has been arrived at between the Sheffield Corporation and local wiring contractors. (Page 79.)

A NUMBER of Patent Specifications relating to miners' safety lamps, electric furnaces, magnetic ore separators and the electric driving of rolling mills were published by the Patent Office last month. (Page 75.)

THE starting of Latour-Winter-Eichberg single-phase commutator motors is dealt with in our "Questions and Answers" columns. (Page 77.)

A PAPER recently read in London describes two methods by which a ship can obtain her bearings by wireless. The House of Commons Committee inquiring into the Imperial wireless telegraph scheme has decided not to hear the evidence of Mr. Marconi until after Easter. (Page 79.)

WE give the details of the re-arrangement of the boards of several tube railways consequent upon the recent amalgamation. The South Eastern & Chatham Railway Co. are having a report upon the electrification of their lines prepared. The National Electric Construction Co. have secured the consent of the Hythe Council to their trolley-omnibus scheme between Folkestone, Sandgate, and Hythe. The shareholders of the Metropolitan Railway Co. are not inclined at present to sanction the purchase of the Great Northern & City Railway Co. (Page 79.)

A PATENT for duplex and quadruplex submarine telegraph working granted to S. G. Brown in 1900 and allowed to lapse has been restored. The grant of a Patent to the same inventor for submarine telegraph relays, although opposed, has been allowed. Among the Specifications published by the Patent Office on Thursday last is one for an electro-magnetic cut-in and cut-out by P. Wessel and T. Gysler, and one by the Siemens-Schuckertwerke, for a means of improving the commutation of rotary-converters, direct-coupled to A.C. boosters, through the medium of an auxiliary machine or by special windings on the booster, which is then provided with a double commutator. (Page 80.)



MR. DICKINSON proposes the addition of four 5,000-kw. or 6,000-kw. sets at Liverpool, and the gradual replacement of the existing Lancashire boilers by water-tube boilers.—The Woolwich Council are offering a supply in bulk to a number of neighbouring local authorities.—Street lighting extensions are recommended at Bedford.

New generating plant is required at Liverpool, Darlington, Barking, Derby, Chatham, and York; mains at Wednesbury, Wrexham, and Dover; converting plant at Marylebone; new cars at Leeds; and miscellaneous electrical stores at Battersea, Marylebone, St. Pancras, Manchester, and Leeds. A loan of £122,000 is to be taken up for a new power station at Bolton. (Page 81.)

### ARRANGEMENTS FOR THE WEEK

(TO-DAY) THURSDAY, FEBRUARY 6TH.

*Institution of Electrical Engineers.*

7 for 7.30 p.m. Annual dinner at Hotel Cecil.

FRIDAY, FEBRUARY 7TH.

*Association of Mining Electrical Engineers.*

8 p.m. London section. At Institution of Electrical Engineers. "Cables for the Shafts of Mines," by E. K. Scott.

MONDAY, FEBRUARY 10TH.

*Institution of Post Office Electrical Engineers.*

6 p.m. At Institution of Electrical Engineers. "Loading Coils," by S. A. Pollock.

*Institution of Electrical Engineers: Newcastle Section.*

7.30 p.m. At Armstrong College. "The Special Application of Electricity in Warships," by A. P. Pyne.

TUESDAY, FEBRUARY 11TH.

*Institution of Electrical Engineers: Manchester Section.*

7.30 p.m. At the University. "Advertising Electricity," by H. Clifford Palmer.

*Manchester Geological and Mining Society.*

4 p.m. At 5 John Dalton Street. "Colliery Cables," by W. T. Anderson.

*Institution of Electrical Engineers: Scottish Section.*

8 p.m. At Station Hotel, Edinburgh.

WEDNESDAY, FEBRUARY 12TH.

*Institution of Electrical Engineers: Yorkshire Section.*

7 p.m. At Leeds University.

*Batti-Wallahs.*

7.30 p.m. Informal meeting at Victoria Mansions Restaurant, Westminster.

*Association of Engineers-in-Charge.*

8 p.m. At St. Bride's Institute, Bride Lane, Fleet Street, E.C. "The Control of Alternating-Current Motors," by J. T. Mould.

THURSDAY, FEBRUARY 13TH.

*Institution of Electrical Engineers.*

8 p.m. "Notes on Parallel Operation," by A. R. Everest.

*Institution of Electrical Engineers: Dublin Section.*

8 p.m. At Royal College of Science.

*Junior Institution of Engineers.*

2.30 p.m. Visit to Osram Lamp Works, Hammersmith.

SATURDAY, FEBRUARY 15TH.

*Institution of Electrical Engineers: Scottish Section.*

Annual smoking concert at the Grosvenor, Glasgow.

*Birmingham and District Electric Club.*

6.30 p.m. Annual dinner at Swan Hotel, New Street.

*Old Centralians.*

6.45 for 7.30 p.m. Annual general meeting and dinner at Trocadero.

### The London Electrical Engineers.

(TO-DAY) THURSDAY, FEBRUARY 6TH. *C. Company.*—Company Training 7 to 10 p.m.

FRIDAY, FEBRUARY 7TH. *D. Company.*—Recruit Training, 7 to 10 p.m.; Company Training, 7 to 10 p.m.

SATURDAY, FEBRUARY 8TH. *C. Company.*—Week-end run at Fort Coalhouse. Parade at Fenchurch Street Station, 3 p.m. Service Dress. No arms. Headquarters open for Regimental business from 10 a.m. till 12 noon.

MONDAY, FEBRUARY 10TH. *A. Company.*—Recruit Training, 7 to 10 p.m.; Company Training, 7 to 10 p.m.

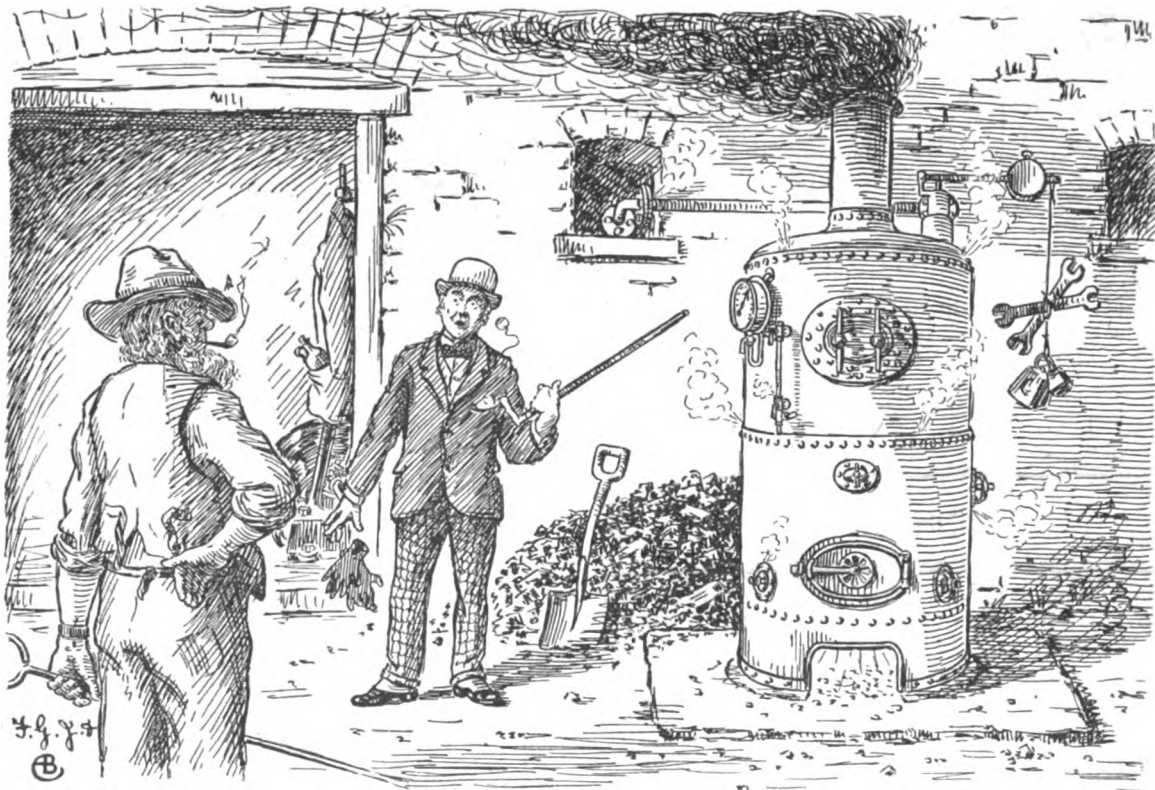
TUESDAY, FEBRUARY 11TH. *B. Company.*—Recruit Training, 7 to 10 p.m.; Company Training, 7 to 10 p.m.

THURSDAY, FEBRUARY 13TH. *C. Company.*—Company Training, 7 to 10 p.m.

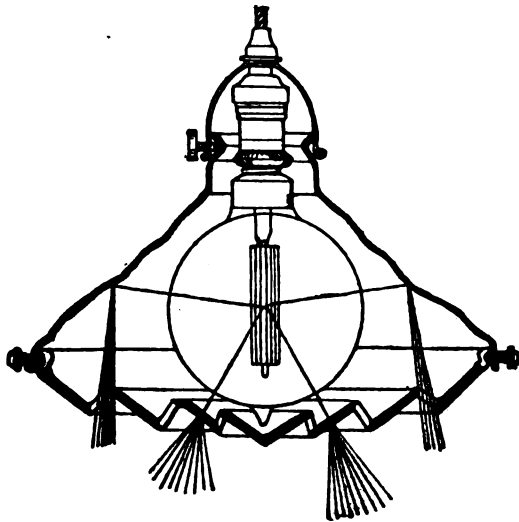
FRIDAY, FEBRUARY 14TH. *D. Company.*—Recruit Training, 7 to 10 p.m.; Company Training, 7 to 10 p.m.

SATURDAY, FEBRUARY 15TH. Headquarters open for Regimental business from 10 a.m. till 12 noon.

**BINDING "ELECTRICAL ENGINEERING."**—Vol. VIII. of "Electrical Engineering" (Jan.—Dec. 1912) closed with our issue of December 26th, 1912. Readers can have their volumes bound by their own bookbinder; or, they may send their numbers to THE KILOWATT PUBLISHING CO., LTD., Temple Chambers, London, E.C., carriage paid (with the reader's name and address), and a remittance of 4s. 6d. under separate cover. The volumes will then be bound and returned carriage paid to any address in the United Kingdom, or carriage forward to the Colonies or abroad. Binding Cases (including index, but not including binding) 2s. each, or post free 2s. 4d. (Abroad 2s. 6d.) Index alone, 1d. (Post free 2d.)



VISITOR.—Hullo! Pressure must be over 60. Gauge sticking?  
HANDY MAN.—It's all right, zur. Th' and's bin rownd wance.



HAVE YOU SEEN

THE

"INDRA"

PATENT SYSTEM OF

LIGHTING

SEND FOR FULL PARTICULARS TO

THE ELECTRICAL ENGINEERING & EQUIPMENT CO., LTD.

109-111 New Oxford Street,

LONDON, W.O.

Telephone: Gerrard 133.

Telegrams: "THERMOTYPE, WESTCENT, LONDON."

### INTERNATIONAL ELECTROTECHNICAL COMMISSION

MEETINGS of three Special Committees on Symbols, Rating, and Prime Movers have recently been held in Zurich, and were presided over respectively by Prof. W. Wyssling, Mr. Huber-Stockar, and Dr. H. Zoelly. Certain proposals regarding symbols were adopted, but await ratification at Berlin in September next. Prof. Miles Walker's suggestions for adopting an entirely new method of dealing with the subject was given consideration; but the delegates decided unanimously that such a procedure was impossible.

Opinions were expressed in favour of the employment of "script" characters for vector quantities generally instead of for magnetic quantities, a proposal emanating from Germany. The Committee made certain modifications in their list of symbols so that, should the German view find favour ultimately and script letters not be recommended for magnetic quantities, no confusion would occur by two identical letters being proposed for the same quantity whether magnetic or electric.

In the question of the Rating of Electrical Machinery the British views were put forward by Dr. Gisbert Kapp and Dr. R. T. Glazebrook, the latter specially interesting himself in the method of employing temperature corrections for copper resistance. Mr. A. R. Everest officially represented the British Electrical and Allied Manufacturers' Association.

The International Standard for Copper was only briefly discussed, as Dr. Glazebrook and Prof. Paul Janet promised to consult with the other national laboratories on the subject, and transmit their final decision to the Berlin Meeting.

The Committee on Prime Movers has adopted the Report prepared by the Italian Committee on hydraulic-electrical installations. An important proposal was unanimously adopted "that the industrial unit of mechanical power be the kilowatt." It is hoped that the German Society will consent to withdraw the proposal to call the mechanical kilowatt the "Neupferd."

Detailed reports of the work of these Committees will be issued by the Central Office for the consideration of the various National Committees with a view to their ratification

at the next plenary meeting of the Commission, which will be held in Berlin from the 2nd to the 6th of September next.

The Italian Society of Electricians has decided to adopt the recommendations of the I.E.C. as and when promulgated, and to recommend their employment in all international specifications, and has decided to suggest that when the necessity arises, in international contracts, for an arbitrator, that he shall be chosen by the President, for the time being, of the I.E.C.

The general arrangements for Zurich meetings were attended to by the Swiss Committee and the Swiss Society of Electricians, whose President, Prof. Jean Landry, came from Lausanne to preside at the official banquet.

**Standardisation of Induction Motors.**—In a Paper read before the Students' Section of the Institution of Electrical Engineers on January 29th, by Mr. E. T. Driver, the results of an investigation into a method of designing lines of induction motors by taking a machine of normal design and varying the core length (and in direct proportion the output), while the diameters of stator and rotor are maintained constant, were given. The method was found to lead to a series of machines which possess good electrical properties and reasonable manufacturing costs. In actual practice more standard sizes of slots would be devised, and similar small items of design would receive more attention. In an estimation of the works cost of the effective material the cost of copper windings was taken as 2s. per kg., and the cost of stator and rotor iron as 7d. per kg. Although the works cost of non-effective material is subject to large variations, the author found from analyses of the works cost of many machines of similar type and output to those under investigation (normal 60 h.p. squirrel-cage motors for 25 and 50 cycles, altered for outputs as low as 20 h.p. and as high as 100 h.p.), that the total cost of non-effective material varied from £50 to £70 per 1,000 kgs. The mean value of £60 per 1,000 kgs., or about 1s. 2½d. per kg., was adopted. Curves were produced showing the relation between cost per h.p. and output. These curves had a marked tendency to become asymptotic with increase of output, showing that no further reduction of manufacturing cost could be procured by increasing the core length and output of the machines. The cost per h.p. increased with increase of poles, showing the desirability of high speeds.

## OVERHEAD TRANSMISSION LINES

THE discussion of this subject (see ELECTRICAL ENGINEERING, Vol. VIII., page 722, December 26th, 1912) by the Western Local Section at the Institution of Electrical Engineers was concluded on January 13th. Mr. A. Jacob (British Aluminium Company) spoke of the handicap imposed by the difficulty in obtaining wayleaves, which were against the realisation of Mr. Ferranti's ideals in the generation of power on the coalfields for transmission to the leading industrial centres. With regard to the economy of aluminium, it had been stated that the increased cost of towers or poles largely minimised the advantage of aluminium, but a close comparison of lines now under construction in Great Britain show a marked saving in favour of aluminium, though the regulations of the Board of Trade handicapped its adoption for sections under 0.1 sq. in. On long lines using seven to eight poles to the mile, such as are erected in Norway, Sweden, Canada, and the States, large economies are effected, and excellent reliability obtained. There was a general feeling in England against the use of aluminium on account of jointing, but a very satisfactory joint was the now well-known torsion joint. Where tappings had to be taken off, it was essential, he said, that mechanical couplings should be made of no metal other than aluminium. Corona losses were insignificant on voltages under 80,000 and for diameters of wire over  $\frac{1}{4}$  in. The larger the diameter the less important these losses become, and consequently this was another feature in favour of aluminium.

Mr. A. T. Kinsey (Post Office Telegraphs, Bristol) stated that he had not found the torsion joint satisfactory with 40-lb. bronze wire, but Mr. Jacob remarked that this was probably due to the fact that the wire was not stranded.

Mr. W. A. Chamen (Treforrest Electric Consumers, Ltd.) gave a few details of a fairly extensive three-phase, 400-volt system, in which he arranged his wires one above the other. He thought that a little extra height of pole was well compensated for by the simplification in crossing roads and in running branch lines. He used five wires, the lower one being the neutral, the next the switch wire for the public street lamps, and the three upper wires the phase wires.

## A NEW PUMP AND BLOWER

WE recently had the pleasure of inspecting the operation and details of construction of a new pump which is being put on the market by the Rotoplunge Pump Co., Ltd. (Albert Chambers, High Street, Cardiff), at their offices at 24 The Broadway, Westminster. The principle of the pump can be seen from the sectional diagram below. The casing A is divided into two portions by the shoes B. In the rotor C, which is keyed to the shaft, six or eight radial cylinders are bored. Pistons D work in these cylinders, deriving their reciprocating motion from the crosshead pin E, whose ends

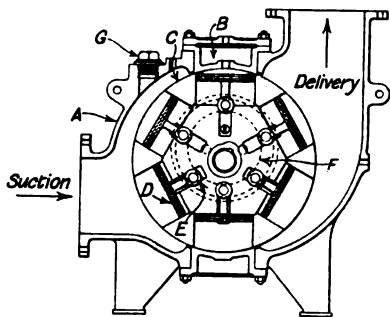


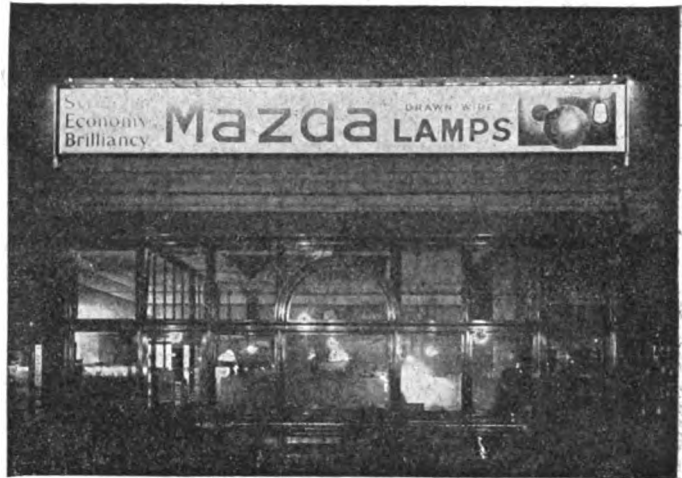
DIAGRAM SHOWING PRINCIPLE OF ROTO-PLUNGE PUMP.

slide in the path F, which is set eccentrically to the axis of rotation, thus causing the pistons to move inwards the first half revolution of C (suction stroke), and outwards the second half revolution (delivery stroke), beginning at the top shoe. Thus it will be seen, it is a positive action valveless pump giving a continuous delivery, and with a high speed of rotation the piston speed is low. For high lifts the pump is made in stages with a common casing and all the rotors on one shaft. For a given output the pump is smaller than some on the market, and it is run at a high speed. It is claimed that no special foundations are required, and that it can create a vacuum to within half-an-inch of the barometer. It may be used for pumping any kind of fluid, and it appears from the condition of a pump, which we were told had been pumping continuously the dirty water from a large dock for two years, that slime and grit have very little effect on the working surfaces. The pump may also be used as a blower compressor or air pump, while by connecting the suction pipe to the exhaust from steam sets and providing for a water

spray at G in the diagram, a condenser is obtained. With regard to size and efficiency a 9 in. diameter pump, with 12 plungers 7 in. diameter by 3 in. stroke, running at 200 r.p.m., will discharge 60,000 gallons per hour on an overall head of 40 ft. The volumetric efficiency is about 95 per cent., and the mechanical efficiency over 70 per cent.

## ILLUMINATED HOARDINGS

FROM the point of view of equality of effect by day and night, some considerable advantage is to be obtained by the use of illuminated hoardings over signs lighted from behind. The British Thomson-Houston Co. (Mazda House, Upper Thames Street) have sent us the illustration reproduced here showing a very effective example of the former method. This is a painted board advertising Mazda lamps, recently erected at Victoria Station (L.B. & S.C. Rly.) by the British Thomson-Houston Co., Ltd. The board is 28 ft. long, about



ILLUMINATED ADVERTISEMENT AT VICTORIA STATION.

5 ft. deep, and is lighted by 40 Mazda lamps contained in a trough reflector attached to the upper edge, and projecting 10 in. therefrom. This arrangement provides effective and uniform illumination over the surface of the board. The reflector equipment is practically invisible. The company have also carried out a number of similar installations, using single light Mazda lamp reflectors, and are prepared to design and supply the equipment for lighting hoardings and painted signs of any size or description.

**Prosecution under the Factory Acts.**—At Leigh, on January 26th, the Hovebridge Spinning Co. pleaded guilty to a breach of the Home Office electrical regulations in respect of a faulty hand-lamp from which an employee received a shock. A fine of £5 and costs was imposed.

**Old Centralians.**—Old students of the college known successively as the Central Institution, Central Technical College, and the City and Guilds (Engineering) College, are reminded that the annual dinner is on Saturday, February 15th. If they have not yet sent in their names, they should apply at once to Mr. G. W. Tripp, 4 Fairfield Road, Charlton, S.E. The price of tickets is 6s. 6d.

**"Matchless" Economy.**—In an interesting communication, the British Thomson-Houston Co., Ltd. (Mazda House, Upper Thames Street, E.C.), have calculated that on the basis of 2d. a dozen boxes of 60 matches each, the light of an 8-c.p. Mazda lamp can be obtained (at 4d. per unit) for  $4\frac{1}{2}$  minutes for the same price as one match. Thus, reckoning that a dozen matches are saved per day by the adoption of electric light, in the course of a year the householder who uses Mazda lamps will have had 365 hours of light paid for by his match economies.

**Copper Production in U.S.A.**—According to the *Electrical World* (New York), the copper output in the United States in 1912 exceeded that of any previous year in the history of the industry. The smelter output, based upon returns for 11 months and estimates for the month of December, was 1,249,000,000 lbs. in 1912, against 1,097,232,749 lbs. in 1911. The average quoted price of electrolytic copper for 1912 was about 16 cents per lb., as compared with 12.5 cents per lb. for 1911. Figures published by the Copper Producers' Association show the production of refined copper amounted to about 1,570,000,000 lbs. in 1912, as against 1,433,875,026 lbs. in 1911. Stocks of refined copper held in the United States on January 1st, 1913, were 105,312,582 lbs., as compared with 89,785,000 lbs. on January 1st, 1912.

## ELECTRICAL ENGINEERING IN THE MINING AND METAL INDUSTRIES

### COMMERCIAL ELECTRIC IRON SMELTING AT TROLLHÄTTAN

THE electric smelting plant erected at Trollhättan, Sweden, in 1910 for the Jernkontorets Forsöksverk (The Swedish Iron Association's Experimental Works) was taken over by an old-established Swedish iron company, the Strömsnas Aktiebolag, Degerfors, in October last, and has been since then working commercially with great success.

The plant consists of one 2,000 kw. two-phase furnace, which is supplied through transformers from the 10,000-volt, 25 cycle three-phase distribution system of the large Government water-power station near by. The power is obtained at the rate of 34s. per electrical horse-power year. The transformers are connected two-phase on the secondary side, each phase being connected to one pair of electrodes. The pressure between the electrodes and the hearth is 45 volts, and a normal current of 12,000 amperes per phase is employed in the furnace. Arcing is avoided as much as possible, so that it is practically a resistance furnace, and has a power-factor of over 90 per cent. Except for being switched off for a few minutes two or three times a week to move the electrodes, the furnace works continuously. A charge of selected ores, charcoal, and limestone is put in every fifteen minutes, and every five or six hours the furnace is tapped, and some five tons of molten iron run out.

Assuming that the value of the iron produced is the same as that of ordinary Swedish charcoal blast-furnace iron, the economy of the electric furnace depends upon the relative prices of charcoal and current. In the ordinary blast furnace, three tons of pig iron produced require about three tons of charcoal, one ton for reduction and two for heating. The electric furnace gives three tons of iron for one electrical horse-power year with the one ton of fuel required for reduction, so that for equal cost of production the cost of the one electrical horse-power year should equal the cost of two tons of charcoal. The value of the latter is at present about 34s., or 17s. per ton, and consequently as electrical energy can be obtained from large water-power stations at a figure as low as 30s. per electrical horse-power year, electric smelting becomes cheaper providing the initial cost of the plant and the electrode consumption are not too high. As a result of tests carried out at Degerfors, it was found that the low-carbon iron, sometimes termed "pig-steel," produced in the electric furnace, was more suitable for use with the open-hearth process of steel manufacture than ordinary blast-furnace pig-iron, and under these conditions it is found that the electric smelting furnace can compete with the blast furnace with a higher rate for electrical energy than that given above, as the electrical product obtains a higher price.

The results obtained by the Jernkontorets Forsöksverk during the experimental periods ending March, 1912, have been published in two exhaustive reports (see *Metallurgical and Chemical Engineering*, Vol. IX., pp. 368, 459, and 505, and Vol. X., p. 413). The results obtained during a continuous run over a period of seven weeks just before the plant was taken over by the Degerfors Company last October were as follows:—The ore used contained 68.6 per cent. of iron, giving a percentage of 63.7 per cent. in the charge. During the period of 1,186 hours continuous working only 13.5 hours were taken up for moving the electrodes, slight repairs, and other interruptions. A total of 966 tons of iron was produced with a consumption of 1,940,000 kw. hrs., or just over 2,000 kw. hrs. per ton of iron. This corresponds to 3.2 tons of iron per electrical horse-power year. The average amount of charcoal consumed was 317 kg. per ton of iron produced, i.e., about one ton for three tons of iron, as stated above as that required for reduction. The average amount of slag was 192 kg. per ton of iron. The average load of the Trollhättan furnace, including the small amount of power required for the fans used to circulate the gases was 1,653 kw. The electrode consumption was only 4.5 kg. per ton of iron produced over this period. An attempt was made in the early part of 1912 to run the furnace with coke instead of charcoal, but this was not successful. This was due, however, only

to the shape and capacity of the furnace shaft, and comparatively good results have been obtained with a furnace especially constructed for using coke which is working at Odda, in Norway.

These furnaces, it may be mentioned, are constructed under the patents of Grönwall, Lindblad, and Stalhane, owned by the Swedish company, "Elektrometals." An English company has been formed under the name of Electrometals, Ltd., and this company owns the patent rights in Great Britain, the United States, Mexico, and all the British Colonies.

### ELECTRICAL PUMPING PLANT AT DOVER COLLIERY

A PAPER describing some interesting features of an electrical pumping installation which is at work at Dover Colliery to keep two shafts dry was read recently by Dr. R. Herzfeld before the Midland Institute of Mining, Civil, and Mechanical Engineers. The pumps are at the 1,275 ft. level, and are capable of dealing with 1,800 gallons per min. The generating plant available at the start was a pair of 250 kw. 3-phase alternators, and it was decided to make use of these sets to deal with the first 900 gallons, and later to double the capacity of the generating station. Two centrifugal pumps, each capable of raising 920 gallons per min. from a depth of 1,275 ft., were accordingly installed each with its own feeder. As far as pumping plant was concerned, there was thus a complete standby, although this was not so in the generating station. The pumps were therefore arranged so that when only one generating set was working, either of the pumps could still deliver 375 gallons per min. at a slightly reduced speed obtained by diminishing the frequency. To effect this with the best efficiency possible to avoid overloading the remaining set, the drive of each pump was subdivided into two motors of 300 h.p. each, one of which only would be taking the load in such circumstances; thus a motor efficiency of 93 per cent. is retained, instead of the 89 per cent., which is all that would be obtained by a 600 h.p. motor at half load; the difference in power factors is even greater. At the same time, the alternators were fitted with air vanes, which enable them to keep reasonably cool up to 300 kw.

A complete underground switchboard is provided. Each pump is controlled by one main automatic oil switch, and one extra switch for the stator of the second motor. Although both motors have been built exactly alike, with slip-rings on the rotor, one of them (as a rule the inner one) has these always short-circuited. The arrangement of building both motors exactly alike has been decided upon in order to secure an equal division of the load between the two. The outer motor has its slip-rings connected to an oil-immersed rotor-starter; and the triple-pole oil-switch fuse of No. 2 motor is interlocked with the rotor-starter in such a manner that it cannot be put in, unless the starter shows "full on" position.

The pumps are started up in the following manner:—The stator of No. 1 motor is excited. The starting rheostat then brings it up to speed, when the stator circuit of the second motor can be put in. Interlocking relays are provided in connection with the trip-gear on the oil-break automatic switch and the starting rheostat. In the event of the current being cut off on the surface, the main switch is tripped, and cannot be put in again unless the switch controlling the stator circuit of No. 2 motor is out, and the starting rheostat put to starting position.

The switchboard was arranged to accommodate a third feeder at a later date, and a special system of change-over switches is employed, guarding against the possibility of making a feeder live from below. When the first pump was put in, and there was danger of the shaft being flooded, it was considered inadvisable to have any switchgear below ground, so the pump was started by running one of the generating sets up to speed fully excited, the pump motor following in synchronism. Some trouble was experienced with the insulation of one of the cables at the start, and to

**THE**  
**UNION CABLE**  
**COMPANY, LTD.**  
**for**  
**BITUMEN**  
**INSULATED**  
**CABLES**  
**DAGENHAM DOCK,**  
**ESSEX.**

TELEPHONE: RAINHAM, 25 & 26.

avoid straining the insulation, the system was run temporarily with one phase earthed.

Before the installation was completed, it was decided to increase the capacity of the generating plant so that both pumps could be worked together, and for this purpose a 600 kw. mixed pressure turbogenerator was put in, taking exhaust steam from the original sets and from a steam-driven air-compressor which formerly ran non-condensing.

### ELECTRICITY v. COMPRESSED AIR FOR COAL-CUTTING

IN the course of a Paper read on January 21st before the Midland Institute of Mining, Civil, and Mechanical Engineers, Mr. G. Blake Walker (Wharnccliffe Silkstone Collieries) made some interesting comparisons between electric and compressed air transmission for mining operations. Even with the most modern compressors, he said, it was not possible to transmit air with the same economy as electric current, and in practice the loss from leakage was greatly more in the former than in the latter system. The results obtained in return for the cost of producing compressed air were disappointing. With ordinary dry compressors fitted with jacket water-coolers, there was usually a loss of 25 per cent. by the time the air entered into the receiver, and the loss in the motors was quite as much. It happened frequently that the air actually converted into work underground was only 30 per cent. of the energy created by the steam-engine. This was where electric power showed itself more economical than compressed air, because the losses in the generator, in the conductor, and in the motor were all much less. Where, however, electric power was not permissible, compressed air, if somewhat more costly, became indispensable. Where the units were small and dispersed throughout a mine, it had been attempted to distribute these losses by installing small electrically-driven air-compressors as near as possible to the places where air-power was required. This was particularly the case with air for driving rock-drills. The system was less

cumbrous and more convenient, but he questioned whether the actual power-economy was much greater than with direct air-transmission. At Wharnccliffe Silkstone Colliery a modern two-stage compressor placed underground, driven by a 70-horse-power motor, was insufficient to drive two coal-cutting machines, which required about 25-horse-power each. It would just drive one coal-cutting machine and one face-conveyor, the latter requiring 8-horse-power.

### THE HOME OFFICE REGULATIONS

IN pursuance of the requirements of the new Coal Mines Act (1911) the Home Secretary proposes to establish general regulations under the Act. Copies of these draft regulations are now obtainable, and any objections to them must be sent in before March 1st, specifying the grounds of objection and the omissions, additions or modifications asked for. The rules affecting electricity in mines are contained in Part III., which embodies the existing special rules on the subject of the installation and use of electricity with such drafting alterations only as are required by their transference with General Regulations under the New Act. It is explained in an accompanying circular that if a "general objection" is made to any of the regulations either by or on behalf of owners of mines employing not less than one-third of the total number of men employed at the mines affected by the regulations, or by or on behalf of not less than one-third of the number of men so employed, or if any objection is made on behalf of the owners of mines of any particular class or in any separate area, and it is alleged that having regard to special conditions the proposed regulations ought not to apply to those mines, the Secretary of State will, unless he is of opinion that the objection is frivolous, refer it to a referee.

**The Association of Mining Electrical Engineers.**—At a meeting of the London Branch, to be held on Friday next, at the Institution of Electrical Engineers, a paper will be read by Mr. E. Kilburn Scott on "Cables for the Shafts of Mines." Mr. W. C. Mountain (President of the Association) will preside, and it is expected that a number of members of provincial branches (who will be in London for a Council Meeting) will be present. Among other points, the Paper will deal with aluminium for shaft cables, wire ropes for earth returns, and silicious tyre rubber for protection of sinking cables.

**Electricity in Mines.**—A Paper on Electricity in Mines, addressed particularly to colliery managers, was read by Mr. R. Nelson (H.M. Electrical Inspector of Mines), at a meeting of the North Staffordshire Institute of Mines and Mechanical Engineers at Stoke-on-Trent, on January 27th. Mr. Nelson dealt with the elementary part of the subject for those not versed in electrical matters, and gave some clear definitions and explanations, and dwelt particularly on the advisability of covering the insulation of cables with an earthed metallic outer covering, and the provision of sufficient surface of insulating material, with bare conductors to avoid creepage. He made quite clear under what conditions there was danger in touching a live conductor, and showed the importance of earthing all conducting material not normally intended to carry current. In conclusion a few notes were given on protective devices.

**Appeal in Regard to a Prosecution under the Special Rules.**—Judgment was given on January 17th by the Lord Chief Justice, Mr. Justice Coleridge, and Mr. Justice Rowlatt in an appeal against the decision of the Gateshead magistrates regarding the prosecution brought by Mr. J. B. Atkinson (Inspector of Mines) against Mr. H. M. Imrie (Manager of Chopwell Colliery). The case was reported in ELECTRICAL ENGINEERING in Mines, August 1st last, page xlv., and the appeal was referred to on page 5 of our issue of January 2nd. The alleged offence was neglecting to earth a switch-box as required by the Rules. A man had received a fatal shock from the switch-cover. The magistrates had refused to convict, and the appeal was brought by the Inspector. The case turned on the interpretation of the Rules, which are not enforceable as regards construction until 1920. The prosecution argued that earthing the switch was not construction, and did not come under this exemption; but the respondent held that the earthing, which would entail running a new cable to the surface, was "construction," and could not be enforced before 1920. The Lord Chief Justice held that the apparatus was clearly in use before June 1st, 1911, and came within the exemption clause. The other judges concurred, and the inspector's appeal was dismissed with costs.



ELECTRICAL MINING AND METALLURGICAL  
PATENTS OF JANUARY

## Metallurgical.

IN addition to those specifications already abstracted in our Patent Record, the following four relate to electric furnaces. No. 19,923/11, by N. Testrup and T. Rigby, deals with arc furnaces for the smelting of iron, which consist of two portions, the shaft and the crucible. A portion of the gases which have passed through the shaft are returned to the furnace, being taken from the shaft at such a point that no substantial amount of water vapour or other substance having a similar cooling effect on the furnace is present. The other portion of the gas is passed through the entering charge in the top of the shaft. In specification No. 2,081/12, by V. Stobie, a 3-phase arc melting or refining furnace is described. It is fed with current from a four-wire star connected supply. Three electrodes are arranged above the bath, each connected to a phase of the supply, while a fourth electrode, also above the bath, is connected to the neutral point to take any unbalanced currents. No. 16,040/12, by J. Bally, relates to induction furnaces comprising an inductor rotating inside the conduit constituting the armature. The inductor is formed of a number of polar pieces arranged radially round the axis, whilst the armature consists of inclined shafts connected together by horizontal conduits or solid connections on concentric cylinders. The shafts may be formed at their upper part with flaring recesses constituting working chambers. The shafts decrease in area from top to bottom, and are all connected at top and bottom by a circular channel. The shafts may be divided into groups, one group to a phase. The central space in which is the rotating inductor is surmounted by a chimney in two pieces. The fourth specification is No. 16,406/12, by the Soc. Générale des Nitrures. It deals with revolving furnaces, according to prior Patent No. 29,299/10, intended chiefly for the manufacture of aluminium nitride. The diametrical resistances are made in sections agglomerated together and having a bevel or feather edge.

Specification No. 29,230/11, by G. Ullrich, describes an improvement in the construction of magnetic ore separators covered by prior Patent No. 14,082/08. The improvement consists in a rotating member co-axial with and below the stationary armature rings and above the lower fixed magnets. The contour of this rotor is similar to that of the opposing face of the armature rings. It is recessed at intervals. No. 10,619/12, by the Elektromagnetische Ges., covers an improved magnetic separator for the wet separation of ores having a magnet system of an even number of poles rotating in front of a stationary induction ring to which the material is supplied from a channel rotating with the magnets.

To effect the manufacture of alloys of light metals with heavier metals, such as sodium with lead, by the electrolysis of fused salts, a process and apparatus is described in specification No. 1,001/12, by E. A. Ashcroft. A body of alloy at constant level in two cells with an intermediate reservoir to take up the variations in bulk is claimed. Continuous movement is imparted to the electrolyte, and a hollow anode for concentrating the gaseous anode product of the first cell and for driving off this product in a pure condition without completely closing the cell is also described, as well as the mechanical and thermal construction of the cell. Nos. 1,003/12, 1,004/12, and 1,005/12, by the same inventor, cover the use of a restricted exposed cathode area and other details

for the manufacture of alkali metals or of their reaction products.

The electrical driving of rolling mills is dealt with in two specifications. No. 1,365/12, by J. S. Peck and S. Eckmann, covers the method of obtaining variations in the speed of a D.C. compound fly-wheel motor by simultaneously varying the series and shunt field windings in the same sense. By this means the desired amount of energy can be given up by the flywheel, whether the motor speed is high or low, without exceeding the usual permissible speed drop of about 10 per cent. The motor need not be supplied from D.C. mains, but through rotaries connected to induction motors. No. 15,469/12, by Siemens-Schuckert, deals with gear for mill-driving where it is permissible to allow of certain fluctuations in the demand on the power mains, though the load is sudden and applied at irregular intervals. The size of flywheel is determined by considerations of the regular working processes separated by equal time intervals. During the longer intervals the power taken from the mains will slowly decrease to the no-load condition. One method of carrying the invention into effect is shown in Fig. 2. The magnetising coil *E* is energised in proportion to the current supplied to the motor from the mains, and inserts resistance in the rotor circuit as soon as the load at any time exceeds average value. A second magnetising coil, *F*, with a small time constant, is energised according to the frequency of the rotor current, i.e., the slip, and consequently in the inverse proportion to the energy remaining in the flywheel. The coil *F* opposes the coil *E*, so that more energy is supplied to the motor while the flywheel is giving out energy, and less while it is storing up energy. Certain modifications may be made in the position of the spring *G*, when the coil *F* may be omitted. If a D.C. motor is used instead of a 3-phase, the coil *F* may be placed in the exciting circuit. If a battery, *B*, is used instead of a flywheel, the same result can be obtained if the coil *F* is connected across the battery. The dotted lines in the diagram show the arrangement in this case. *D* is an auxiliary machine.

## Mining.

The following patent specifications of interest to mining electrical engineers have been published during the month of

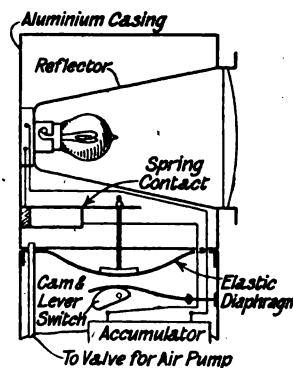


FIG. 1.—SAFETY LAMP WORKING UNDER AIR PRESSURE.

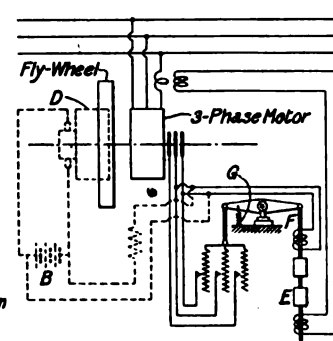
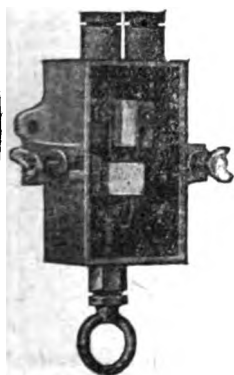


FIG. 2.—ROLLING MILL MOTOR CONTROL.

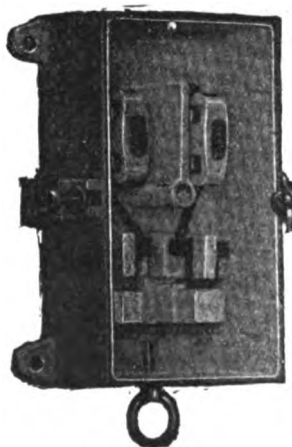
January. No. 28,388/11, taken out by J. H. Hoadley and W. H. Knight, covers their hydro-electric system of coal

IRONCASED  
SWITCHES.

M TYPE. FOR LIGHTING.  
For Workshops, Collieries,  
and exposed situations.

STRONG & COMPACT.

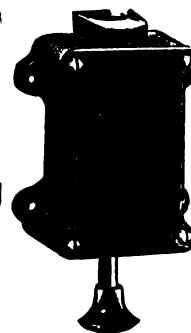
(LIST ON APPLICATION.)



DORMAN  
AND  
SMITH,

Ordsal  
Electrical  
Works,  
SALFORD,

MANCHESTER.



mining described in *ELECTRICAL ENGINEERING*, Vol. VIII., Oct. 3rd, 1912, p. LXIII. No. 29,334/11, by G. A. Dickie, gives constructional details of a miner's electric safety lamp. The lamp and switch are enclosed in a glazed and hermetically sealed chamber provided with an elastic diaphragm, so connected to the switch that the latter can only be closed when the air pressure in the chamber is greater than atmospheric. Provision is made for the use of a cycle pump for

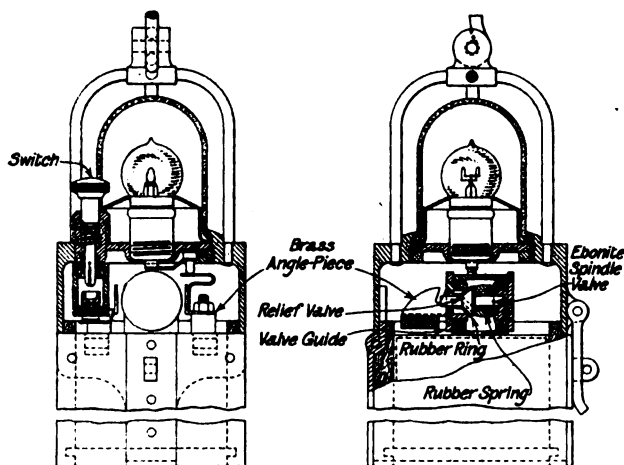


FIG. 3.

FIG. 4.

UNSPILLABLE SAFETY LAMP.

this purpose. Diminution of this pressure to atmospheric due to any cause opens the switch. An outline of the proposed lamp is given in Fig. 1. Specification No. 78/12, by T. Sparkes, has for its objects to provide a safety lamp with unspillable battery. The insertion of a charging plug provides

for the escape of gases evolved during charging. The lamp bulb is preferably placed over a conical reflector enclosed in a glass dome mounted on the battery box cover. The lamp-holder, reflector, and dome are assembled in position from the inside of the containing box, and are held by a screwed plug. The construction proposed in the specification is shown in Figs. 3 and 4. Any ordinary form of locking may be used. For charging a charging plug is used. It has two pegs of different sizes, which fit into slots in the brass angle pieces. The plug then presses against the end of the spindle valve, and allows the evolved gases to escape through holes in the valve guide.

**The Safety of Electricity in Mines.**—A Paper entitled "An Account of Experiments on Safety Devices in connection with Electrical Machinery for Coal Mines" was read by Professor D. Bowen (Mining Department, Sheffield University) on Saturday last before a joint meeting of the Yorkshire branches of the National Association of Colliery Managers and the Association of Mining Electrical Engineers. The author said that his chief object in presenting the Paper was to point to the necessity for continued research into the best form of protection to use. Many of the experiments of German and American investigators were, he said, inconclusive, and were carried out without any real knowledge of mining conditions. The future of the economic working of coal mines was, in his opinion, unquestionably bound up in the application of electric power and machinery in mines. His experiments demonstrated that plate protection was so far the safest method, and that the pressure was increased where fans were inserted in the motor-casings, as a result of the agitation of the explosive atmosphere inside. In the course of the discussion, Mr. Halliday (Featherstone) expressed the opinion that there might be a danger of dust and coal particles being drawn between the plates during the "breathing" of a motor, and that these particles might be blown out in an incandescent state in the event of an explosion in the motor chamber, and might ignite any explosive mixture in the outer atmosphere, although no flames issued. Professor Bowen, however, did not think that there was any danger on this score on account of moisture which would accumulate.

# BABCOCK & WILCOX, Ltd.

## ELECTRIC CRANE DEPARTMENT:

GOLIATH CRANES, TRANSPORTERS, PORTAL CRANES, JIB TRAVELLING CRANES, WINCHES & CAPSTANS, COAL HANDLING CRANES, FOUNDRY CRANES, LADLE CRANES, SCRAP MAGNET CRANES, PIG BED CRANES, SECTION HANDLING CRANES, BOX HANDLING CRANES, OPEN HEARTH CHARGERS, VERTICAL INGOT CHARGERS, HORIZONTAL INGOT CHARGERS, &c.

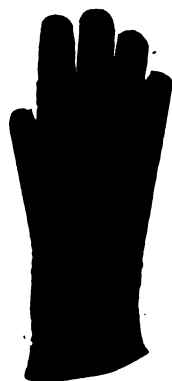
**Head Office: ORIEL HOUSE, FARRINGDON STREET, LONDON, E.C.**

Telegrams—"Babcock, London."

Works: RENFREW, SCOTLAND.

Telephone No. 5540 Holborn (8 lines).

## ELECTRICIANS!



Have you seen

**Moseley's** latest production in  
**Rubber Gloves?**

**THEY ARE ABSOLUTELY THE BEST.**

You cannot afford to run risks, and should use the best glove that can be made.

Write for particulars. Samples sent on approval.

**DAVID MOSELEY & SONS, Ltd.,**  
ARDWICK, MANCHESTER.

## PATENT LOUD SPEAKING TELEPHONES

COMPLETE INSTALLATIONS FOR

**WARSHIPS, MERCANTILE VESSELS,  
MINES, POWER STATIONS, Etc.**

Adopted by the British Admiralty, Foreign Governments, the Leading Shipping Companies, and as used in many Electrical Generating Stations.

**ALFRED GRAHAM & CO.,**  
ELECTRICAL ENGINEERS AND CONTRACTORS,  
ST. ANDREW'S WORKS, CROFTON PARK, LONDON.

WHEN CORRESPONDING WITH ADVERTISERS, PLEASE MENTION "ELECTRICAL ENGINEERING."

## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelopes.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,325.

In cases where electric trains with collectors at both ends run through from the lines of one company to those of another fed from an entirely independent power-house, by what means are excessive interchanges of current avoided at the moments when the train puts the two systems in parallel, if the voltage on one line happens to be much in excess of that of the other?—R.

(Replies must be received not later than first post, Feb. 13th.)

### ANSWERS TO No. 1,323.

Describe the best starting arrangement for the Latour-Winter-Eichberg single-phase commutator motor, using an autotransformer, so as to obtain the best distribution of current in the rotor and stator to give the maximum starting torque with the minimum K.V.A. taken from the mains. How does the design of the motor affect the adjustments of the apparatus?

The first award (10s.) is made to "B. S. L.," whose reply in slightly condensed form is as follows:—

Assuming a motor for at least 250 volts, the rotor is not directly in series with the stator. The current supplied to the rotor is less than that in the stator, as part is diverted by a transformer. This is the usual practice, so that there shall be no excessive sparking nor danger of a flash over on the commutator. Fig. 1 shows the scheme of connections to the different parts of the controller in a certain case. Two autotransformers are used: one, the exciting transformer, is used to divert part of the stator current in order that the rotor current may be less, and it also performs the function of supplying a still lower voltage to the rotor at starting for purposes which are explained later. The other transformer is placed

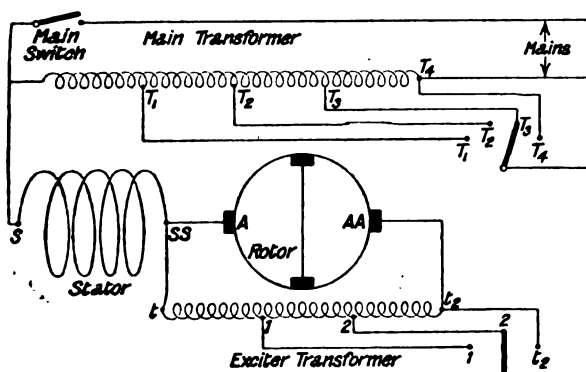


FIG. 1.

across the mains, and tappings are taken to the various points on the controller,  $T_1$ ,  $T_2$ ,  $T_3$ ,  $T_4$ , giving a four-step controller.  $A$ ,  $AA$  are the main brushes, and  $S$ ,  $SS$  the stator terminals;  $t_1$ ,  $t_2$  is the exciting transformer, and 1, 2 are tappings from it. At the first stop on the controller the main switch is closed, and the machine is placed across the first tapping of the starting transformer; at the same time a small proportion of the

stator current passes through the rotor. On the next two stops the voltage across the machine is increased, while the rotor current still bears the same proportion to the stator current. On the fourth stop, however, the full voltage and full exciting current are put on, although it must be borne in mind that the full rotor current is not equal to the stator current. Now the full current is going through the stator, and the rotor is excited by the required proportion of the stator current. If it were desired to make the machine a full series one, and have the same current in rotor and stator, it would only be necessary to remove the connection from 2 to  $t_1$ . Now at starting, owing to the short-circuited brushes on the rotor, the stator acts like the primary of a transformer of which the secondary is short-circuited. Hence it acts like a non-inductive resistance, and almost the full applied voltage (differing only by CR stator drop and leakage considerations) is across the main brushes of the rotor. Thus a great advantage is gained by reducing the voltage across the rotor, for it means an increase in the power-factor of the current taken at starting, as the rotor current is increased gradually instead of the necessary proportion of the stator current being taken at once. Another result is that if the starting torque is considered constant, then the total K.V.A. taken from the mains is higher because of the current diverted by the transformer. [This depends on the relative impedances of stator and rotor, and is a question of design.—Ed. E.E.] The starting transformer is, of course, essential, as it would not be possible to place the machine at once across its rated voltage, as there is no back E.M.F., and the current taken would be excessive; this is quite a similar case to that of the ordinary D.C. motor; and it is more advantageous to have a transformer than a resistance, because no power is lost in the transformer, and an auto-transformer is used, as it is more simple. If the motor runs on a low voltage supply, then an exciting transformer is unnecessary.

The second award goes to "Roy," whose reply in abbreviated form is given below:—

The Latour-Winter-Eichberg motor has the usual induction-type stator and an armature wound with an ordinary continuous-current winding having a commutator with a large number of segments. On this commutator are fixed two pairs of brushes, one pair being short-circuited and fixed at 90 electrical degrees from the other pair; the latter are connected so as to put both armature and stator windings in series. For purposes of speed regulation the armature receives current from the secondary of a transformer with adjustable tappings, whose primary is in series with the stator winding. This transformer can be coupled to an auto-transformer, also with adjustable tappings, as shown in Fig. 2. A still wider economical speed

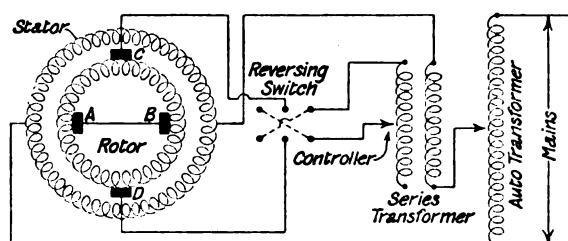


FIG. 2.

range is thereby obtained with no waste of energy. Reversal of direction of rotation is obtained by reversing the direction of the current in the armature or field windings. The currents in the stator and in the rotor windings between the brushes  $CD$  are in phase with one another, since they are both supplied from the same source in series. The motor thus starts up very much like a series motor, except that the flux of the stator winding is largely neutralised by the currents flowing in the short-circuited armature through the brushes  $AB$ . The impedance of the motor at starting is thus due chiefly to the circuit  $CD$ , which forms an inductive circuit, since the vertical flux due to the armature current is not neutralised. As the motor speeds up the conductors cut this vertical flux, and thereby a voltage is induced between  $AB$ , making the stator less like a short-circuited transformer. The voltage across the stator winding thus increases, and resembles that in the primary of a transformer working on a non-inductive load. This has the effect of increasing the horizontal flux crossing the air-gap. This horizontal flux is also cut by the conductors in rotating, so that a back voltage is also induced between the brushes  $DC$ , and this has the effect of raising the power factor. Rotation thus changes the distribution of voltage between the

stator windings and the series transformer, and the speed adjusts itself until both portions of the circuit are practically non-inductive. By altering the secondary turns of the series transformer, it can be arranged that the motor can be made to exert full torque and to work at its maximum power factor at several different speeds. All alterations of speed are effected by oil-immersed controllers varying in construction, according to the size and type of motor and the pressure used in the first instance.

### CATALOGUES, PAMPHLETS, &c., RECEIVED

**SHADE GALLERIES.**—A card from the General Electric Co., Ltd. (67 Queen Victoria Street), describes the "Autogrip" gallery which dispenses entirely with screws, and allows the adjustment of a shade in a moment's time merely by the pressure of finger and thumb on a wire spring. The shade is held in position by three teeth-like clutches, which are adjusted to grip firmly, but without unnecessary pressure. The contraction of the spring throws the three clutches back, permitting the shade to pass them. When the spring is released, the clutches return to position and grip the shade.

**ARC LAMP CLEANING.**—Another novelty, of which the General Electric Co. give notice on a card, is the "Kleenark," which is a simple device for removing deposits in flame arc lamps, without allowing the dust to escape. It consists of a transparent, incombustible rim, to which is fixed an upper and a lower bag. The upper bag is open to receive the base of the lamp to which it can be secured tightly by means of a tape. The lower bag is fixed to the rim. A loose brush is used inside, and as the rim is transparent, the trimmer can see what he is doing.

**ELECTRIC HEATING AND COOKING APPARATUS.**—A small folding price-list of "Meta" heating and cooking appliances is to hand from the Metallic Seamless Tube Co., Ltd. (Meta House, 153 Corporation Street, Birmingham). The company will be glad to furnish our readers with quantities of these lists overprinted with their names and addresses free of charge on application. The apparatus dealt with includes some handsome designs of glowing and other heaters, toasters, warming plates, kettles, shaving pots, milk warmers, irons, and frying pans.

**CONTROLLER SPARE PARTS.**—A small folder from the British Westinghouse Electric and Manufacturing Co., Ltd. (Trafford Park, Manchester), gives particulars of their complete scheme of interchangeable controller spare parts.

*Readers desiring copies of catalogues or pamphlets should apply to the firms in question, referring to the notice in "Electrical Engineering."*

**ELECTRIC CARPETS.**—A list from the Schniewindt Electric Co. (40 and 41 Stainforth Street, Birmingham) describes the Stangertherm system of electric carpet-heating. The heating element is entirely separate from the carpet itself, and is enclosed in a watertight insulating envelope, which is placed between the carpet proper and a waterproof underlay fitted to the carpet, and open at one end to receive the element. The heater can be applied to any part of the carpet, and can be easily withdrawn when not required.

**TELEPHONES.**—A new list from the Sterling Telephone and Electric Co. (200 Upper Thames Street, E.C.) deals with domestic, battery, magneto and intercommunication telephones of various patterns, as well as bells, indicators, and accessories. The cream and gold finished "Twencen" domestic telephone has been reintroduced.

**MINE EXPLODERS.**—Another Sterling list deals with the company's latest pattern of "Permitted" shot-firing generator for miners, which is fully in accordance with the revised requirements of the Home Office.

**DRIVING BELTS.**—A neat booklet is to hand from the Bell Rock Belting Co. (Norton Works, Gravel Lane, Salford), in which is given some particulars of the new "Zenith" belting. It has a textile basis, but is subjected to various preservative processes.

**"COMSTICK."**—A leaflet from S. W. Cuttriss (Park Row, Leeds) calls attention to a solid commutator dressing compound known by the above name, conveniently made up in sticks.

**SUPPLY ADVERTISING.**—We have received a copy of a revised and enlarged edition of the excellent electricity consumers' guide issued by the Grimsby Corporation Electricity Department.

**ELECTRIC DRIVING OF PRINTING MACHINERY.**—The Adams Manufacturing Co. (Balfour House, Finsbury Pavement, E.C.) have issued a second edition of their booklet on "Electric Control of Printing Machinery," which deals very thoroughly with control gear for electrically-driven printing machinery of

every description, and contains a mass of valuable information which should be in the hands of all interested in this subject.

**ELECTRIC COOKING APPARATUS.**—A series of leaflets from the Westminster Tool and Electric Co. (Suffolk House, Laurence Pountney Hill, E.C.) call attention to some of their electric cooking specialties, including a convenient grill suitable for cooking breakfasts for two or three persons, which can be used also for toasting and boiling. A larger cooker comprises a self-contained oven, combined with a grill and a boiling plate, capable of doing all the cooking for two or three persons. A complete range for eight persons, with large oven, three boiling plates, and a grill, all with three degrees of heat, is also listed.

### THE SHEFFIELD WIRING DEPARTMENT

THE Sheffield Corporation have, as a result of a conference with the local electrical contractors, come to an arrangement which will remove all opposition to their Bill now before Parliament, and will, it is hoped, tend to amicable working between the Corporation and contractors in Sheffield in future. The result of the Conference in question has led to the insertion of the following sub-section to the clauses in the Bill which at present, as modified by the House of Commons, give the Corporation full wiring powers. The sub-section reads as follows: "The Corporation may enter into contracts for the execution of any of the powers of this section, including the wiring of private property. The Corporation shall not, under the powers of this section, sell any such electrical fittings (other than electric lines, fuses, switches, ceiling roses, and such other electrical fittings as are used in connection with the wiring of private property from the distribution mains as far as ceiling, wall, or floor outlet only), except through a contractor carrying on his business independently of the Corporation." This means, of course, that the Corporation may wire as far as the ceiling roses and floor outlets, but that the contractor is to be left to supply, fix, and wire to the fittings and switches in the various rooms.

An announcement to the above effect was made on Tuesday, when the Sheffield Bill came up in the House of Lords for consideration of the House of Commons' reasons for disagreeing with the action of the House of Lords earlier in the session, when clauses to the effect that the Sheffield Corporation could only carry out wiring work through a contractor were inserted. The effect of the above agreement, however, was to obviate any necessity for discussion by the House of Lords, although the Earl of Donoughmore wished it to be distinctly understood that the House of Lords does not depart from the attitude they have taken up in recent years on this matter, viz., that municipalities should not be allowed to do wiring work.

The amendment, which is a compromise between the Corporation and the contractors, will now have to come before the House of Commons for their approval, but as it is agreed between the parties there is not likely to be any opposition.

### F. H. LOVELL & COMPANY, of ARLINGTON, NEW JERSEY, U.S.A.

#### DESIRE TO ANNOUNCE

That they maintain a large and well-equipped Brass Foundry, Machine-shop, and Finishing Rooms suitable for the manufacture or assembly of electrical and steam specialties. They are in close touch at all times with the U.S. Navy Department and the leading companies, whose patronage they have enjoyed for many years. They are therefore peculiarly fitted to handle under the new provisions of the new U.S. Act governing the free importation of material used in shipbuilding, such raw materials and such devices as can be imported in part and assembled here.

They solicit the inquiries of all those who are desirous of obtaining capable U.S. Agents for the handling of their products.

# ADAMS IGRANIC

ELECTRICAL CONTROL GEAR FOR PRINTING MACHINERY.

ADAMS  
M<sup>FC</sup> L<sup>T</sup>  
BEDFORD  
AND  
LONDON

## TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

A paper on "Directive Wireless Telegraphy," by Mr. F. Addey, was read recently before the London Centre of the Institution of Post Office Electrical Engineers. The early part of the paper deals with directive wireless from an historical standpoint as revealed by published researches and patent specifications. The Bellini-Tosi apparatus is next described. This has been most fully dealt with in *ELECTRICAL ENGINEERING* for Nov. 14th, 1907, Vol. II., p. 771; March 5th and April 2nd, Vol. III., pp. 848 and 507; July 14th, 1910, Vol. VI., p. 457; March 11th, 1909, Vol. V., p. 233; July 14th, 1910, Vol. VI., pp. 457 and 491.

There are two methods by which a ship can obtain her bearings by wireless. In the first, the shore station has a number of radiating aeriels from which signals are successively emitted, and the ship is provided with means by which the signals from each of the aeriels, the directions of which are known, can be distinguished, and the strength of each noted. In the second method a directive receiving apparatus is fitted on the ship, the shore station being non-directive. The first system has been developed by the Telefunken Co. Sixteen double directive aeriels are erected in the form of a symmetrical star. The inner end of each half aerial is led to one of 34 contacts, arranged in a circle. The leads from the two parts of one complete directive aerial are led to contacts at opposite ends of a diameter. The contacts immediately before the north and south contacts remain free; these are joined together and led to a non-directive aerial. A rotating switch which bridges a diameter of the circle, and is connected to the transmitter, causes signals to be emitted first on the non-directive and then successively on the directive aeriels. It makes one revolution each half-minute. By means of a stop watch the direction of the station can be determined, for each aerial radiates least in its own plane. By a modification of the Bellini-Tosi system the Marconi wireless compass has been developed. The opposite halves of each directive aerial are joined together at the top, the upper parts being insulated. The bases of the triangular aeriels are cut in the centre, and insulators inserted. The leads to the coils of the oscillation transformer are taken from each side of the cut aerial bases close to the insulators. Each aerial coil is divided in the centre, and a variable condenser inserted. These condensers are arranged so that their capacity can be simultaneously varied by the motion of a single handle. With this arrangement of the aerial system, it is found to be no longer necessary to make the dimensions of the antenna comparable with the length of wave to be received, a condition which evidently could not be met on board ship for the wave lengths used in practical wireless working.

The ordinary aerial and wireless installation are not altered in any way when the compass is fitted, but protecting switches are inserted in the aerial leads. Protective spark gaps are also inserted across the leads to each aerial. A pointer which moves over a graduated scale is attached to the axle of an exploring coil, which turns between coils in the aerial circuits.

An arrangement, by which the connection of the detector to the aeriels is made through an intermediate tuning circuit, and in which the detector circuit is also tuned, is intended for use by skilled operators. Where non-skilled operators only are available the exploring coil is joined, through two blocking condensers, directly to the detector. The aerial circuits alone are tuned, the detector circuit is aperiodic. Bearings can be taken to within two degrees. In practice, the apparatus is fixed so that the zero diameter of the circular scale is parallel to the ship's axis, and hence the position of the pointer gives at once the direction of the sending station. Automatic transmitting gear must be employed at the shore stations, of which there must be a large number, and they must be in continuous operation.

The Eastern and Eastern Extension Telegraph Companies are contemplating laying a new telegraph cable from Suez to Hong Kong, and have applied for the necessary landing rights. The route will be via Colombo, and a different route will be adopted to those of the cables to Bombay and Madras, so that the new cable may not be liable to simultaneous troubles due to subsidences, &c. Until the landing rights have been obtained, it is premature to publish any details of

the proposed cable, but we may state that in view of the enormous mechanical pressures to which ocean cables are necessarily subjected, there will be no suggestion of possible experiments with loading coils.

It has been decided that Mr. Marconi's evidence with regard to the Imperial wireless telegraph scheme will not be taken by the House of Commons Committee until after Easter. The whole time of the Committee since our last issue has been occupied in the cross-examination of Mr. W. R. Lawson, the financial journalist, who originally started the rumours that Cabinet Ministers had profited by their advance knowledge in regard to the agreement, and dealt in Marconi shares.

In our last issue, page 65, line 19, for "Sir Alexander Kennedy and the Secretary to the Post Office," read "Sir Alexander King, Secretary to the Post Office."

## ELECTRIC TRACTION NOTES

The half-yearly meetings of the Metropolitan Railway Company and Great Northern & City Railway Company were held on Wednesday last week, and in both cases the question of amalgamation was discussed at some length. However, whilst the shareholders of the Great Northern & City Co. passed the necessary resolution authorising the sale of their undertaking to the Metropolitan Co., the shareholders of the latter at present fail to see any great advantage in the proposed acquisition, and it was agreed to adjourn the meeting for a fortnight in order to allow a number of the larger shareholders of the Metropolitan Co. to confer with the Board on the matter.

After receiving a report as to the satisfactory working of trolley omnibuses at Leeds, Rotherham, and Bradford, the Hythe General Purposes Committee recommend that the trolley omnibus scheme of the National Electric Construction Co. shall be consented to. It is proposed, however, that one of the conditions of this consent shall be a contribution, not exceeding £1,000, for street improvements.

The South Eastern & Chatham Railway Co., naturally enough in view of the L.B. & S.C.R. results, has the question of electric traction under their careful consideration. In fact, the matter has gone so far as to have been in the hands of a leading consulting engineer for some time, and as soon as his report is received it is possible that some public announcement will be made.

Now that the amalgamation of the Central London Railway Co. and the City & South London Railway Co. with the London Electric Railway Companies has been formally approved by the respective shareholders, there will be, as might have been expected, considerable changes upon the boards of directors of the first named. Lord George Hamilton, Colonel Sir Herbert Jekyll, and Mr. A. H. Stanley join the Board of the Central London, the latter as Managing Director. Mr. H. F. Parshall retires from the Board, but continues as Consulting Engineer. Mr. Stanley will also be Managing Director of the City & South London, and another addition to the Board of this Company will be Mr. T. C. Jenkin, who has resigned his position as the General Manager of the Company. Lord George Hamilton has resigned from the Chairmanship of the London Electric Railway Co., and is succeeded by Lord Farrer.

An amusing summons was heard at the Bradford City Police Court last week. There is an inter-communication arrangement between the Leeds and Bradford tramway systems, and it appears that a man travelling in a Leeds car on the Bradford lines was summoned for a breach of the Bradford bye-laws, in using obscene language upon the car. The point was raised as to whether in the circumstances the Bradford police had any jurisdiction, as the offence took place on a Leeds tramcar, but eventually the magistrates decided to convict, and imposed a fine of 2s. 6d. and 13s. costs.



## "ELECTRICAL ENGINEERING" PATENT RECORD

*(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)*

### Specifications Published Jan. 30, 1913

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

**Names in italics indicate communicators of inventions from abroad.**

**412, 12. Telegraphing over Power Mains.** *SOC. INDUSTRIELLE DES TÉLÉPHONES.* Wherever a receiving station is required, a neutral point is formed between the conductors. Signals are sent from any place by earthing one of the lines through a resistance or inductance, since this sets up a P.D. to earth at each of the neutral points, which may be utilised to work a receiver. Two figures.

**6,061/12. Pulp Coils.** *F. A. BECKER.* The laminated core is divided, or its reluctance is regulated so that the magnetic flux is practically uniform. The core may consist of geometrically similar tubular cross-sections forced into one another, or bands of magnetic material may be spirally wound on one another. Four figures.

**8,260, 12. Igniters for Gas Burners.** *J. KEITH and G. KEITH.* A platinum filament is protected by a metallic cover having a small adjustable louvred piece. This louvred piece catches some of the main jet and diverts it inside the cover, where it is ignited by the filament. A large jet may thus be ignited with no risk of cooling the filament by the rush of gas. Two figures.

**9,492/12. Ignition Electrodes for Internal-combustion Engines.** *H. BAUER and M. ECKMEIER.* An air-driven rotary metal disc in the ignition chamber has both electrodes pointing towards it. The end of one scarcely touches the rim of the disc, while the end of the other is further removed. It is found that the spark, which is long, goes direct from one electrode set to the other, and in the direction of rotation of the disc, and there is no sooting. The disc may be made with pockets to ensure intimate mixing of the gases. Six figures.

**14,120 12. Overload Cut-outs to Automatically Cut-in Again.** *P. WESSEL and T. GYSLER.* A working relay is switched in on overload by the main circuit relay, which has a thin armature. The armature of the working magnet effects a periodical interruption of the main circuit through a contact arm provided with an air-brake. There is also an auxiliary paralleled contact in a slot in the iron core of the working magnet, the working of which is always effected after that of the main contact, and at a greater speed. A contact spring in the working magnet circuit maintains this circuit until the air-brake, after the demagnetising of the relay magnet, has moved a certain distance. Another contact spring, on the armature of the working magnet, is attracted, closing a circuit of the working magnet through its arm. Five figures.

**14,755 12. High-frequency Undamped Oscillations.** *V. F. FEENEY (Nat. Wireless Teleph. & Telegr. Co., U.S.A.).* Movable series electrodes are controlled by a solenoid through clutches which engage with them through springs compressed by the solenoid. The electrodes are liquid cooled, and alternate poles are metal and carbon. The carbon electrodes are perforated to allow of the free flow of the cooling liquid in the direction of the axis. Seven figures.

**14,835 12. Sterilisation of Milk.** *A. HEBRONNER, M. VON RECKLINGHAUSEN, and V. HENRI.* The milk is first raised to a temperature of 50° C. to 70° C. for a short time, and then subjected to the action of ultra-violet light.

**16,045 12. Transformer Boilers.** *J. BALLY.* The liquid is heated by the hysteresis and eddy currents induced in a magnetic container mounted in refractory material. The magnetic frame extends through a series of tubes in the form of hollow coils, which communicate at the top with a steam collector and at the bottom with a mud drum. A number of circular tube systems, constituting the secondaries of as many transformers, may be arranged one above the other or side by side in the same body. The magnetic core may also be formed of superposed hollow pieces or bundles of parallel tubes to form a feed-water heater. Three figures.

**19,890 12. Locomotives, Boats, &c.** *OERLIKON.* The driving motors have squirrel-cage rotors, and are fed by a polyphase alternator coupled to a prime mover on the vehicle. The speed of the rotors is governed by adjusting the speed of the prime mover while starting; stopping and reversing is effected by ordinary control gear.

**25,755 12. Sparkless Commutation of a Rotary Mechanically Coupled to an A.C. Booster.** *SIEMENS-SCHUCKERT.* The compensating windings are energised by a current varying with the load on the booster, as well as by the D.C. current from the converter. This extra exciting current may be derived from extra brushes on an auxiliary commutator on the booster, and lying in the direction of the main poles; auxiliary poles mid-way between the main poles are energised by the direct current from the converter. Auxiliary windings on the booster armature may be used, or else an auxiliary dynamo with con-

stant field driven by a D.C. motor whose armature is connected to the field coils of the booster. These two machines may be combined into one, having two commutators, and operating in conjunction with fields of different numbers of poles. Five figures.

### Specifications Published To-day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, E.C., at the price of 8d. each, post free.

**Summaries of some of the more important of these patents will appear in our next issue.**

**Arc Lamps:** PAULING [Electrodes for endothermic gas reactions] 24,051/12.

**Distributing Systems, &c.:** B. T.-H. and GARTON [With variable-speed generators] 1,681/12.

**Dynamos and Motors:** ROSENBERG [A.C. motor control] 1,979/12.

**Electrometallurgy and Electrochemistry:** ASHCROFT [Treating alloys of alkaline metals to obtain various products] 1,002/12; B.T.-H. (*A.E.G.*) [Welding] 2,343/12; ROUND and FISHER [Electroplating] 15,492/12; BOCUZE [Furnaces] 21,290/12; *GES. FÜR ELEKTRO-OSMOSE* [Extraction of water from animals, vegetables, or minerals] 23,545/12; COLLETT and NORSK KVAELSTOFAKTIESELSKAB [Ammonium phosphate and nitrate] 26,097/12.

**Heating:** BALLY [Boilers] 16,042/12.

**Ignition:** DIEHL [Rotating interrupters] 2,472/12.

**Incandescent Lamps:** BOSSON and GUESNIER [Vapour] 991/12; WILSON and CANDOLITE Co. [Candle lamps] 1,178/12; BALLY and PLEWS [Renewable] 3,906/12; LUSTED, 9,983/12; B.T.-H. (*G.E. Co., U.S.A.*) [Machines for forming filaments] 11,252/12.

**Instruments and Meters:** CLARK and MAY [Galvanometers] 9,094/12.

**Storage Batteries:** NIBLETT, 819/12.

**Switchgear, Fuses, and Fittings:** MÜLLER [Holders for lamps] 1,166/12; VICKERS, LTD. and CREFFIELD [Remote motor control] 1,280/12; PRICE [Switches] 5,562/12; PALMER [Lamp-shade holders] 18,177/12; LUNDBERG [Switches] 21,915/12; DE THIERRY [Automatic control for cut-outs] 22,251/12.

**Telephony and Telegraphy:** WILLIAMS [Enumeration of telephone calls] 28,171/11; REHDER and VOIGTSBERGER [Transmitting telegraphic code figures into words] 9,195/12; PEAKE [Wireless] 10,501/12.

**Traction:** SIEMENS BRÖS. (*Siemens & Halske*) [Block signalling] 5,559/12; [Signals for supervising relative positions of turn-tables, &c.] 14,658/12.

**Miscellaneous:** HUNTE and HUNTE [Battery lamps] 1,015/12; STERLING TELEPHONES (*Schaffner & Co.*) [Mine exploders] 5,712/12; KEITH and KEITH [Valve control] 6,517/12; BECKER [Pocket lamp] 19,246/12.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Distributing Systems, &c.:** BECKER [Abnormal pressure rise control] 12,908/12.

**Dynamos, Motors and Transformers:** CONRAD [Vapour rectifiers] 622/13.

**Electrochemistry:** *GES. FÜR ELEKTRO-OSMOSE* [Metal adsorptions] 29,049/12.

### Grant of Patent Allowed

20,451/11. **Telegraphic Relays.** *S. G. BROWN.* The Controller has allowed the grant of the Patent [ELECTRICAL ENGINEERING, Vol. VIII., Oct. 3rd, 1912, p. 550, and Oct. 10th, 1912, p. 564] subject to amendment.

### Lapsed Patent Restored

7,471/00. **Submarine Telegraphy.** *S. G. BROWN* [ELECTRICAL ENGINEERING, Vol. VIII., Oct. 24th, 1912, p. 588].

### Expired Patents

The following are the more important Patents that have become void through non-payment of renewal fees.

**Arc Lamps:** D. TIMAR and K. VON DREGER [Parallel carbon lamps] 25,045/07.

**Distribution Systems, &c.:** B.T.-H. (*G.E. Co., U.S.A.*) [Control of two or more motors: fields supplied from unipolar generator] 22,868/07.

**Ignition:** P. A. POPPE [Contact maker] 22,808/07.

**Incandescent Lamps:** C. O. BASTIAN and G. CALVERT [Sealing wires of copper or copper alloy into glass] 22,911/06; [As 22,911/06 but for all oxidisable metals] 22,911/06.

**Instruments and Meters:** A. O. BENECKE [Damping vanes and enclosing case] 22,356/02.

**Switchgear, Fuses and Fittings:** W. SCHMIDL and ARMORPACT MFG. CO. [Screwed conduits and junction boxes] 22,789/06; J. S. RAWORTH and A. RAWORTH [Series-parallel motor controllers] 23,075/06.

## LOCAL NOTES

**Accrington: Large Power Supply.**—Messrs. Peebles & Co., of Rishton paper mills, have applied for a minimum supply of 1,000,000 units per annum. A Sub-committee has been formed to negotiate the matter.

**Bedford: Street Lighting.**—The Electrical Engineer recommends mains being laid in certain districts for street lighting, as he anticipates that once the mains are laid for this purpose there will be a good demand for private lighting.

**Dudley: Sale of Electricity Undertaking.**—We announced some time ago that Mr. C. E. Savage, the Council's Chief Electrical Engineer, had accepted a position under the Earl of Dudley at Baggeridge Colliery. The Council have now advised that arrangements should be made for Mr. Savage to devote a certain portion of his time to look after their interests until the undertaking is transferred according to the arrangements which have already been made. The salary proposed for this work is £25 per month. After the transfer it is suggested that Mr. Savage should be retained at an annual fee of £21 for the purpose of inspection in the interests of the Council.

**Liverpool: New Plant at Lister Drive.**—We reported briefly a short time ago that Mr. Harold Dickinson, the recently appointed City Electrical Engineer, had prepared a scheme for the re-arrangement and extension of the generating plant at Lister Drive No. 1 power-house. A 3,500-kw. vertical Curtis turbo-alternator, representing the first portion of a reconstruction scheme prepared by his predecessor in 1911, is at present on order, and when this is delivered the capacity of the station will be 11,000 kw. He also advises the laying down of four additional sets of 5,000 kw. or 6,000 kw. each, instead of two 3,500-kw. vertical Curtis sets as originally contemplated. When the previous 3,500-kw. Curtis turbo-generators were ordered, the British Thomson-Houston Co. gave the Corporation a favourable option in the matter of price for the purchase of two others, but the Engineer considers the larger units as the right policy. Negotiations are being carried on with the B.T.-H. Co. in this connection. The boiler capacity for these extensions, Mr. Dickinson proposes, should be furnished by water-tube boilers, and he suggests the replacement at once of a battery of seven of the existing Lancashire boilers by water-tube, and the ultimate replacement of a further seven boilers as the additional generating plant is installed. Among other alterations proposed is the provision of a sub-station in the old Pumpfields Station, so that the uneconomical steam plant there can be shut down altogether for the greater part of the year.

**London: Woolwich: Development of Electricity Undertaking.**—Apparently great efforts are to be made in connection with Mr. J. F. C. Snell's scheme for reorganising the electricity undertaking, in order to put it upon a sound financial basis. Last week we reported that an offer had been made to the Erith Council to give a supply in bulk, and we now learn that a similar offer is being made to the Bexley Council.

**Wood Green: Electricity Supply.**—Considerable controversy is taking place as to the relative advantages of the supply of electrical energy in this district being in the hands of the Tottenham & Edmonton Gas Co. or the North Metropolitan Electric Power Company. At a public meeting recently the voting went in favour of the latter course after a speech by M. E. T. Ruthven-Murray, Chief Engineer to the Electric Power Company. The Council, who is being advised by Mr. G. W. Spencer Hawes, is at present giving its support to the Gas Company's proposal to acquire their electric lighting Provisional Order for £500.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

[Notes of Contracts Open are not repeated under this heading week by week until the last date for receiving tenders, as is done in some of our contemporaries, but are only inserted once.]

## Generating Stations, Sub-Stations, Mains, &amp;c.

**Aberdeen.**—The recommendation to instal new plant at the power house has now received the sanction of the Corporation. The main cause of the necessity for this new plant is an increase in the consumption of current for power purposes,

some 7,000 h.p. being at present connected to the mains. Approximately 50 per cent. of the motors are hired out. An interesting feature is the large number of electric derrick cranes now being used at granite yards. A supply is contemplated to Banchoory and Ballater, in connection with which high tension cables will be required. Total borrowing powers amounting to £80,000 are to be sought.

**Barking.**—Extensions of the generating plant are under consideration.

**Bedford.**—A loan of £1,800 for house services is to be applied for.

**Bolton.**—A Local Government Board inquiry was held last week concerning an application for powers to borrow £122,200 for the new power station. A period of 30 years was asked for the repayment of the loan. Generation will be at 6,500 volts 50 cycles, and the new works will be linked up with the existing power station. The initial plant will be two 4,000 kw. turbo-alternators, and four water-tube boilers, each capable of evaporating 34,000 lbs. per hour.

**Darlington.**—One 1,000 kw. steam turbo-alternator; one 750 kw. and one 250 kw. rotary converters; one water-tube boiler capable of evaporating 15,000 lbs. per hour. Borough Electrical Engineer. Feb. 17th.

**Derby.**—A 2,000-kw. turbo-alternator is required (see an advertisement on another page).

**Liverpool.**—Considerable extensions are contemplated at the Lister Drive power-house (see under Local Notes).

**London: St. Marylebone.**—Converting plant. General Manager, February 12th. (See advertisement on another page.)

**Oldham.**—A 2,000 kw. generating set is to be substituted for the 1,500 kw. set originally intended in the application for a loan, which will shortly come before the Local Government Board.

**Stoke-on-Trent.**—A loan of £27,196 has been sanctioned for electrical extensions.

**Waterford.**—An electric lighting scheme put forward by Mr. Lawless at an estimated cost of £3,900 has been adopted by the Asylum Board.

**Widnesbury.**—A loan of £3,000 is to be applied for in connection with mains and house service extensions.

**Wrexham.**—Extension of the mains into Rhos is under consideration.

**York.**—The City Electrical Engineer has reported the necessity for a new 3,500 kw. alternator (£14,257); two water-tube boilers, chain-grate, stokers, &c. (£4,170); high-tension cables (£6,551); new battery and battery room (£4,722); stores, sheds (£600). The Electricity Committee recommend the necessary application being made to the Local Government Board.

## Wiring

The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.

**Birmingham.**—New Weights and Measures offices, Corporation Street. City Engineer.

**Bristol.**—Swimming bath. City Engineer.

**Cardiff.**—Thirty workmen's cottages. City Engineer.

**Colchester.**—School in Hamilton Road. Education Offices.

**Falmouth.**—Forty-four houses for the Council.

**Glasgow.**—Cinematograph theatre, Main Street, Pollok-shaws.

**Llanelli.**—New Town Hall.

**London: L.C.C.**—Camberwell and Cressy Road car sheds. February 25th.

**Lewisham.**—The electric lighting of the infirmary is under the consideration of a Sub-committee.

**Manchester.**—Riding school. Colonel Winder, National Buildings, St. Mary's Parsonage.

## Miscellaneous

**Leeds.**—Twelve months' supply of stores for Tramways Department. Tramways Manager, February 17th.

**Leeds.**—Ten new cars are required by the Corporation.

**London: Battersea.**—One year's supply miscellaneous stores for Electricity Department, including meters, joint

## THE RECORD ELECTRICAL Co., Ltd.

LONDON OFFICE:  
CAIXTON HOUSE,  
WESTMINSTER, S.W.

Telephone:  
3087 Victoria.  
Telegrams & Cablegrams:  
"Infusol."  
London.

MEASURING  
INSTRUMENTS.

RECORD'S PATENT.

Write for Prices & Particulars.

WORKS:  
BROADHEATH,  
MANCHESTER.  
Telephone:  
104 Altrincham.  
Telegrams & Cablegrams:  
"Infusol."  
Altrincham.

boxes, carbon and metal filament lamps, &c. Borough Electrical Engineer, February 12th. (See advertisement on another page.)

**St. Marylebone.**—Twelve months' supply of various stores for Electricity Department. Town Clerk, February 26th. (See advertisement on another page.)

**St. Pancras: Arc Lamp Carbons.**—Borough Electrical Engineer, March 4th. (See advertisement on another page.)

**Manchester.**—Twelve months' supply of stores for Tramways Department. Tramways Manager, February 18th.

### TENDERS RECEIVED AND ACCEPTED

**Eastbourne.**—The Corporation have accepted the tender of the British Westinghouse Co. for a 1,500 kw. turbo-alternator, without condensing plant, running at 3,000 r.p.m., at £5,236. The turbine is of the pure impulse type. Fifteen other tenders were received.

**Epsom.**—The tender of the Electric Construction Co. for an electrical pump at the waterworks has been accepted at £368.

### APPOINTMENTS AND PERSONAL NOTES

Mr. H. P. Stokes, on the occasion of his leaving the Ilkeston Electricity Department to take up his appointment as Chief Electrical Engineer at Bexley Heath, was entertained to dinner on January 22nd by members of the Council, and presented with a silver tea urn by the Mayor. He has also been presented with a silver cake basket by the station staff.

The following short list has been chosen from the applicants for the post of Burgh Electrical Engineer at Wishaw:—G. H. Bellwood, Wishaw; W. J. Cooper, Uddingston; William M'Farlane, Holytown; J. W. Slorach, Hamilton; L. S. Thomson, Jordanhill (Glasgow); and S. Williams, Motherwell.

Among the salaries of head officials of the Birmingham Corporation which are being recommended for increase are those of Mr. R. A. Chattock, the City Electrical Engineer, from £1,200 to £1,500, and Mr. H. Foulds, Secretary of the Electric Supply Department, from £600 to £750 per annum.

A new scale of salaries has been established for electrical engineers and assistant electrical engineers under the Admiralty. Electrical Engineers, £450, rising by £20 increments to £650 per annum, with official residence or an allowance of £50 to £75; electrical engineers, lower grades, £300, rising by £15 increments to £400 per annum, with official residence, or an allowance of £50; first assistant electrical engineers, £250 to £350, and second assistant electrical engineers, £200 to £250.

Mr. W. Innes, Assistant Electrical Engineer to the Poplar Borough Council, has resigned.

It is recommended that the salary of Mr. W. Fennell, Borough Electrical Engineer, at Wednesday, be increased from £300 to £325 per annum.

Young electrical engineer required to assist in catalogue and advertising work, by Messrs. Siemens Bros. & Co., Ltd. (See an advertisement on another page.)

Foreman wanted for wiring work. (See advertisement on another page.)

**Obituary.**—The death of the Earl of Crawford and Balcarres, F.R.S., removes one of the founders of the Institution of Electrical Engineers and the first Vice-President (1872-4). At the time of his death Lord Crawford was the senior surviving officer. In 1869, he (then Lord Lindsay) started an electrical laboratory in Eaton Place, and it was there that the first inception of the Society of Telegraph Engineers was made. He was made a Fellow of the Royal Society in 1878, and in the same year was President of the Royal Astronomical Society. For the last twenty-three years he was Chairman of the Governors, Faraday House, where much of his original apparatus is preserved. The Institution of Electrical Engineers was represented at the memorial service in the Chapel Royal, St. James's, on Tuesday, by Mr. W. Judd, Mr. R. Hammond, and Mr. F. R. Rowell.

The death is reported of Dr. G. P. de Laval, well known as the Swedish inventor of the high-speed impulse steam turbine bearing his name. His sphere of activity was wide,

and embraced various chemical and other industries. He was the pioneer of centrifugal separators, constructed a boiler working up to 3,000 lbs. per sq. in., and was connected with a number of manufacturing companies and large electrical power schemes in Sweden.

### MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. Geo. Smith & Son, of 5, Philpot Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f., port of arrival, quoted on Tuesday night, was £74 10s. to £75 10s. (last week, £74 15s. to £75 5s.).

**Tantalum and Wotan Lamps.**—Siemens Brothers' Dynamo Works, Ltd. (incandescent lamp and fitting department, Tyssen Street, Dalston), inform us that they have arranged for the production of cinematograph films showing the processes of manufacture of Tantalum and Wotan drawn-wire lamps at the majority of first-class cinema theatres.

**The Langdon Davies Motor Co.**—This company have installed an additional telephone service (City 3888) at their City office, 110 Cannon Street.

**The Machine Tool and Engineering Association.**—The address of this Association is now Queen Anne's Chambers, Tothill Street, Westminster, S.W. (Telegrams: Toolxib, London: Telephone, Regent 125).

**Magic Appliances, Ltd.**—Mr. W. C. Jeary, General Manager, has been elected to a seat on the Board of this company.

**The M.A.N.**—The London offices of the Maschinenfabrik Augsburg-Nürnberg A.G. are being moved next week from the East block to a larger suite on the first floor of the West block of Caxton House, Westminster.

**Electrical Conduits, Ltd.**—We are informed that Mr. J. R. A. Hemming has ceased to represent this company (of 18 Bennett's Hill, Birmingham), and has no longer authority to act for them in any way.

**Osram & Robertson Fancy Dress Dance.**—This annual function was held on Saturday last, and was much enjoyed by the 300 persons present. Prizes were awarded to Misses Ralombo, Brayshaw, Bignell, and Ritchie and Messrs. Woodward and Cook, and were presented by Mrs. C. Wilson. Mr. and Mrs. H. Hirst, Mr. M. Railing, Mr. F. Sells, and Mr. and Mrs. Shepperd were amongst the company.

**The "Mazda Gems" Bohemian Concert.**—An exceedingly successful concert was given by the employees of Mazda House on Monday evening. The musical items and recitations were excellent. Some cleverly-executed caricatures of leading members of the staff appeared on the programmes. A concert of the employees at Rugby was being held simultaneously, and telegrams of greeting were exchanged.

**Who said Strength?**—A coloured gentleman named William Osram was riding on a bicycle when he came into collision with a refuse cart belonging to the Public Health Committee of the Johannesburg Municipality. As has happened with numerous namesakes of his, Osram was undamaged, but he obtained £10 compensation from the Johannesburg Corporation for damage to the machine.

**MARRYAT**  **PLACE**  
**DYNAMO & MOTOR HOSPITAL,** 28, HATTON G<sup>o</sup>, LONDON, E.C.

#### EVERY INSTALLATION ENGINEER

Should join his Trade Protection Organisation,

THE

### ELECTRICAL CONTRACTORS' ASSOCIATION

(Incorporated).

*Inquiries cordially invited by the Secretary,*

L. G. TATE,

20, Bucklersbury, LONDON, E.C.

# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 320 [Vol. IX., No. 7]  
*All rights reserved.*

THURSDAY, FEBRUARY 13, 1913.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES AND TECHNICAL COLLOQUIAL ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

*Other Advertisement Rates on Application.*

*Latest Time for Advertising*

Letters for Insertion, Tuesday first post.

Small Advertisements and Official Announcements, Wednesday first post.

Displayed Advertisements, Tuesday first post.

Corrections in Standing Advertisements, Monday first post.

All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 208-206, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Cireling, Fleet, London."

Telephone No.: 5509 Holborn.

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## CONTENTS

	PAGE
SUMMARY	83
Arrangements for the Week	84
Electrical Equipment of the Swansea Docks	85
A New Electrically-driven Fire Escape	88
A Mains Breakdown in Manchester	88
Salford Corporation to Buy in Bulk from a Power Co.	88
Annual Dinner of the Institution of Electrical Engineers	89
New Plant at the Hornsey Generating Station	89
The Large Central Station Battery at Manchester	89
A Balancer Starter	90
Laundry Irons	90
A Chain Pull Switch Holder	90
The Association of Electrical Station Engineers	90
Questions and Answers by Practical Men	91
Catalogues and Pamphlets Received	91
Electric Traction Notes	92
Telephony and Telegraphy (Including Wireless)	92
Patent Record	94
Local Notes	95
Tenders Invited and Prospective Business	95
Tenders Received and Accepted	96
Companies' Meetings, Dividends, &c.	96
Miscellaneous Business Notes, &c.	96

## SUMMARY

A NEW electric power station has been established in connection with the Swansea Docks. Current at 3,000 volts is generated by turbo-alternators. There are four sub-stations, where the pressure is reduced to 430 volts A.C. or 250 volts D.C. Open-type arc lamps are largely used for lighting, while metal filament lamps have been recently introduced. A number of D.C. cranes are already in use and a 700-ton Scherzer bridge of 100-ft. span is worked through a C.M.B. converter, and has an elaborate system of signalling and interlocking. The fittings and repair shops have been converted from steam to electric drive. Besides

the equipments on the docks a number of works take power for machine tools, cranes, lighting, &c. Witton-Kramer magnets are being adopted for lifting iron pig and scrap. (Page 85.)

THE London County Council has just acquired a new electrically-driven Cedes "turn-table fire escape," in addition to twelve "first-aid ladders" which have been in successful operation for some time past. (Page 88.)

A BURN-OUT of five pairs of 1 sq. in. feeders in Manchester interrupted the supply in one of the sections of the city for 1½ hours last Friday. Although the cables were completely burnt through, normal current was hardly exceeded, and the cut-outs did not act; in fact, the station only knew of the interruption an hour after it had occurred. (Page 88.)

SALFORD Corporation have accepted an offer for supply "in bulk" from the Lancashire Power Co., at an extremely low price. (Page 88.)

A JOINT meeting of the Institution of Electrical Engineers and the Société Internationale des Electriciens will be held in Paris in the last week of May. This announcement was made by the President of the Société, Monsieur Grosselin, at the Annual Dinner of the Institution of Electrical Engineers last Thursday. At the dinner the Postmaster-General proposed the toast of the Institution, and made an interesting statement with reference to the Technical Committee nominated in connection with the consideration of the Marconi contract. (Page 89.)

A NEW 750-kw. triple-expansion direct-coupled set was officially started up at Hornsey on Saturday last. (Page 89.)

MR. F. H. WHYSALL's paper on the results of working of the large Manchester battery has been further discussed by the Manchester Local Section of the Institution of Electrical Engineers. (Page 89.)

A BALANCER starter, a new design of laundry iron, and an improved switch-holder are described in illustrated articles. (Page 90.)

A MEETING was held last week in London in connection with the proposed formation of an association of engineers in subordinate positions in generating stations. (Page 90.)

THE design of generators for use with Tirrill regulators is discussed in our "Questions and Answers" columns. (Page 91.)

WE refer to prospects of considerable extensions of railway electrification in London in the near future, and an important extension of the North-Eastern electric lines. The Melbourne electric railway scheme is also being pushed forward. Some information is given of a large American railway scheme. The Oxford Corporation propose to enforce the penalties for the non-completion of the electric tramways. (Page 92.)

MARCONI's Wireless Telegraph Co. have informed the Government that unless the contract for the pro-

posed Imperial wireless telegraph scheme is confirmed by Parliament by March 1st they will treat it as not binding. An underground telephone cable with Pupin coils is to be laid between Zurich and Basle. An appeal has been entered by the Postmaster-General against the portion of the telephone award dealing with the raising of capital. A large number of automatic telephone instruments are to be used in New Zealand. (Page 93.)

THE Specifications published by the Patent Office on Thursday last included one by the B.T.-H. Co. and E. Garton for a pressure regulator and switching arrangements for automobile lighting from a variable-speed dynamo and accumulator set. Another specification deals with the speed control of two or more induction motors arranged in cascade, by E. Rosenberg, while W. S. Peake protects an emergency calling-up system for wireless stations, and J. H. de Thierry an automatic resetting overload circuit-breaker which only permanently opens the circuit if the overload persists through an adjustable time-limit. (Page 94.)

MR. J. A. BELL, the City Electrical Engineer, Aberdeen, is claiming £1,000 damages against the local Electrical Contractors' Association.—The Scarborough Corporation contemplate purchasing the local Electric Supply Co.—The position of the Walsall Electricity Undertaking is causing some concern.—The Shropshire Power Co. has been deprived of its powers in certain districts recently incorporated in Birmingham.—Good progress is being made with the extensions to the Dundee power station.—A power contract has been entered into in Belfast on the basis of 30s. per kw. per annum, plus 0.5d. per unit. (Page 95.)

Two 8,000-kw. turbo-alternators, rotary converters, and transformers are required by the L.C.C.; two 5,000-kw. turbo-alternators at Stepney; economisers at Shoreditch, and a new generating set at Maidstone. Mains costing £30,000 are contemplated at Rochdale, and £1,000 at Peterborough. Stores are required at Ilford, and electric numns at Hereford. (Page 95.)

A BONUS dividend of 7s. 6d. per share is to be paid by the Chloride Electrical Storage Co., and a dividend of 15 per cent. for 1912 by Messrs. W. T. Henley's Telegraph Works. The Yorkshire Electric Power Co. made a net profit of £7,361 last year. (Page 96.)

## ARRANGEMENTS FOR THE WEEK

(TO-DAY) THURSDAY, FEBRUARY 13TH.

*Institution of Electrical Engineers.*

8 p.m. "Notes on Parallel Operation," by A. R. Everest.

*Institution of Electrical Engineers: Dublin Section.*

8 p.m. At Royal College of Science.

*Junior Institution of Engineers.*

2.30 p.m. Visit to Osram Lamp Works, Hammersmith.

SATURDAY, FEBRUARY 15TH.

*Institution of Electrical Engineers: Scottish Section.*

Annual smoking concert at the Grosvenor, Glasgow.

*Birmingham and District Electric Club.*

6.30 p.m. Annual dinner at Swan Hotel, New Street.

*Old Centralians.*

6.45 for 7.30 p.m. Annual general meeting and dinner at Trocadero.

MONDAY, FEBRUARY 17TH.

*Institution of Electrical Engineers: Western Section.*

4 p.m. At Bristol University. "Some Uses of the Stroboscope," by Prof. David Robertson.

TUESDAY, FEBRUARY 18TH.

*Institution of Electrical Engineers: Manchester Students' Section.*

7.30 p.m. At Municipal School of Technology. "Time Limits," by H. B. Constantine.

WEDNESDAY, FEBRUARY 19TH.

*Institution of Electrical Engineers: Students' Section.*

7.45 p.m. At Victoria Embankment. "Electricity Supply Policy," by G. W. P. Page.

*Association of Mining Electrical Engineers.*

7 p.m. North of England Branch. At Armstrong College, Newcastle. Paper by Mr. R. Nelson, Chief Electrical Inspector of Mines.

## The London Electrical Engineers.

(TO-DAY) THURSDAY, FEBRUARY 13TH. C. Company.—Company Training, 7 to 10 p.m.

FRIDAY, FEBRUARY 14TH. D. Company.—Recruit Training, 7 to 10 p.m.; Company Training, 7 to 10 p.m.

SATURDAY, FEBRUARY 15TH. Headquarters open for Regimental business from 10 a.m. till 12 noon.

MONDAY, FEBRUARY 17TH. A. Company.—Recruit Training, 7 to 10 p.m.; Company Training, 7 to 10 p.m.

TUESDAY, FEBRUARY 18TH. B. Company.—Company Training, 7 to 10 p.m.



BUILDER to ELECTRICAL CONTRACTOR (who has looked in on newly completed job):—"Look here, the next job you do for me has got to be in casing. I ain't going to waste time and spoil tools trying to get through your infernal tubes. Besides, you can get a fixing in wood! . . . might as well have gas!"



## ELECTRICAL EQUIPMENT OF THE SWANSEA DOCKS

BY the kindness of Mr. D. Fulton (Electrical Engineer, Swansea Harbour Trust) we were enabled recently to examine the interesting electrical equipment which has been completed at the Swansea Docks. It is only about three years ago, when the "King's" Dock was nearing completion, since the first step towards electric power supply was taken, and progress has been rapid. There are now in operation many electric cranes, machine tools, blowers, &c., in addition to the lighting and signalling. An inspection of the sketch plan of the docks, Fig. 1, will show that the Swansea Harbour Trust owns a considerable amount of land, some of which has been recently reclaimed. Many works are being attracted to sites on this land on account of the electric supply available at reasonable rates.

from there by a Gwynne pump connected by a flexible coupling to a motor, which also drives Edwards' air and force pumps through rawhide and cast-iron gearing. The motor for the 810-k.v.a. set is 20 h.p., and for the 440-k.v.a. sets 15 h.p., squirrel-cage type, supplied by Bruce Peebles & Co., Ltd., and controlled by British Westinghouse auto-controllers. When the water in the dock is lower than the circulating-water inlet, the circulating water is supplied by a 12-h.p. Crompton motor-driven Gwynne pump, which can deliver 2,000 gallons of water per min. against a total head of 10 ft. All the auxiliary motors in the station are supplied from a 95-k.v.a. transformer, which steps down from 3,000 volts to 480 volts. The alternators of Bruce Peebles & Co.'s manufacture are star-connected. The rotors are of the cylindrical type, and

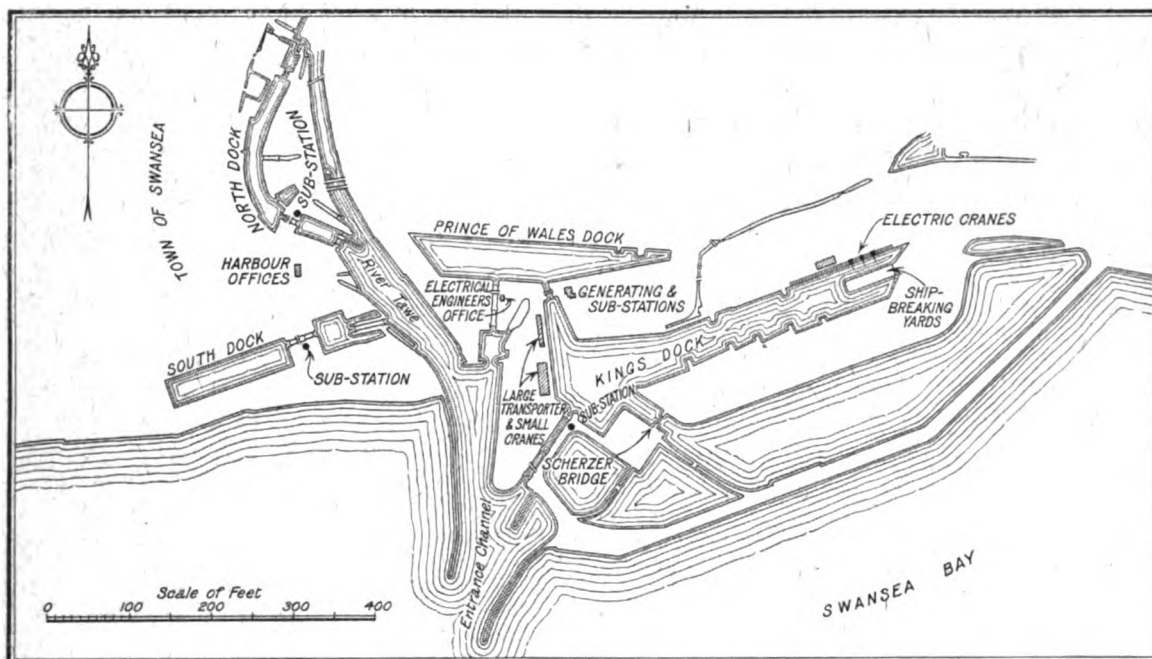


FIG. 1.—SKETCH PLAN OF THE SWANSEA DOCKS.

The original lighting of the docks was carried out by two 150 kw. 100 cycle 2,500 volt single-phase alternators, but on the opening of the King's dock in 1909 it became necessary to increase the supply, and Mr. Fulton, who had just joined the Trust, made arrangements for the loan of the machines used by the dock contractors, while the final scheme matured. The pressure was 250 volts D.C., and this had to be maintained by the new plant.

Power is now generated and transmitted at 3,000 volts three-phase. All motors above 50 h.p. are run at this pressure, while smaller ones are run at 480 volts or else 250 volts D.C. The generating station is on the site of an old hydraulic station, so that any trouble due to uncertainty of foundations was avoided. The generating plant at present consists of one 810-k.v.a. three-phase 50-cycle 3,000-volt turbo-alternator, and two of 440-k.v.a. capacity.

The turbines are of the Willans-Parsons reaction type at 3,000 r.p.m.; the steam pressure is 180 lbs. per sq. in., superheated 150° F. The overload capacity is 25 per cent. continuously, obtained by bye-pass valves, which can also maintain normal full load non-condensing. The main governor acts upon a double-beat equilibrium valve, and controls the turbine within 2 per cent. at all loads. A runaway governor, also workable by hand, comes into action when the speed increases 10 per cent., and cuts off steam. A Willans and Robinson's surface condenser fitted with an augmeter is used. Cooling water is brought from the dock through a culvert into a well, and pumped

the slip-rings are of mild steel. The ventilation is by fans at each end of the rotor, and the air is discharged at top and bottom of the stator-cases. The exciters are of Bruce Peebles multipolar protected interpole type; the regulation is done by rheostats close to the machines on the shunt circuits of the exciters only. Callender's single-core lead-covered 2,500-megohm cables, carried on rack insulators underneath the floor and through ducts, lead to the generator panels. Each set is entirely independent. The main steam pipe and the atmospheric exhaust and condenser pipes are carried under the floor, the valves being operated through extended rods.

The boiler-house is equipped with four hand-fired 30 ft. by 8 ft. Lancashire boilers and Hotchkiss circulators with Sisson superheaters, built by H. & T. Danks, Ltd. (Netherton), and fitted with the "current" incandescent fire bridge. A Green economiser of 288 tubes is placed at the back of the boilers. The main switchboard is on the main floor level, and, together with all the other boards, was supplied and erected by Crompton & Co., Ltd. It consists of three generator panels with exciter panels directly underneath, seven H.P. feeder panels, and four L.P. distribution panels. The board is of the separate compartment type. Isolating switches are fitted to every cell, and are interlocked with the expanded metal doors. The bus-bars are similarly enclosed behind expanded metal screens. A rotary synchroscope, made by Everett,

Edgumbe & Co., is placed on a swivel bracket at the end of the board, and a N.C.S. leakage indicator is mounted under one of the H.P. feeder panels. Arresters of the General Electric Co.'s make, fitted with isolating switches, are mounted on the wall at the back of the board. The power factor of the system is about 0.75, and the installation of a phase advancer is under



FIG. 2.—ELECTRIC GANTRY CRANES AT THE NEW KING'S DOCK.

consideration. The fuel used is ordinary steam coal, and we understand that the generating costs including all charges work out at about 0.5d. per unit. Three-and-a-half lbs. are used per B.O.T. unit generated.

There are four sub-stations, one in the generating station and the others at King's Dock, North Dock, and South Dock. In the first there are two 100-kw. interpole Crompton motor-generators, and in each of the others two 60-kw. interpole motor-generators and a 375-k.v.a. transformer. The H.P. panels are of similar design to the main switchboard. The motor-generators are controlled by oil-immersed auto-transformers.

The whole layout, including that of the generating station, has been effected with the idea of considerable expansion in mind, so that no great difficulty is likely to be met with when further extensions are necessary. The fire risk at the switchboards is small.

The lighting of the dock quays, locks, railway sidings, railway and dock signals, and main roads is by 180 10-amp. Crompton open-type lamps, 55 7.5-amp. Crompton-Blondel flame arcs, and 35 6-amp. Crompton enclosed arcs. The sheds on the King's Dock are lit with open-type arc lamps, and those on the Prince of Wales, North and South Docks by Osram metal fla-



FIG. 3.—UNDERHUNG JIB TRANSPORTER CRANE IN WAREHOUSE ON THE NEW KING'S DOCK.

ment high and low candle-power lamps, as well as the head offices, trustees', workshops, &c. The arc lamps have clear glass lanterns, as the cost of replacement in case of fracture is low. The power supplied to the tenants on the estate is used for sawmills, fuel works, anthracite coal crushing and screening, flour mills, ship-breaking yards, dry docks, &c.

The ship-breaking yards are those of T. W. Ward & Co., Ltd., and the Shipbreaking Co., Ltd. The equipment of the former includes about 250 h.p. in motors, embracing a 40 h.p. shears, a 20 h.p. shears, a 5-ton gantry crane, a 30-ton jib crane, a smaller crane for feeding the shears, a Witton-Kramer magnet,

&c. The latter company have, besides a three-phase ball breaking gear, a somewhat similar equipment, and are, we believe, contemplating very considerable extensions to the electrical equipment. The Great Western Railway Co.'s repair shop takes 25 h.p. for its machine tools, and the company also maintains about 100 arc lamps. The Trust's fitting shops are entirely electrically driven, having three 25 h.p. and two 10 h.p. slip-ring Crompton-protected motors, and one 60 h.p. Peebles slip-ring protected motor, controlled by Ellison oil-immersed gear. The smaller motors drive lathes, a Roots blower for the blacksmiths' fires, punch, shears, plate bending tools in the boiler-makers' shop, a circular saw and wood-working machinery, &c. The 60 h.p. motor drives an air compressor for the hammers in the smiths' shop, and portable pneumatic tools. The costs have been reduced about £5 per week since the three small steam engines were done away with.

The mains are carried on creosoted wooden poles, and are double-braided copper. The H.P. mains are suspended from a No. 8 S.W.G. galvanised steel wire by Henley's rawhide suspenders; the cables going under the dock locks are the British Insulated & Helsby Cable Co.'s paper-insulated lead-covered and armoured. The overhead mains are brought into a galvanised iron cabin at each side of the locks, and connected to the submarine cables through trifurcating boxes. Distributing boards in these and similar cabins in different parts of the estate control the lamps and other circuits.

Three electric cranes, of 2 tons capacity, are in use on the King's Dock (Fig. 2). They were manufactured by C. & A.

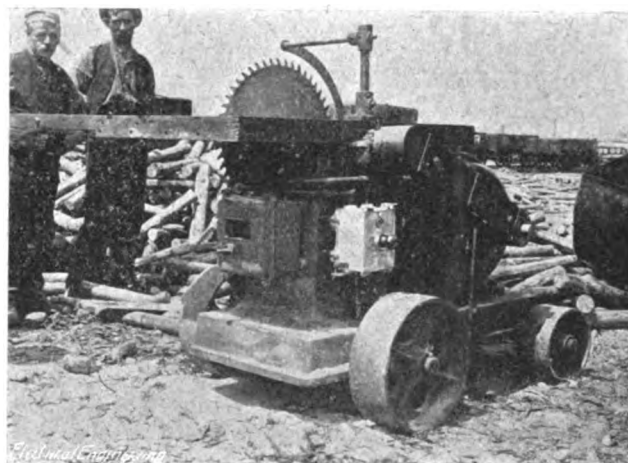


FIG. 4.—PORTABLE ELECTRIC SAW BENCH.

Musker, Ltd. (Liverpool), and travel on a gantry 21 ft. high and 52 ft. 3 in. long; this has an overhang over the road of 17 ft., while the radius of the jib is 50 ft. 6 in., and the height of lift 70 ft. For full load the lifting speed is 300 ft. per min.; slewing, 400 ft. per min.; cross travelling, 150 ft. per min.; and longitudinal, 20 ft. per min. The motors are of 60 b.h.p. for hoisting, 5 b.h.p. for slewing, 10 b.h.p. for cross travel, and 5 b.h.p. for longitudinal travel. They are totally enclosed Peebles D.C. interpoles series machines, with a temperature rise of 70° F. at the one hour rate. The controllers are of the British Westinghouse tramway type. Overwinding switches are provided on the hoisting motions, and limit switches on the cross travelling motions. The gearing is cast steel machine cut throughout, magnetic brakes are fitted on the hoisting and cross travelling motions, a foot brake is also provided on the hoisting motions, the magnetic brake can also be released by a pedal, enabling the load to be lowered by gravity. One of the cranes is fitted with a Witton-Kramer 42 in. lifting magnet, controlled by an oil-immersed controller with non-inductive resistance in the driver's cabin. The feeding cable is taken from the cabin to two slip rings enclosed in a spring drum on the jib, and over wooden sheaves to the magnet. The average lift is 16 cwt. of pig iron, out of rough pile in ship's hold into trucks. Whilst unloading a cargo by slings recently, one lift was dropped into the dock. The magnet afterwards lifted it out. An installation of three jib cranes is projected. In a shed on King's Dock, 400 ft. long and 60 ft. wide, is a 3½ ton overhead travelling crane with underhung jib (Fig. 3), manufactured by Herbert Morris & Bastert, Ltd. (Loughborough). It has been working for about three years, and has four motions, longitudinal and cross transverse, hoisting and slewing. The full load speeds are:—Hoisting, 45 ft. per min.; longitudinal travel, 500 ft. per min.; cross travel, 125 ft. per min.; slewing, 250 ft. per min. The h.p. of the motors, one hour's rating, is:—Hoisting, 20; longitudinal travel, 20; cross travel, 5; slewing, 5. An overwinding switch is con-

nected in the hoisting motion, and a limit switch in the cross travelling motion. The motors are series wound and protected, and, together with the tramway type controllers, are of British Westinghouse make.

Two of the dock sheds are equipped with 1-ton Crompton overhead electric runways, electric hoist and push travel. Ball bearings are used throughout.



FIG. 5.—100 FT. SPAN SCHERZER BRIDGE WITH C.M.B. CONTROL.

A considerable amount of pit props is imported into the port, and is sawn up to order on the estate. A portable electric saw bench (Fig. 4) installed some time ago, has been very successful; another one is now on order. The present one was supplied by W. V. Waite & Co., Ltd. (Taff Wells, Cardiff), and built by Broome & Wade, Ltd. (High Wycombe). The saw is driven through a Hans Renold chain by a  $7\frac{1}{2}$  b.h.p. Peebles totally enclosed compound wound interpole motor. Current is obtained from the lighting mains, through a trailer cable, which is plugged into ironclad Berry Skinner D.P. switch-fuses, mounted on the lighting poles.

The generating station and five hydraulic stations are ventilated with 36 in. Verity's exhaust fans, two of the hydraulic stations have Davis Perrett electric oil-eliminating plants, the boiler feed is taken from the hot well by small high-speed pumps, driven by General Electric Co.'s motors.

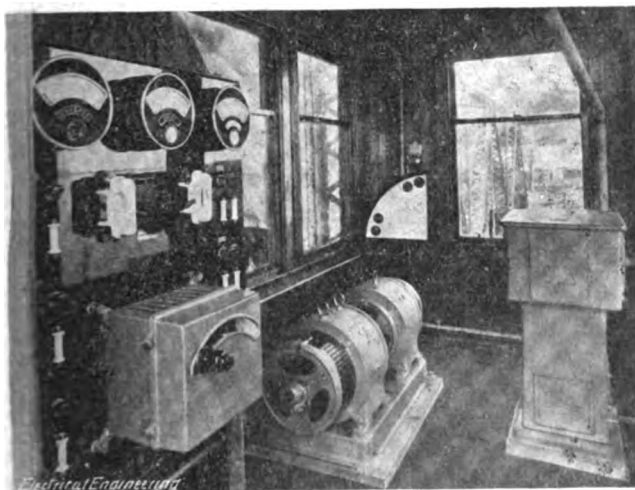


FIG. 6.—INTERIOR OF SCHERZER BRIDGE CONTROL CABIN.

Between the King's Dock and a lay-by dock a Scherzer single road and railway bridge with a span of 100 ft. crosses the lock. Fig. 5 shows the bridge open and Fig. 6 the interior of the control cabin. It is balanced with 340 tons of concrete. The electrical equipment consists of a Crompton C.M.B. motor generator, and a main driving motor. Current is supplied to the switchboard at 250 volts D.C. One machine of the C.M.B. equipment is driven as a motor and the other as a generator, which has special windings for limiting the maximum current taken by, and for regulating the pressure on, the main motor, which drives the bridge through gearing.

In case of breakdown the bridge can be worked by hand. The motor is 40 b.h.p. and runs at 500 r.p.m. A magnetic brake works on a brake sheave keyed on to the motor shaft. This brake has hand-release, and is released on the first point of the controller without influencing the motor. Speed control of the motor is obtained by varying the field of the generator, which in turn controls the main motor circuit pressure from zero to a maximum of 480 volts. The controller is incorporated with a reversing switch, and consists of a multiple contact switch; each contact is connected to a resistance unit. Fig. 7 gives the connections of the control and signalling circuits. A pedal switch is placed at the foot of the controller and mechanically connected to it so that it is impossible to work the switch until the controller is in the "off" position, and the brake on. Moving the controller to the first notch releases the brake, and full field is given to the generator which at once builds up an

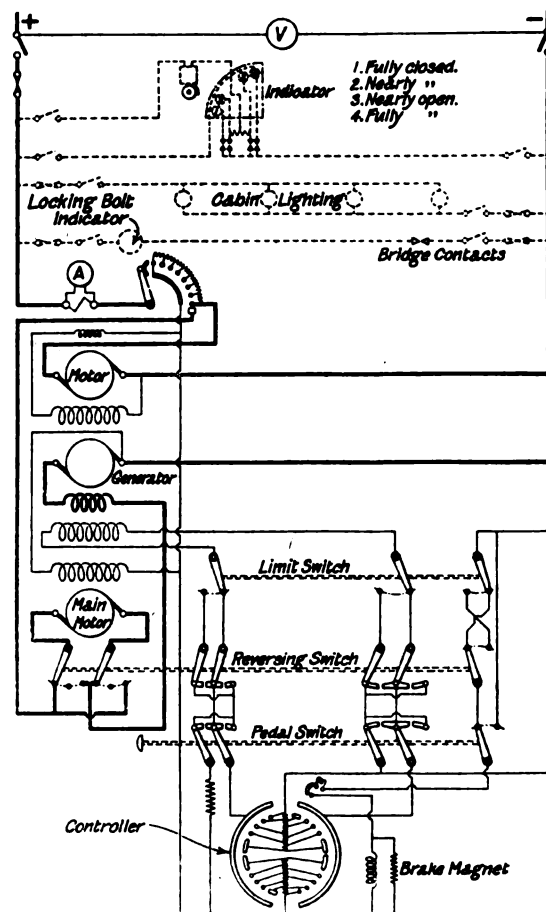


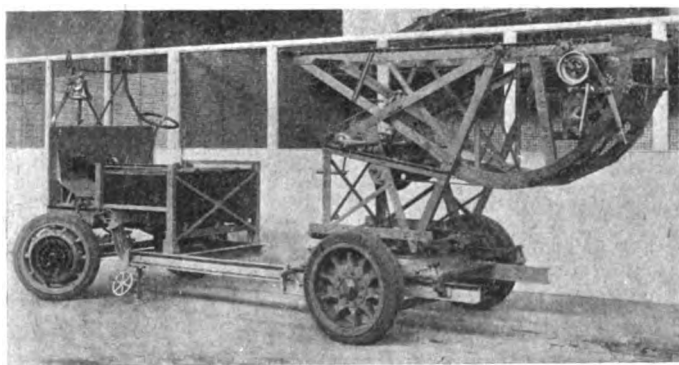
FIG. 7.—CONNECTIONS IN SCHERZER BRIDGE CONTROL CABIN.

opposing pressure equal to the line pressure, so that although the main circuit is closed, the voltage at the motor is zero. Moving the controller weakens the opposing field of the generator until in the neutral position the full line voltage is applied to the driving motor; in this position the motor will run at half speed. A further movement of the controller reverses the generator field. Limit switches are mechanically operated by the movement of the bridge, at a position 6 ft. from the full-closed or full-open position. The action of operating this switch in either direction opens the brake and field circuit, so that the generator volts are built up in opposite directions and the voltage of the main motor circuit immediately drops to zero. In order to operate the bridge with the limit switches in this position, the pedal switch is depressed, re-making certain of the field circuits which are independent of the controller. As the pedal switch cannot be opened until the controller is in the off position it is impossible to apply the full field instantaneously. The main switchboard consists of one D.P. knife switch and enclosed fuses, one ammeter, a locking bolt indicator, a 1.5 ampere D.P. switch for cabin lighting, one D.P. 5 ampere switch for indicator circuit, a 1.5 ampere D.P. switch for the locking bolt, and a 1.5 ampere D.P. switch for the bell circuit. For indicating the position of the bridge, switches are provided on it, which, when operated, light a lamp and ring a bell

in the cabin. This indicates the nearly-home and full-home positions. The locking-bolt indicator shows on a dial whether the bolt is in or out. The whole, along with the C.M.B. motor generator and main controller, are installed in a cabin from which a full view of the operation of the bridge can be gained. The whole of the electrical equipment of the bridge was supplied and erected by Crompton and Co., Ltd. (Chelmsford), and the bridge was constructed by Sir William Arrol and Co., Ltd. (Glasgow).

## A NEW ELECTRICALLY-DRIVEN FIRE ESCAPE

THE London County Council has just taken delivery of an electrically-driven fire-escape of the kind known as a "turn-table ladder." It was supplied by Cedes Electric Traction, Ltd. (112, Great Portland Street, W.), as were twelve "first-aid ladders" like the one described in *ELECTRICAL ENGINEERING*, Vol. VIII., March 23rd, 1911, p. 153. The chassis construction is well shown in the illustration. The Tudor battery is similar to those used in former escapes, except that some mechanical improvements have been made. It is placed under the seat instead of in the bonnet. The capacity of the battery is 200 ampere-hours at the four-hour rate, and its weight complete is 26 cwt. The hub-driving motors are of 20 h.p., as were those used originally, but by alterations in one or two details greater speeds have been obtained. The total weight with complete equipment is six tons, of which the ladder is responsible for one ton.



CHASSIS OF ELECTRICALLY-DRIVEN TURN-TABLE FIRE-ESCAPE FOR THE L.C.C.

When fully extended it is 90 ft. high, and can be raised in 90 seconds by a 6-h.p. motor. The controller is fixed to the back of the framework, but is not shown in the illustration. A feature of all Cedes controllers is that the fingers are separately detachable, being fixed by a spring and small screw. Three raising and three lowering speeds are provided for. A limit switch, seen by the hand-brake handle in the illustration, prevents overrunning. The swivelling motion is carried out by hand. To obtain rigidity when the ladder is to be used, the chassis is jacked up by four jacks fitted with swivel heads and coarse adjustments, as well as a convenient hand-wheel for the final adjustment. It is said that ten seconds is sufficient time to take the jack from its housing immediately above the point of application, and to jack up the chassis. The following speeds were guaranteed: 21 m.p.h. on the level and 12 m.p.h. up Pentonville Hill, but 25.5 and 16 m.p.h. were actually attained. Similarly the more recent of the "first-aid" ladders supplied attained a speed of 28 m.p.h. on the level against a guarantee of 25. The batteries will run for 5,000 miles before new positive plates are required, while the negative plates last twice this time.

**Low and Mixed Pressure Turbine Plant.**—A long Paper on this subject was read by Mr. C. H. Goulden before the Students' Section of the Institution of Electrical Engineers on February 5th. The author dealt with the advantages of exhaust steam turbines as regards economy and freedom from blade stripping and other possible sources of breakdown. Suitable vacua might be taken from 27½ in. as a low limit to 29 in. as a maximum. Condensers, heat accumulators, and mixed pressure sets were also discussed, and a description of the governing gear was given. In the discussion, the Chairman, Mr. H. Brazil (Charing Cross, West-End and City Electricity Supply Co.), raised the question of the possibility of obtaining better results by the installation of a battery in certain cases.

## MAINS BREAKDOWN IN MANCHESTER

ON Friday last one of the sixteen sections of the Manchester distributing network was deprived of its supply from 9.15 to 11 p.m., owing to a breakdown on a feeder, which spread to four other pairs of feeders and yet did not cause a sufficiently serious short-circuit to throw out the cut-outs at the station. The area affected was bounded by the lower end of Market Street, Corporation Street, Fennel Street, and Witty Grove.

In Manchester the sixteen sections of the D.-C. network are all separate and not interconnected, and each is supplied by its own set of feeders. To the one in question there were five pairs of 1 sq. in. feeders, all laid in the same cutting and some in the same troughing. The cut-outs for each of these were set at about 1,500 amperes. A fault developed on one of the positive feeders and spread to all the others and burnt them completely asunder, so that the section of the distributing network was completely cut off. At no time, however, did the feeder ammeters register much more than normal load, although the current was, of course, observed to be unsteady, and actually the first notification received at the station of an interruption of supply was a telephone message from a consumer a whole hour after the fault had first developed. The cables in question are V.B. unarmoured, laid solid in bitumen. They are amongst the cables laid in the Manchester central area in 1893, and as they had fallen in insulation considerably of late, they were already on the point of being replaced. The particular feeder which burnt out was to have been replaced at the crossing by a new lead-covered paper-insulated cable during the Friday night following the burn-out, and the electricity department had been at work for a week or two in Mosley Street, driving a new heading under the tram lines to accommodate ducts for the replacement of some, and eventually all, of the ten cables in question.

The two newspaper offices located in the faulty area, viz., the *Manchester Guardian* and the *Manchester Courier*, were never without their 400-volt power supply, owing to special alternative feeding arrangements. The *Courier* office was, however, deprived of its 200-volt supply, which the *Guardian* should have been able to secure through the special balancer installed on their premises for this very purpose. The railway stations at Exchange and Victoria are also provided with alternative feeding supplies.

## SALFORD CORPORATION TO BUY "IN BULK" FROM A POWER COMPANY

AT a meeting of the Salford Corporation yesterday a report of the Electricity Committee was adopted, recommending that a tender for the supply of current by the Lancashire Power Co. should be accepted. Current will be delivered at extra high tension at the boundary of Salford and Swinton, and the charge will be £3 per kw. of maximum demand for the first 1,000 kw., and £2 per kw. for any additional demand up to 3,000 kw., plus ½d. per unit., on the basis of a supply for two or more years. (For one year only the kw. charge would be £6.)

A tender had also been invited from the Manchester Corporation, but the Committee reported that "the terms offered were so much higher that the Committee consider it unnecessary and undesirable to quote them."

The position was one of considerable difficulty and delicacy to all parties concerned. Mr. C. D. Taite, who is Engineer-in-Chief to the Lancashire Power Co., is Consulting Electrical Engineer to the Salford Corporation, and thus was unable to issue the specification or to adjudicate upon the tenders. No specification in the true sense of the term was issued, however, but the tenderers were asked to quote for (1) a minimum demand of not less than 1,000 kw., (2) an additional demand of 1,000 kw. on not more than fifteen minutes' notice, and (3) a further demand of 1,000 kw. on one calendar month's notice. Obviously this might imply a fixed minimum demand of 1,000 kw. and what is practically stand-by for a further 2,000 kw. It seems reasonable to suppose from the price tendered by the power company that they considered that the full supply would be required, and not merely stand-by for the 2,000 kw.; while, presumably, the Manchester Corporation, having no guarantee, found it necessary to take account of the latter contingency.

The present capacity of the Salford electricity works is about 9,000 kw., including all reserve plant, and the bulk supply is intended in the first instance to be supplementary to this.



## ANNUAL DINNER OF THE INSTITUTION OF ELECTRICAL ENGINEERS

IN proposing the toast of the Institution of Electrical Engineers at the annual dinner, which took place last Thursday, Mr. Herbert Samuel, the Postmaster-General, made an interesting statement with regard to the Technical Committee appointed in connection with the consideration of the agreement between the Post Office and the Marconi Company. Mr. Samuel said that it was no easy matter to select members for this Committee, as it was necessary to combine competence, independence and impartiality. Mr. Duddell had the distinction of being the inventor of the "singing arc," and so great was their confidence in his impartiality that, in nominating him for this Committee, they had only feared that he might feel biased against the system [the Poulsen system] based upon his invention. In the course of his speech Mr. Samuel also referred to the rapid comparative growth of the electrical industry in this country as compared with that of the United States. In 1903 the exports of electrical machinery of all kinds from this country amounted in value to about £400,000, compared with about £1,000,000 in the United States. In 1911, however, our exports had risen to actually more than those from the United States, viz., £1,791,000 as compared with £1,700,000 in the United States.

Professor John Perry, in proposing the toast of the guests, said that it was a characteristic of the scientific engineer that he always talked and thought "shop," and that was the reason of his success. He referred sarcastically to the people who always stated that new inventions had been anticipated in past ages, and said that if this had been so we should have been left without an ounce of coal to-day. He also referred to the remarkable fact that some of the most eminent men in this country had no knowledge of science at all. The British Post Office, however, had, in his opinion, shown more enterprise in introducing new inventions than any telegraph or electrical company in the world.

Lord Justice Buckley responded on behalf of the guests, as did also Monsieur Grosselin, President of the Société Internationale des Electriciens, and Herr Geheimrat Christiani, President of the Verband Deutscher Electrotechniker. Monsieur Grosselin made the interesting announcement that his Society had invited the Institution to attend a general meeting with them next May, when there would be papers and discussions on electric traction, wireless telegraphy and other subjects, and visits to electrical works. We understand that the Institution has now definitely accepted this invitation, and the meeting will be held in the last week of May, probably from Wednesday to Friday inclusive.

## NEW PLANT AT THE HORNSEY GENERATING STATION

THE inauguration of the new 750 kw. set at the Hornsey generating station took place last Saturday. A Belliss and Morecom triple expansion engine of the latest design, with automatic expansion gear and oil pressure control running at 250 r.p.m., is direct coupled to a ten-pole interpole shunt generator, by the Electric Construction Co. The engine has a special graphite and oil lubricator by Knowles & Wollaston. As the cost of water for condensing purposes is excessive, a turbine was not adopted, and a barometric jet condenser by The Mirrlees Watson Co., Ltd. (Scotland Street, Glasgow), is installed. Two Rees Roturbo pumps driven by the same 28 h.p. motor by Bruce Peebles & Co., Ltd. (Edinburgh), are used: one supplies the condenser from the cooling tower ponds, and the other pumps the hot well water from the cooling ponds to the top of the cooling towers. Interposed in the 20 in. exhaust main near the engine is a large Baker oil separator. To provide against failure of the vacuum due to heating of the condenser owing to cessation of the water supply, a 2 in. supply is laid on from the New River, and is controlled from the engine room. The make-up water from the cooling ponds is also supplied by this means. Water for the boilers from the hot well is delivered by a Rees Roturbo motor-driven pump delivering up to 2,000 gallons per hour. In order that this hot well water may be delivered proportionally to the load on the engine, a controlling resistance connected in the shunt circuit of the motor pump is fixed near the main stop valve of the engine, and is adjusted by the driver according to the steam pressure. The switchboard extensions consist of a dynamo panel and two feeder and bus-bar panels, by Spagnoletti, Ltd.

In addition to the above plant, an electrically-driven Rees Roturbo 3-stage centrifugal feed pump has been installed. It

will deliver 3,000 gallons per hour into the boilers against a steam pressure of 180 lbs. per sq. in., and runs at a speed of 2,000 r.p.m. The peculiarity of this type of pump is, that it is self-regulating to a large extent, and in the case of a stoker inadvertently closing all check valves, the rise of pressure is only small. Other recent extensions consist of a further Babcock & Wilcox marine type boiler evaporating 15,000 lbs. of water per hour with hot feed. To accommodate this the boiler house was enlarged, and will take a similar boiler, while the engine room will now take two additional 750 kw. sets.

The extensions of plant have all been carried out under the direction of the Borough Electrical Engineer, Mr. Norman Staniland, and the staff at the Electricity Works.

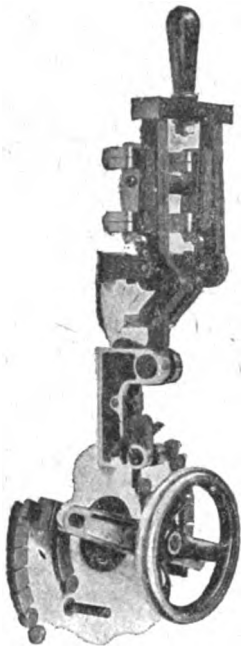
## THE LARGE CENTRAL STATION BATTERY AT MANCHESTER

MR. F. H. WHYSALL'S Paper on "The Use of a Large Lighting Battery in Connection with Central Station Supply" was discussed at a meeting of the Manchester Local Section of the Institution of Electrical Engineers on January 28th. (A report of the discussion in London appeared in ELECTRICAL ENGINEERING, January 30th, page 59).

Mr. S. J. Watson (Borough Electrical Engineer, Bury) considered that as the peak load lasted about an hour and a half, a battery should be given a two-hour rating; on this basis, the cost of the Manchester battery worked out at £10.7 per kw., while modern generating plant would cost about £10 per kw., so that the difference in first cost was slight. He considered large batteries should always be kept on the bus-bars. The battery cables were a heavy item in the installation cost. The capacity on a two-hour rating should be equivalent to that of the largest machine. Alderman Walker (Manchester) considered twenty years as loan period for generating plant too long, as now only about seventeen years was allowed on turbines, while the period for boiler plant was even more restricted. This, however, only made the case more favourable for the battery. Mr. E. C. McKinnon (Chloride Electrical Storage Co.) said that in America batteries were chiefly used as stand-by plant. Makers there made their maintenance guarantees contingent upon the maximum number of charges and discharges, usually on a basis of 150 to 200 in five years, or about forty times per year. During a severe storm recently, the load on the New York Edison Co.'s stations increased from 75,000 kw. to 125,000 kw. at the rate of 5,000 kw. per min. In a case like this, engines could not be put on quickly enough, and the demand was met by the batteries, of which there were twenty-five at various points, representing 17,000 kw. At the end of its useful life a battery was still worth about 25 per cent. of its original value in the scrap metal. Mr. P. P. Wheelwright (Borough Electrical Engineer, Blackburn) considered a battery an advantage from the smoke nuisance point of view. Batteries were now built on sounder lines than formerly. The present battery at Blackburn worked hard, and the maintenance during the four years it had been installed was negligible. Mr. S. L. Pearce (City Electrical Engineer, Manchester) pointed out that on the very worst case for the Manchester battery there was a saving of £2,000 in its favour. The total units lost in the booster and battery were 700,000 units per annum, but the saving in coal alone covered this four times over. The design of the switchgear had given rise to more anxiety than any other detail of the installation. They decided to treat the battery board as a high-tension one, and to put the switches in separate brick cubicles. Remote control circuit breakers should always be installed as near as possible to the battery terminals. They were arranging now for control of their circuit breakers from more than one point for emergency tripping. Mr. C. L. E. Stewart (Borough Electrical Engineer, Rawtenstall) spoke of satisfactory experience with a battery. Mr. Bertram Thomas pointed out that there was no recognised basis on which to determine the size of battery most satisfactory, and suggested that some of the economies at Manchester were due to causes other than the battery, as they began to appear the year before the battery was installed. Mr. A. G. Cooper (Borough Electrical Engineer, Colne) considered that to put in a battery equal in capacity to the largest generating unit was unwise, as it would be in most cases too small before its loan period was up. Mr. W. Cramp (Manchester Municipal Technical School) had found that makers would only guarantee 80 per cent. or 90 per cent. of the rated capacity over a maintenance period. Mr. Whysall replied briefly.

**I.E.E. Students' Section.**—Further changes have become necessary in the officers of the committee of the Students' Section of the Institution of Electrical Engineers, consequent upon the election of Mr. D. Betts (vice-chairman) as Associate Member. Mr. G. W. P. Page has been elected vice-chairman in place of Mr. Betts, and Mr. E. T. Driver (24 Bradgate Road, Catford, S.E.) has been elected honorary secretary.





BALANCER STARTER.

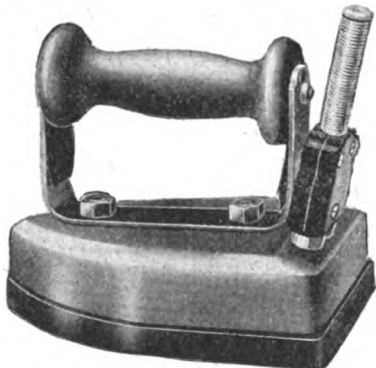
### A BALANCER STARTER

ONE of the disadvantages of balancer starters fitted with "no-volt" releases, is that the starter may be knocked into the "off" position, or may open on account of vibration when running, with the result that in the event of the system being much out of balance the side which is lightly loaded may have its lamps burnt out. To overcome this difficulty, the General Electric Co., Ltd., have recently designed and patented a type of starter which avoids the use of a no-volt release. The arrangement consists of a main switch, which is interlocked with a starter so as to ensure that the starter must be in the "off" position before the main switch is closed; and if the main switch is opened when the starter is in the full "on" or any intermediate position, it cannot again be closed until the starter arm is moved to the "off" position. One form of this starter is illustrated here.

### LAUNDRY IRONS

THE General Electric Co., Ltd. (67 Queen Victoria Street, E.C.), have brought out an improved pattern of electric iron, specially designed for laundry work.

Following the general design of the "Magnet" domestic iron, the laundry iron is equipped with a replaceable heating element disposed so as to give a uniform heating effect over the whole area of the face, and clamped so tightly to the sole that the heat transmission is as perfect as can be desired. The element is formed of a special metal resistance strip mounted on mica, which arrangement lends itself well to a close application to the sole plate. Careful attention has been given to the toe of the iron, and the sharp point which is essential to the successful treatment of many classes of work



THE MAGNET LAUNDRY IRON.

is not secured at the expense of an inadequately heated toe.

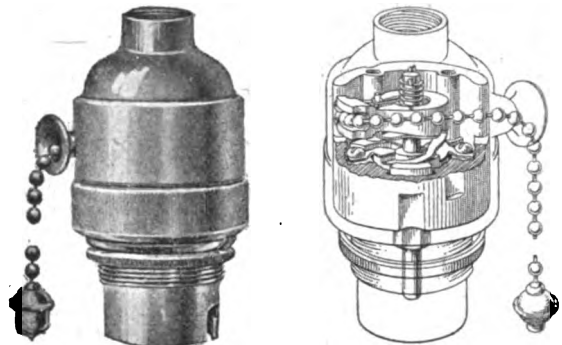
Care has also been taken in the design of handle, which not only gives good heat insulation, but is so shaped that the hand and arm assume an easy position, partly owing to the handle being slightly sloped backwards.

Three weights of "Magnet" laundry iron are obtained, weighing 6 lbs., 7½ lbs., and 9 lbs., each of which is stocked in pressures of 100 to 110, 200 to 220, and 230 to 250 volts. The 6 lb. iron takes 500 watts, and the 7½ and 9 lb. sizes 600 watts.

"The Queen's Engineering Works Magazine."—We have received from W. H. Allen, Son & Co., Ltd. (Bedford), a copy of this interesting and well-illustrated magazine, which is published primarily for the purpose of circulation among the old pupils and apprentices of the firm with the object of keeping them in touch with the company. Messrs. Allen hope that such old students whom they have lost sight of will communicate with them on seeing this notice with a view to obtaining a copy. The number before us contains several interesting articles on engineering work in various parts of the world, and news as to the doings of many who received their practical training at the Queen's Engineering Works, Bedford.

### A CHAIN-PULL SWITCH-HOLDER

THE British Thomson-Houston Co., Ltd. (Mazda House, Upper Thames Street, E.C.), have introduced a new pattern of switch-holder which has some marked advantages over the ordinary key-holder, with its stiff, jerky action. The new switch, of which the company have sent us a sample, is worked by a beaded chain, and alternate gentle pulls of the chain switch the lamp on and off. The ratchet action by which this is accomplished will be understood from the illustration.



CHAIN PULL SWITCH-HOLDER.

The action is very easy, and the chain is more readily taken hold of than the usual key, only one hand being required. Twelve inches of chain are usually supplied, and the device should be useful for a variety of different kinds of fittings. The contractor who fits a B.T.H. full-chain switch-holder to a table standard, and keeps it standing on his counter is sure to make sales to many people who pull the chain out of curiosity and then want to buy the whole equipment.

### THE ASSOCIATION OF ELECTRICAL STATION ENGINEERS

A MEETING of members of the staffs of electricity supply stations in the London district and others was held last Thursday in connection with the formation of an association with the above title. Mr. C. F. Wade (Shift Engineer, Islington Electricity Works) was in the chair, and between 30 and 40 persons were present. Mr. W. J. Ebben (7 Vernon Road, Stratford), who is acting as hon. sec. to the movement, made a short speech outlining the inception of the scheme, which, although originating in London, where a preliminary meeting had been held already, was being pushed forward all over the United Kingdom. A meeting was to be held in Dublin the following day, and similar meetings would take place soon in Manchester and Glasgow. Since the original announcements were made a large number of inquiries have been received, and there were some 2,000 who would probably become members. The Association is not to be conducted on trade union lines, and its objects as defined at the last meeting are:—"To raise the efficiency and general status of members of the Association; to provide means for social intercourse among its members, for their improvement, advancement, and recreation; to form an information bureau for the general assistance of members and employers." It was decided at the meeting that the subscription should be 10s. 6d. per annum, payable in two half-yearly instalments, with an entrance fee of 2s. 6d. The affairs are to be managed by a committee of 24, of whom 12 form a quorum, but for certain reasons the names of the committee are not to be published. A provisional committee of 18 was elected and empowered to elect members to the Association, and draw up a scheme of organisation. The finances of the Association are to be in the hands of a chartered accountant.

**Club Lighting.**—The British Thomson-Houston Co., Ltd. (Mazda House, Upper Thames Street, E.C.), have sent us some particulars of the lighting installation recently carried out at the Cavendish Club, Piccadilly, for which they supplied the whole equipment. This forms a good example of modern efficient methods at the same time in keeping with club traditions. In all, 149 Mazda lamps of various sizes are used, and 141 Holophane reflectors have been installed. Wherever possible, the lamps have been fixed well above the line of vision, so as to minimise the effects of glare. In the dining-room a number of three-light cluster fittings, equipped with Mazda lamps and Holophane reflectors, are employed, and the illumination is uniformly brilliant over the whole room.

## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelopes.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,326.

It is required to erect a simple wireless receiving apparatus for experimental work, and some information on the following points is requested:—(1) What apparatus is necessary for enabling messages to be received up to about 500 miles? (2) The approximate length of aerial wires necessary, and whether it matters whether these are run vertically or at a sharp angle to the ground? (3) Can a suitable coherer be made by an amateur? If so, give particulars. (4) Is a telephone receiver sufficiently sensitive to be connected directly across the coherer without any other instrument, to enable messages to be received? Assuming that this apparatus is fixed on a hill some 600 ft. above sea-level, will it be too high for satisfactory working?—WIRE.

(Replies must not exceed 1,000 words.)

(Replies must be received not later than first post, Feb. 20th.)

### ANSWERS TO No. 1,324.

What is the best method to follow in the construction of a generator for use in connection with a Tirrill or other voltage regulator, where wide variations in the load take place, and where these are sudden and frequent, and sometimes of very short duration?—B. T.

The first award (10s.) is given to "M. M." for the following reply:—

When it is intended to employ a separate regulating device with an alternating current generator, it is possible to cheapen the design of the generator considerably. For an alternator to have good voltage regulation its windings must be of low resistance, it must have a large number of armature slots per pole, and have a liberal pole pitch. To meet these three conditions will necessitate a larger machine, for any given output, than where voltage regulation is not of prime importance; there will therefore be a proportionate increase in the first cost of the machine. If, however, we can govern the terminal voltage by means of an outside source, it will be possible to have a cheaper design of generator. Although the question of power factor largely increases the difficulties of voltage regulation in the case of alternating current generators, in order to have good regulation with both A.C. and D.C. machines, practically the same conditions with regard to design must be observed. Armature resistance must be low and ampere turns per pole a minimum; therefore, in either A.C. or D.C. machines good voltage regulation can only be secured by expensive design. On the other hand, if we are to have the assistance of a regulator, a cheaper design of generator can be employed; any shortcomings on the part of the machine being met by the regulator. The fact that a Tirrill regulator is unaffected by the power factor of the load gives it a great advantage over self-contained methods of voltage regulation; the various arrangements for compounding alternating current generators are both complicated and expensive.

[It might also be remarked that a machine constructed on these lines will have a lower short-circuit current than one specially designed for close inherent regulation.—Ed., E.E.]

The second award (5s.) is made to "Ohm," who writes as follows:—

Speaking generally, the Tirrill Regulator will give satisfactory results when used with almost any type of generator or exciter, irrespective of their individual characteristics. The makers specify, however, that the exciter voltage at full load must not be more than twice the voltage at no-load. This is really the only point that has to be borne in mind by the designer of the generator. Assuming that the specified range in the exciter voltage has been exceeded, the makers are prepared, as a rule, to consider the proposition and to put forward a scheme. The problem of adapting the Tirrill regulator to meet such a case presents certain difficulties, and as a result the cost of the Tirrill regulator outfit would be more than if the exciter voltage had been kept within the prescribed limits.

Another point of secondary importance is that the exciter field rheostat must be of sufficient capacity to reduce the generator voltage to at least 35 per cent. of normal at no-load, when the whole of the resistance is inserted. The exciter should be shunt-wound, and whilst a compound exciter will in most cases give equally good results, the additional winding is quite unnecessary, and only means extra expense and complications which are quite unwarranted. The poles can be either solid or laminated, but as a general rule the Tirrill Regulator will come out cheaper if the former construction is adopted.

## CATALOGUES, PAMPHLETS, &c., RECEIVED

**CABLES.**—An ingenious two-colour folder calls attention to an order for 1,115 miles of Armorduct vulcanised rubber cable, which has been placed by the Postmaster-General of New South Wales with the Armorduct Manufacturing Co., and gives an idea of the distance by means of maps.

**ELECTRIC MOTOR SYRENS.**—A new catalogue of syrens driven by electric motors, for loud and penetrating signals for factories and other purposes, is being issued by Siemens Brothers & Co., Ltd. (Woolwich). These are compactly arranged, and can be controlled so as to give sharply defined signals. When used as fire-alarms they can be started by push buttons from any number of points.

**HOLOPHANE PENDANTS.**—A number of designs of pendants, ceiling fittings, &c., for holophane bowls, spheres, and stiletto reflectors for semi-indirect lighting, are illustrated in a new catalogue just issued by the General Electric Co., Ltd. (67 Queen Victoria Street, E.C.). These include some handsome designs, and the illustrations do them full justice.

**INSULATING MATERIALS, &c.**—Messrs. Carson and Evans (3 Fenchurch Buildings, E.C.) send us a copy of a card which they are issuing to call attention to the high quality of the ebonite and vulcanite which they supply, and also a folder giving some particulars of a new and cheaper material which they are supplying, where something is wanted at a lower price than ebonite or vulcanite, under the name of Carvanite. Those interested are invited to write for samples.

**INTERCOMMUNICATION TELEPHONES.**—A finely got-up catalogue from the British L.M. Ericsson Manufacturing Co., Ltd. (4 Chancery Lane, E.C.), deals with intercommunication telephone sets of all types and sizes. A special feature is made of a "secret" intercommunication system in which overhearing or interruption is impossible. This can also be used in conjunction with exchange connections. Junction boxes, multiple cables, and other accessories are included.

**CINEMATOGRAPH MOTOR GENERATORS.**—Several patterns of these sets for converting from alternating current, as well as for obtaining lower continuous voltages, are dealt with in a leaflet from the Electric Construction Co., Ltd. (Dashwood House, 9 New Broad Street, E.C.).

**CALENDAR.**—The Electrical Accessories Supply Stores (9 Queen's Terrace, Sheerness-on-Sea) send us a pretty little calendar for 1913.

**ARC LAMPS.**—A price list from Siemens Brothers Dynamo Works, Ltd. (Supplies Dept., 38 and 39 Upper Thames Street), gives particulars of a new pattern of double enclosed alternating current long burning flame arc lamp. The lamp is specially suited for the lighting of large open spaces on account of its long burning hours, low carbon consumption, and economy in current, while its convenient size, not exceeding 3 ft. overall length, renders it also quite suitable for shop lighting.

**METAL FILAMENT LAMPS.**—The Electrical Co., Ltd. (122-124 Charing Cross Road, W.C.) have just issued a new booklet dealing with Aegma drawn wire lamps for all purposes, including plain and twisted flame, tubular, and traction lamps. The booklet also refers to "Goliath" holders and shades for 600 and 1,000 c.p. lamps. The company announce that they hold stocks of Osram, Mazda, Wotan, and Tantalum lamps, and they give some interesting notes on lamp manufacture.

## ELECTRIC TRACTION NOTES

The half-yearly meetings of several of the London suburban railways companies which have just been held, all point to the possibility of great developments of electric traction in the near future. Following on the successful working of the single-phase line of the London, Brighton & South Coast Railway, the Company has, as we have already pointed out, decided to make considerable extensions of the system, and close upon that comes the announcement that the London & South-Western Railway Co. have decided almost at once to proceed with the electrification of the lines on the north side from Waterloo to Hounslow, Shepperton, Kingston, and Hampton Court. The complete scheme originally included the southern lines as far as Guildford, but for the present that portion will be developed by an improved steam service. An expenditure of £1,000,000 is contemplated upon the electrification scheme. The work of conversion of these lines will probably be accelerated by the satisfactory results of the extension of the Central London Railway from the Bank to Liverpool Street, the increase in receipts on this line for the past year having been no less than £5,222, which is mainly attributed to the extension. In the North of England, the North-Eastern Railway Co. have decided to electrify their mineral line between Shildon and Newport (Middlesbrough), a distance of 18 miles. This company has decided to build 10 electric goods locomotives at Darlington, the electrical equipment of which has been placed in the hands of Messrs. Siemens Bros. Dynamo Works; the contract for the equipment of the permanent way has also been placed with the same firm. An important announcement is expected on this subject at the forthcoming meeting of the Midland Railway.

A Paper by Mr. R. A. MacMahon entitled "The Rolling Stock Equipment of the Electric Railways of Great Britain" was read before the Students' Section of the I.E.E. a short time ago. In the course of the discussion the chairman, Mr. Roger T. Smith (Electrical Engineer, G.W.Rly.), said that the similarity of the rolling stock of the British electric railways was largely due to the fact that electrification had taken place on practically each one of the sixteen railways mentioned in the Paper so as to get a more rapid service than formerly. The question why locomotives had been adopted for the electrification of the Berlin "Stadt-Ring und Vorortbahn" (ELECTRICAL ENGINEERING, Dec. 6th, 1912, p. 696, and Jan. 16th, 1913, p. 40) was raised in the discussion, and Mr. Roger Smith mentioned the following factors as probably influencing the authorities: Increased height of centre of gravity and therefore smoother running; possibility of using entirely spring-suspended motors; ability to use wheels of larger diameter and a much larger wheelbase. He was himself in favour of increasing the wheelbase on all motor trucks up to 10 ft. 6 in. or higher. Another reason was probably that with the extremely heavy trains run in Berlin it would not be possible to get single-phase motors on motor-coaches. He cited a case on the Metropolitan Railway where an old car was equipped with motors in the cab so as to raise the centre of gravity; the life of the wheels was doubled. With regard to seating accommodation, there is a noticeable return to cross seats. With this design the car can be filled and emptied much quicker than with the open car unless an "expensive staff of hustlers" travels on the train.

The Great Falls Power Co., of Montana, has obtained the right-of-way for a transmission line 150 miles long for a period of 50 years, subject to a supply being given to the Chicago, Milwaukee, & Puget Sound Railway. The mountainous main line between Harlowton Mount to Avery, Idaho, a distance of 440 miles, is to be electrified. The estimated time of conversion of the railway is about eighteen months, and work should start within the same time. Between 50 and 100 locomotives will be required. According to the American electrical journals, a contract has been signed with the Montana Power Co., which controls the Montana Power Transmission Co., the Madison River Power Co., and the Thompson Falls Power Co. Energy at 110,000 and 60,000 volts will be fed to the railway company at eight different points, the minimum requirement for power being 25,000 kw., and the maximum for the present 50,000 kw. It is said that, though nothing definite has been decided, probably 2,400-volt D.C. traction motors will be used, supplied from trolley lines. The generating stations will be located at Great Falls on the Missouri River; three will be near Helena, one on the Madison River in the Rocky Mountains, and another at Thompson Falls in Clark's Fork.

According to the *Elektrotechnische Zeitschrift*, an order has been placed with the Ganz Electricitäts A.-G., of Budapest, for the complete electrical equipment of the Italian 18-mile railway between Angera and Varese on Lake Maggiore. The equipment is to be for direct current at 850 volts, and ten motor-coaches have been ordered.

Electric traction has been commenced on the Bevers, Zuoz, Schuls section of the Rhaetian railways, the well-known narrow-gauge system in the Engadine. The whole system is being equipped for electric working on the single-phase system at 10,000 volts, 16 $\frac{2}{3}$  cycles, power being supplied to motor-generator sub-stations from a large water-power station at 25,000 volts, 50 cycles three phase.

At the Committee of the Reichstag dealing with the proposed electrification of the Berlin Ring u. Stadtbahn, according to the *Elektrotechnische Zeitschrift*, the opinion was expressed by the Chairman that the cost of the additional steam rolling stock required to improve the service has been estimated too high, and the cost of the corresponding electrical installation too low. The cost of the necessary alterations to the telegraph and telephone systems if the single-phase system were employed would, he said, be nearer one million pounds sterling than the £250,000 allowed for this purpose. The representative of the State Railways affirmed, however, that the steam locomotives proposed by the Chairman would not enable the required service of trains to be reached.

A Select Committee has been appointed to inquire into certain aspects of Mr. C. H. Merz's scheme for the conversion of the Melbourne Suburban Railway system to electric traction. Among the matters to be investigated are the reasons for the substitution of the overhead direct-current system for the third-rail system.

According to the *Board of Trade Journal*, the Victorian Legislative Assembly has approved of the electrification of the Melbourne suburban railways being proceeded with on the understanding that no tender for the supply of electrical energy for traction purposes shall be invited or accepted without the sanction of Parliament. H.M. Trade Commissioner for Australia states that the initial work of conversion will probably be started at an early date.

Matters in relation to the tramway position in Oxford are evidently to be brought to a head because the Corporation have passed a resolution instructing the Tramways Committee to apply to the National Electric Construction Co. for the penalties due in consequence of the failure to convert the tramway system to electrical working within the period specified by the Acts of Parliament. As we pointed out recently, the company are considering the possibility of using petrol-electric tramcars.

Good progress is being made with the trolley omnibus scheme in Brighton, and representatives of the Brighton and Hove Corporations are meeting to decide upon the overhead equipment for the through routes.

The Tottenham Council have agreed to the proposal of the Metropolitan Electric Tramways Co. to seek Parliamentary powers to run trolley omnibuses from Wood Green to link up with the Walthamstow tramway system.

## TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

For over a week Mr. W. R. Lawson has been cross-examined by members of the House of Commons Committee which is inquiring into the Imperial wireless telegraph scheme, and the nett result of it is that he has practically withdrawn all charges of corruption against Cabinet Ministers in connection with the proposed contract. The Committee are now considering a second interim report. The most important item of interest since Mr. Lawson's evidence is the receipt of a letter from the Marconi Company stating that unless the contract is definitely confirmed by March 1st, they have been advised by Sir Robert Finlay that they are within their legal rights in regarding the contract at an end, and that they would, in fact, do so. This letter is in answer to a reply by the Postmaster-General to a previous communication by the company refusing a request to treat the contract as at an end.

We are informed that the meeting of the Advisory Committee on Wireless Telegraphy will be held in private, and will not be open to the press.

The Postmaster-General has entered an appeal against that portion of the award in the Telephone Arbitration which deals

# ADAMS IGRANIC

ELECTRICAL CONTROL GEAR FOR PRINTING MACHINERY

ADAMS  
MFG CO LTD  
BEDFORD  
AND  
LONDON

with the raising of capital. By a majority of two to one (Sir James Woodhouse disagreeing with the principle adopted) the Commissioners allowed £247,189 for the cost of raising capital, in respect of which the company claimed £757,657.

The results of some tests on transmission efficiencies of an umbrella-type antenna and "counterpoise" at Fort Leavenworth, Kansas, by the U.S. Signal Corps are given in the *Electrical World* (New York). The antenna was of the four-wire type, supported by a pole 40 ft. high; each wire was 85 ft. long, and connected by three insulators in series with a guy rope 150 ft. long. The bottom of the antenna was about 18 ft. from the ground. The counterpoise consisted of four wires, each 100 ft. long, rubber-insulated, laid upon the ground, outer ends insulated and inner ends connected to the transmitter. Normally this counterpoise is spread out so that each wire is directly under one of the antenna wires. This is not really a counterpoise, but a capacity earth. By rotating the counterpoise through  $45^\circ$  a 17 per cent. gain in efficiency was recorded. This is difficult to explain. Increases in efficiency to the value of about 15 per cent. were noted when an eight-wire antenna of the same natural period was substituted; the wires were 65 ft. long on a 40-ft. pole, the height of the lower ends of the antenna being 29 ft. above the ground. The regular four-wire antenna and counterpoise, with ends of antenna raised to 40 ft. above the earth, making a four-wire umbrella "flat-top" aerial, gave an increase of about 40 per cent. The experiment repeated with the outer ends of the antenna lowered to within 3 ft. of the ground gave a loss in efficiency of 6 per cent. This result is not in agreement with earlier work carried out on much higher antennae, but probably the same laws of radiation efficiency do not hold when wires are close to the earth as when they are raised well above it. It is probable that even with the outer ends of the antenna wires in their normal position, 18 ft. above the ground, they are too low for good results.

In an article in the *Elektrotechnische Zeitschrift* of January 23rd, Mons. E. Leimer, of Nancy, describes some interesting experiments in wireless reception. In the immediate neighbourhood of a large transmitting station he says it is possible to receive and read signals by laying out the connecting leads of a high-resistance receiving apparatus on the window-sill. Signals had been read up to a distance of 30 miles from the Eiffel Tower station with an antenna consisting of a wire netting of half a square metre stretched over the window-frame. In dry weather messages had been received up to 60 miles, using a roof drain-pipe or badly-earthed lightning conductor. For the same distance successful results were obtained with the gas-pipes of a house for the antenna, and the water-pipes of the same house as an earth, even when the resistance between the two was as low as 5 ohms. Within a range of 180 miles an antenna consisting of two wires 55 ft. long strung along the roof 24 in. apart, and only 4 in. from the tiles, was sufficient. It is not necessary for the roof to be a high one. Good results were obtained for the same range with two 80-ft. lengths of wire strung parallel to, and only 3 ft. above, the ground in an enclosed yard. The lightning conductor of a 55-ft. chimney made an excellent antenna when disconnected from earth, and it was noticed that when much black smoke was emitted the signals were much better, showing that the smoke had the effect of lengthening the conductor. If a wire is strung for a distance of some 150 to 300 ft. parallel to, and about 3 ft. from, an overhead lighting circuit, this makes an excellent antenna, enabling signals to be received at a distance of several hundred miles. Good results were also obtained by connecting the antenna lead of the receiving apparatus direct with a working overhead A.C. lighting circuit, the connection being made through a condenser of suitable capacity to avoid earthing the circuit. Overhead telephone lines can also be used for the purpose. With direct connection to a double circuit line, 300 yards long, it was found possible to receive signals from a distance of 1,200 miles. Finally, Mons. Leimer states that he has succeeded in receiving messages from Clifden at a distance of 770 miles by connecting his receiving apparatus direct to

an ordinary double circuit overhead telephone line, and, moreover, by connecting the receiver telephone circuit again to the telephone line he has enabled a subscriber 170 miles distant to hear the signals also, the same telephone circuit being thus used as antenna and as transmitting circuit.

It is stated that in Tuckerton, New Jersey, a large wireless station on the Telefunken system is being installed. The tower will be 820 ft. high, and will be second in height only to the Eiffel Tower. It is proposed to establish direct communication with Europe and German West Africa from these stations.

It is announced that the six U.S. naval wireless telegraph stations in Alaska are to be opened for commercial purposes.

It is stated that the New Zealand Government have decided to install automatic telephones in Wellington and Auckland, and that 1,000 instruments have been ordered from America for this purpose.

The February number of the *Marconigraph* opens with a concise report on the findings of the International Conference with regard to the transmission of radiotelegraphic time signals. Following is a varied series of articles, amongst which is one by Mrs. Eva Jordan on "Travel in the Congo." Another deals with the effect of volcanic eruptions on wireless telegraphy; and a third tells the history of wireless telegraphy in Brazil. Capt. Beuttler contributes a humorous sketch, while the monthly biography is of His Excellency Don Jose de Bascaran y Federic. Lastly, there is an illustrated review on "Heroes of Science," and a considerable amount of miscellaneous information as to the progress of the Marconi system throughout the world.

A 5-kw. wireless telegraph station is to be erected at Hong Kong. It is hoped that if the Imperial Government erect a high-power station at Hong Kong in connection with the Imperial wireless scheme, it will be available for long-distance commercial work.

According to *The Times* Sydney correspondent, wireless stations are now operating in the six State capitals, also on Thursday Island and at Port Moresby. The Mount Gambier station will be open next week, and the Townsville, Cooktown, and Rockhampton stations next month. Before the end of June the Port Darwin, Wyndham, Broome, Roebourne, Geraldton, and Esserance stations are all expected to be working, thus completely encircling the continent.

For some time it has been decided to lay an underground telephone cable with Pupin coils between Zurich and Basle. Owing to the decision that the cable, which will cost some 600,000 francs, was to be made by a Swiss firm, there has been some delay, but the work will shortly be taken in hand.

The Dartmouth-Guernsey cable was down on the 29th January and telegrams had to be sent *via* France until 6th February, when repair was effected.—The Ottoman Government prohibited the use of secret language in telegrams for places in Turkey in Europe and Asia, excepting the provinces of Hedjaz, Yemen and Bassorah. Diplomatic official messages are, however, accepted.—The lines of the Indo-European Telegraph Company between Kertch and Soukhoun-Kale, and the cable between St. Jacques and Doson were down on the 5th inst.—The cables between Lattaquie-Palura, Scalamuova-Samos, Marmaritzia-Rhodes, Besika-Tenedos, Tokio-Guam, and Otranto-Vallona still await repair.—The Bissao-Bolama cable was restored on the 8th inst., and the lines between Teheran and Meshed became deranged.

**Expiration of American and Foreign Patents.**—In a recent decision, the U.S. Supreme Court held that American patents on inventions patented in foreign countries expire with the expiration of the foreign patent, notwithstanding claims that the treaty of Brussels of 1900 provides otherwise.

**Electricity and Fire Risk.**—Our attention is called by an article in "Installation News," published by Simplex Conduits, Ltd., to the following remark which appeared in the *Post Magazine and Insurance Monitor*: "Cheaper current and cheaper lamps are still further replacing gas, and on the whole the change is materially improving the Fire Risk."

# "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

## Specifications Published Feb. 6, 1913

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

819/12. **Storage Battery Plates.** J. T. NIBLETT. To improve the contact between the conductors and active material in batteries of the solid type, i.e., those in which porous masses of active material are used instead of grids supporting active material, the electrodes are made grid-like, and their pocketed fuses are pasted with active material. Before this has set, loose active material is packed between the electrodes and the porous pot of the cell. Two figures.

991/12. **Lighting Incandescent Vapour Lamps.** F. BOTSSON and J. GUESNIER. Two positive electrodes are used. In the circuit of one is an inductance, and of the other a resistance, connected through a two-way switch. At starting, the inductive circuit is used, whereby a series of hot sparks is produced which forms the vapours required. Three figures.

1.166/12. **Incandescent Lamp Holders.** A. R. MÜLLER. The holder is made entirely of insulating material, and is in two parts. The lower part is in the shape of a double cup, while the upper part forms a closure for the uppermost cup. In the partition which divides the lower part are two holes for the lugs of the porcelain fitting. A shade is held against a flange by a spring. One figure.

1.280/12. **Control Switch for Step-by-step Signalling Motors.** VICARS and H. J. CREFFIELD. Non-inductive resistances are connected between pairs of contact fingers, so that they are included in the circuit of one pair of field magnets when more than one pair are being energised at a time. By this means the armature movements are well defined, and sparking at the brushes and excessive currents reduced. Four figures.

1.681/12. **Automobile Lighting.** B. T. H. and E. GARTON. A vibrating contact is controlled by an electromagnet with two windings, one across the generator armature, and the other across the field. An automatic cut-out controls the connections between the generator and a storage battery. To limit the charging current there is a series resistance, which is automatically short-circuited when the battery is supplying the lighting. There is a similar resistance in series with the lamps, which is cut out when they are supplied from the battery alone. One figure.

1.979/12. **Speed Control of Cascade Induction Motors.** E. ROSENBERG. The rotor of the first motor is connected to a starting resistance through the stator of the second motor, which has a short-circuiting switch whereby the resistance can be connected direct to the rotor of the first motor. Mechanically connected to the short-circuiting switch is a pole-changing switch. The resistance is always connected to the rotor of the first motor. Two figures.

3.906/12. **Renewable Incandescent Lamps.** E. M. BAILEY and W. PLEWS. A moulded glass bulb with funnel-shaped neck and a conical rubber stopper containing the leading-in wires and exhaust tube are vulcanised intact. An hermetically sealed joint is maintained by the vacuum, the atmospheric pressure keeping the stopper in position. By opening the exhausting tube, the stopper may be removed intact. One figure.

7.602/12. **Combined Cigar-lighter and Advertisements.** F. WEBER. An electric cigar-lighter is connected to a case containing illuminated advertisements. A motor-driven switch is also provided. Its function is to cause the advertisements to be successively illuminated once every time the lighter is used. Three figures.

9.983/12. **Incandescent Lamps.** W. J. LUSTED. The stem is provided with an extension, at the end of which is a reflector. Filaments are arranged across the reflector and along the stem extension. Six figures.

10.501/12. **Wireless: Calling-up.** W. S. PEAKE. To call up all stations within range, each station is provided with a vibrating reed, mechanically tuned to the same frequency as that of the received impulses. It must have a considerable moment of inertia and small damping coefficient, so that comparatively many impulses are required to set it vibrating sufficiently. The sending apparatus is of the Morse key type driven uniformly. Nine figures.

16.042/12. **Induction Boilers.** J. BALLY. The tube system in which the liquid is heated forms the short-circuited armature of an alternator having a movable inductor. The tubes are arranged in a circle round a central space in which the inductor rotates. The tubes may be in slots in a magnetic frame, which may be utilised as a feed water heater. Six figures.

22.251/12. **Automatic Circuit-breakers.** J. H. DE THIERRY. A momentary overload causes the breaker alternately to break and make circuit as long as the overload lasts, but after a certain time-limit the circuit is permanently broken. The actuating mechanism is held in the make position by a pawl

actuated by a relay, and in the break position by a lever worked by a pin from a clockwork, spring-controlled toothed wheel, which advances by one tooth with every make and break. To adjust the time-limit, the wheel has as many holes as it has teeth, and into one is inserted a pin. A weighted piston is raised by oil pressure, produced by a pump worked by the wheel. When rotation has ceased the piston descends, discharging the oil through a hole, whereby the lever holding the toothed wheel against rotation is released, and the wheel returns to its normal position. Five figures.

24.135/12. **Railway Signalling.** J. W. PAGE. A signal system is described whereby "the driver of a train may at all times keep the road ahead of him clear by causing signals to be displayed in advance, denoting that his train is approaching a certain block." Signals are worked by electric motors supplied from batteries, but are put into operation by a striking gear at the side of the track, worked by the train. Five figures.

## Specifications Published To-day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, E.C., at the price of 8d. each, post free.

Names in italics indicate communicators of inventions from abroad. Summaries of some of the more important of these patents will appear in our next issue.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** B.T.H. and GARTON [Automobile lighting] 2,874/12; VON DREGER [Charging accumulators] 5,434/12; GEB. SIEMENS [Fireproofing moulded conductors] 16,044/12.

**Dynamos, Motors, and Transformers:** LEITNER [Brush gear] 28,817/11; SIDDELEY, 1,999/12.

**Electrometallurgy and Electrochemistry:** NIBLETT [Electrolysis] 1,671/12; MARINO [Treating aluminium for metallic deposition] 2,136/12; PAULIN [Electrolysis] 6,261/12; RENNERFELT [Furnaces] 7,367/12; MURRAY [Electrotype] 8,746/12.

**Heating:** MANX [Fluid heater] 26,485/11.

**Incandescent Lamps:** DEUTSCHE GASGLÜHLICHT, 2,284/12.

**Instruments and Meters:** RECORD [Moving coil type] 26,241/12 and 26,242/12.

**Switchgear, Fuses, and Fittings:** MOLLETT [Shade supports] 28,462/11; DRUSEIDT [Switches] 28,942/11; SELBY and PRESTON [Switch and fuse boards] 1,646/11; B.T.H. and GARTON [Switches] 1,680/12; LEITNER [Circuit control] 1,965/12; MUNRO [Spring shade holder] 2,020/12; BERRY and MARKHAM [Fused switches] 3,338/12; CLIFFORD [Automatic switches] 3,915/12; COX [Switches] 5,280/12; LEVI and ROSE [Portable reading lamp] 9,442/12; BOYD and TANNAHILL [Fuse] 12,273/12; SIEMENS-SCHUCKERT [Mercury motor-starting switches] 14,087/12; SCHOTT and GEN [Automatic switches] 25,518/12.

**Telegraphy:** STILLE [Telegraphic photography] 12,709/12.

**Traction:** BLACKALL and JACOBS [Tablet single-track working] 1,852/12; PIERER [Petrol-electric] 3,281/12.

**Miscellaneous:** STEWART [Ozonising, ventilating, &c.] 1,931/12; BRITISH EVER-READY ELECTRIC CO. (Heil) [Depolarizers] 25,784/12.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Ignition:** BOSCH [Short-circuiting gear] 27,403/12.

**Telephony:** TELEPHON APPARAT FABRIK ZWIETUSCH [Automatic selector switch] 16,151/12

## Expired Patents

The following are the more important Patents that have become void through non-payment of renewal fees.

**Distribution Systems, Cables and Wires, Insulating Materials, &c.:** E. MÜLLER [Plastic insulating material] 23,095/07.

**Electrochemistry and Electrometallurgy:** S. O. COWPER-COLES [Purifying electrolyte in centrifugal container by arc lights] 23,145/07; [Making small copper tubes] 23,235/07.

**Instruments and Meters:** HARTMANN & BRAUN [Magnetometer for resonance, instruments, tuned reeds, &c.] 23,318/07.

**Switchgear, Fuses, and Fittings:** VERITY's and F. W. THORPE [Tilting incandescent lamp fitting without balance weights] 21,202/05; B.T.H. (G.E.Co., U.S.A) [Toggle joint circuit breakers] 23,449/07.

**Telephony and Telegraphy:** I. KITSEE [Moving-coil relays] 23,386/07.

**Traction:** J. S. RAWORTH [Regenerative control: construction details and car interlocking gear. Series turns on motor magnets] 22,551/05.

**Miscellaneous:** E. & O. A. Co. [Adjustable fans: Motor in spherical pivoted case] 22,701/04; J. C. BEST [Locks of miners' safety lamps] 23,086/07.



## LOCAL NOTES

**Aberdeen: City Electrical Engineer's Libel Action.**—The libel action in which Mr. J. A. Bell, the City Electrical Engineer, is claiming £1,000 damages for slander against Mr. A. E. Milne, Hon. Secretary of the Aberdeen Branch of the Electrical Contractors' Association, has arisen through Mr. Bell's advice upon an estimate by a local firm for an electric lighting and heating installation. From the papers in the case it seems that the estimate was for 23s. 1d. per point, and Mr. Bell, in the capacity of consulting engineer, expressed the opinion that this charge was excessive. Following on this, a letter was sent by the Hon. Secretary of the Aberdeen Branch of the Electrical Contractors' Association to the Aberdeen Town Clerk, commenting on this matter, and couched in language which Mr. Bell maintains is a reflection upon his ability, and implies ignorance, incompetence and want of professional skill on his part. Further, he claims that the letter was intended to damage him in the eyes of the Aberdeen Town Council, and that in fact he has been greatly injured in his professional reputation by the statements made, of which, by the way, a withdrawal of and apology for is refused. For the defendant it is claimed that the statements were privileged and that the letter in question was written under the instruction of the Association. Further, it is contended that, looking to the character of the work, the statements made by Mr. Bell were untrue. The case is expected to come on very shortly.

**Belfast: Power Supply.**—Arrangements have been made to supply the Irish Flax Spinning Co. with power for their Bath Place mill on a basis of 30s. per annum per kw. of maximum demand, plus 0.5 per unit for a minimum of 317.196 units per annum.

**Threatened Strike of Electrical Workers.**—A demand is being made by the electrical wiremen for an increase of from 84d. to 9d. per hour, and a strike has been threatened if this demand is not met. It seems that the membership of the local branch of the electrical wiremen's association is about 230, most of whom are employed by Messrs. Harland and Wolff. This firm has paid a minimum wage of 9d. per hour, and have promised a further advance in March. It seems, therefore, that the effect of the threatened strike will be very circumscribed.

**Derby: New Plant.**—At the last meeting of the Corporation it was decided to apply to the Local Government Board for sanction to a loan of £13,500 for the 2,000-kw. turbo-alternator set advertised in our last issue. The addition of this set will bring the generating plant of the Corporation up to 7,750 kw., but it is proposed to scrap two small engines, which will reduce the total to 7,450 kw. The chief criticism on the proposal came from a shareholder in the local Gas Company, who expressed the opinion that the scheme proposed is only half a scheme and that it would be far better to remove the Corporation's new power station to a more favourable site, where it would be possible to produce more economically than at present. He himself, he said, was producing electrical energy cheaper than the Corporation.

**Dundee: Carolina Port Extensions.**—Excavations on the site for extensions at the main generating station at Carolina Port are now well in hand, and pile-driving is to be started immediately.

**Electric Driving.**—Messrs. Mather & Platt are fitting a factory in the centre of the City with three-phase motors. Another factory which has recently been connected to the Corporation mains in the Lochee district has been fitted with the Schorch system of individual drive.

**Handsworth (Birmingham): Lapse of Electric Supply Powers.**—The Board of Trade have issued an order depriving the Shropshire, Worcestershire & Staffordshire Electric Power Co. of their rights to supply electricity in Handsworth, Yardley, and a portion of King's Norton and Northfield, all of which are now included in the city of Birmingham. The company has never given a supply in these districts, and the Board of Trade's certificate is issued under the "Cesser of Powers" Clause in the Company's Acts.

**Hove: Purchase of Electric Supply Co.**—The poll of rate-payers to decide as to the promotion of the Bill providing for the acquisition of the Hove Electric Lighting Company's undertaking, has resulted in a majority of 369 in favour, the figures being 1,380 in favour and 1,015 against.

**Leicester: Interruption to Supply.**—The interruption to the supply on Wednesday last week has been explained by the Borough Electrical Engineer, who states that a short circuit occurred at the back of the main switchboard at the Aylestone

Generating Station. This switch controls the whole of the lighting supply of the town, and the fire that ensued could only be coped with by shutting down the whole supply. Temporary wires were then installed and in ten minutes the full supply was restored.

**Rushden: Electrical Power Station.**—The Corporation have passed the plans for the generating station of the Rushden and District Electric Supply Co., which recently obtained an electric lighting provisional order.

**Scarborough: Proposed Purchase of Electric Lighting Co.**—The Town Clerk, Borough Engineer and Borough Accountant have been instructed to report upon the proposed purchase of the Scarborough Electric Lighting Company.

**Walsall: Position of Electricity Undertaking.**—The General Purposes Committee recommends that a consulting electrical engineer be engaged to report upon the general position of the electricity undertaking, and to advise as to the course to be adopted to ensure its profitable working in the future.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

[Notes of Contracts Open are not repeated under this heading week by week until the last date for receiving tenders, as is done in some of our contemporaries, but are only inserted once.]

## Generating Stations, Sub-Stations, Mains, &amp;c.

**Glasgow.**—Plant for one of the pumping stations for the new Dalmarnock Electricity Works is required at an estimated cost of £3,000.

**London: L.C.C.**—Two 8,000-kw. turbo-alternators with condensers, &c.; three 1,500-kw. rotary converters; nine transformers for same with two starting transformers. Feb. 25th. (See advertisement on another page.)

**Battersea.**—Additional boiler and mechanical stoker, &c., is required, at estimated cost of £3,275.

Mains extensions at an estimated cost of £200 are to be put in hand.

**Shoreditch.**—Two Green type economisers. Borough Electrical Engineer. (See advertisement on another page.)

**Stepney.**—Turbo-alternators, boilers, &c. Borough Electrical Engineer, March 17th. (See an advertisement on another page.)

**Maidstone.**—A new generating set at an estimated cost of £5,620 is to be installed at the generating station.

**Oldham.**—Two 500-kw. motor alternators. Borough Electrical Engineer, February 21st. (See an advertisement on another page.)

**Peterborough.**—A loan of £1,000 for mains extensions has been sanctioned.

**Tunbridge Wells.**—The Corporation have referred the report of their Borough Electrical Engineer, with respect to the replacement of the small sets used on the light load, to its Consulting Engineers, Messrs. Boot & Partners, 7 Victoria Street, Westminster, for report.

## Wiring

The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.

**Gloucest.**—Estimates are being secured for the lighting of the workhouse.

**Durham.**—Training college for women. County Architect, Shire Hall.

**Egham.**—New drill hall for Surrey Territorial Force Association. Secretary, Caxton House, S.W.

**Lincoln.**—Extensions to County Asylum.

**London: L.C.C.**—Leipsic Road School, Camberwell, 210 points. Feb. 25th. (See advertisement on another page.)

**Westminster.**—Theatre, near Charing Cross. Architects, Richardson & Gill.

**Manchester.**—Electric light and fittings for George Leigh Street municipal school, Ancoats. Education Offices, Deansgate.

FOR  
STEAM JOINTS  
USE



JOHN HUDSON & CO.'S SUCCESSORS, Mansell St., London, E.

**Motherwell.**—Cinematograph theatre, Brandon Street.  
**Oldham.**—New mill for Belgrave Mills Company. Architects, F. W. Dixon & Son.  
**Preston.**—New baths.  
**Torquay.**—New municipal buildings.

#### Miscellaneous

**Blackburn.**—Twelve months' supply of insulated material, fuse boxes, motors, motor starting switches, &c., for Electricity Department. Borough Electrical Engineer. February 15th.

**Canada.**—A supply of electric motors is required for the equipment of the machine shops of the National Transcontinental Railway, Manitoba. Copies of the specification may be seen at 73 Basinghall Street, E.C.

**Douglas (I.O.M.).**—At a special meeting of the Town Council last week, Messrs. Handcock & Dykes were instructed to furnish full particulars of an electric lighting scheme estimated to cost £12,000.

**Hereford.**—Electricity is to be substituted for steam for the pumps at the waterworks. A loan of £1,000 is required for the work.

**Ilford.**—Twelve months' supply of arc lamp carbons, cables, house service fuse boxes, incandescent lamps, joint boxes, and meters. A. H. Shaw, Borough Electrical Engineer. February 25th.

**London: L.C.C.**—Tenders are to be invited for 2,200 track insulators and 3,200 porcelain for the tramway system.

**Rochdale.**—An additional loan of £80,000 for electrical extensions is to be applied for.

**Stockton-on-Tees.**—Twelve months' supply of stores for Electricity Department. Electrical Engineer. February 19th. (See advertisement on another page.)

### TENDERS RECEIVED AND ACCEPTED

**Belfast.**—The Harbour Board has placed an order with Messrs. G. Russell & Co., of Motherwell, for a 120-ton electric derrick crane at £8,725.

**London: L.C.C.**—Orders have been placed with the British Insulated & Helsby Cables, Ltd., and Messrs. Brecknell, Munro & Rogers, for fittings for the overhead tramways system.

The following tenders have been received for number plates on the trams:—Venner Signs, Ltd., £3,805; Brush Electrical Engineering Co., £6,070; Hurst, Nelson & Co., £7,486. The first-named tender is recommended for acceptance.

**Manchester.**—The following tenders have been accepted by the Corporation:—Testing battery at Ardwick cable stores, Tudor Accumulator Co.; transformers, British Electric Transformer Co.; fuse boxes, British Insulated & Helsby Cables, Ltd.; and paper insulated cable, Siemens Bros. & Company.

**Newcastle-on-Tyne.**—Messrs. Ferranti, Ltd., have received a contract for the supply of tramcar meters.

**Newcastle-under-Lyne.**—An order for cable has been placed with Callender's Cable & Construction Company.

**Salford.**—An order for two-circuit breakers at £90 has been placed with Mr. Bertram Thomas.

### APPOINTMENTS AND PERSONAL NOTES

The Sheffield Tramways Committee recommend an increase in the salary of Mr. A. R. Fearnley, the tramways manager, from £800 to £900 per annum, with further annual increments of £25 to £1,000 per annum.

The salary of Mr. T. Hall, Borough Electrical and Tramways Engineer at Burton-on-Trent, is recommended for an increase from £225 to £275 per annum, and that of Mr. C. J. Melbourne, Chief Engineer at the Electricity Works, from £145 to £160 per annum.

Mr. Bernard L. Myer has resigned his position as Chief Electrical Assistant with Messrs. Sloan & Lloyd-Barnes, consulting electrical engineers (Liverpool), and has taken over the management of the electrical and engineering department of Messrs. Fred. Wilkins & Brother, Ltd., 27-35 Duke Street, Liverpool.

An engineer for line work is required by the Constantinople Telephone Co. (See an advertisement on another page.)

The salary of Mr. J. W. Dugdale, General Manager of the Oldham Tramways, has been increased from £350 to £400 per annum.

Messrs. W. H. Tritton and D. Ritson, shift engineers at the Gillingham Electricity Works, have resigned. Mr. F. Tutt, of Gravesend, succeeds Mr. Tritton, and Mr. F. Knell, of Sheerness, succeeds Mr. Ritson.

Mr. J. M. Keenan, Chief Assistant Electrical Engineer at Torquay, is to have his salary increased from £166 to £180 per annum.

Mr. S. Williams has been appointed Borough Electrical Engineer at Wishaw.

### MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. George Smith & Son, of 5 Philpot Lane, E.C., inform us that the price of electrolytic copper bars c.i.f. port of arrival, quoted on Tuesday night, was £74 to £76 (last week, £74 10s. to £75 10s.).

**Lantern Slides.**—Siemens Brothers Dynamo Works, Ltd. (Caxton House, Westminster), have extended and revised their list of lantern slides which are kept at Caxton House, and lent free of charge to lecturers, schools, &c., and now comprises 238 different slides of electrical interest.

**The G.E.C. Football Teams.**—The still undefeated team from the Witton works was victorious last Saturday against the London office staff by 5 goals to 3. In the evening a most successful dinner and entertainment was held, at which some seventy were present.

**Plant for Sale.**—The whole of the plant at the Dunning Street generating station of the Sunderland Corporation is to be sold. (See an advertisement on another page.)

**Social Gathering.**—Messrs. Rawlings Brothers, Ltd. (82 Gloucester Road, South Kensington, S.W.), entertained some 400 of their employees, with their wives and friends, on Saturday last at their annual social gathering, when an excellent musical programme was performed.

**Dinner.**—The employees of the Record Electrical Co. (Broadheath, Manchester) held their first annual dinner at the Brooklands Hotel, Cheshire, last Saturday. Mr. C. W. von Roemer, chairman of the company, presided. After some speeches in happy vein, the proceedings terminated with a concert.

### COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &c.

**Yorkshire Electric Power Co.**—The net profit last year was £7,361, against £7,784 and £6,503, respectively, in the two previous years. The accumulated profits to the end of 1911 have permitted the writing off of £14,047 administration and development expenses, and the payment of the dividend due on the cumulative preference shares, leaving £330 to be carried forward, in addition to the 1912 profits. Out of the available balance of £7,691, a 6 per cent. preference dividend for the half-year to December 31st is to be paid, and after writing off special expenditure during 1911 upon generating plant (£1,920), the sum of £644 is carried forward. During 1912 considerable expense has been incurred upon the generating plant and distribution system in order to cope with the increasing demand. The Yorkshire Waste Heat Co. is erecting a station at Barugh, near Barnsley.

**Dividends of London Electric Supply Companies.**—Announcements of dividends by the London electric supply companies for 1912 are now being made. The Westminster Electric Supply Corporation and St. James's & Pall Mall Electric Light Co. announce final dividends, making 10 per cent. for the year, and the London Electric Supply Corporation 5½ per cent.

**W. T. Henley's Telegraph Works.**—A dividend at the rate of 15 per cent. per annum for 1912 is recommended.

**Chloride Electrical Storage Co.**—The directors propose to pay a bonus dividend of 7s. 6d. per share on the ordinary shares for last year by the issue of the 19,344 unissued ordinary shares. If the bonus is not met by the above issue, the remainder will be paid in cash.

**Liquidations.**—A meeting of creditors of the Provincial Electric Co. was held at 125 Edmund Street, Birmingham, on Tuesday.

### John E. Raworth,

Queen Anne's Chambers, Chartered Patent Agent.  
 30, Broadway, Westminster, London, S.W.

# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

NO. 321 [VOL. IX., No. 8]  
*All rights reserved.*

THURSDAY, FEBRUARY 20, 1913.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES and TECHNICAL COLLEGE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

*Other Advertisement Rates on Application.*

### Latest Time for Receiving

Letters for Insertion, Tuesday first post.

Small Advertisements and Official Announcements, Wednesday first post.

Displayed Advertisements, Tuesday first post.

Corrections in Standing Advertisements, Monday first post.

All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 208-206, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Circling, Fleet, London." Telephone No.: 5509 Holborn.

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## CONTENTS

	PAGE
SUMMARY	97
Arrangements for the Week	98
Advertising Electricity	99
The Salford Electricity Undertaking and Bulk Supply	100
The Control of Motors, Switches, &c., from the Central Station	101
The Starting of Induction Motors	101
The Hunting of Alternators	103
Factory Lighting	104
A New Fuse Box	104
An Oil Switch for Low Voltages	104
Questions and Answers by Practical Men	105
Patent Record	106
Electric Traction Notes	107
Telephony and Telegraphy (Including Wireless)	107
Catalogues and Pamphlets Received	107
Local Notes	109
Tenders Invited and Prospective Business	109
Tenders Received and Accepted	110
Miscellaneous Business Notes	110
Companies' Meetings, Dividends, Reports, &c.	110

## SUMMARY

THE co-operation of all sections of the electrical industry to form an Association for the purpose of advertising electricity was advocated in a Paper read by Mr. H. C. Palmer before the Manchester Section of the Institution of Electrical Engineers. Mr. Palmer had worked out his scheme in considerable detail, and the Paper was followed by a critical discussion, in the course of which a diversity of views were expressed. (Page 99.)

WE publish some more particulars of the position of affairs at Salford which made it necessary to make arrangements for obtaining a "bulk" supply. The boiler plant is fully loaded, there is no space for ex-

tensions, and the load next winter is expected to be beyond the capacity of the present station. Had the Council not known that they were favourably situated for bulk supply, a new station would doubtless have been put in hand a year or two ago. (Page 100.)

AN ingenious system of cutting meters out of action periodically during non-peak hours to give the effect of double tariff charging, by means of resonating relays actuated by a small high frequency voltage superposed on the mains, has been developed by Mr. W. Duddell, Mr. A. H. Dykes, and Mr. H. W. Handcock. (Page 101.)

THE results of an investigation into the best kinds of induction motors for different services were given in a Paper by F. C. Aldous read recently before the Manchester Local Section of the Institution of Electrical Engineers. The effects of onerous starting conditions on squirrel cage motors were discussed at length. The author recommends that all rotor joints be brazed or welded. (Page 101.)

A FORMULA by which the natural period of oscillation of alternators may be more accurately determined than by the short-circuit method, was given by Mr. A. R. Everest in a Paper read and discussed before the Institution of Electrical Engineers in London and Birmingham. (Page 103.)

THE lighting of a factory is described, and notes are given on a new oil switch and a house service fuse-box on page 104.

AN electric traction problem is mentioned in our Questions and Answers columns. (Page 105.)

THE grant of a patent to V. Stobie for a combined gas and electric arc steel refining furnace is opposed. A luminous radiator patent, by H. J. Dowsing, covering certain arrangements of reflectors to obtain a convector effect, expires on Monday next after a full life of 14 years. The Specifications published by the Patent Office last Thursday include one for telegraphic photography by C. Stille, and one for the arrangement of motors in electric locomotives above the wheel axles, which they drive by flexible gearing through a countershaft. This specification is in the name of P. Dawson and S. J. Lucas. (Page 106.)

THE Metropolitan Railway Co.'s shareholders have now sanctioned the purchase of the Great Northern & City Railway.—Considerable dissatisfaction is expressed with the position of the Lowestoft Corporation tramway system.—The proposed electrification of the Berlin Stadtbahn has been postponed pending further information with regard to a number of matters. (Page 107.)

THE Postmaster-General has again refused to release the Marconi Co. from the Imperial wireless telegraph contract.—Contracts have been placed for the erection of two pairs of Marconi wireless stations for Atlantic and two pairs for Pacific service.—The position of the Marconi Co. in Europe is also dealt with.—It is pos-

sible that the Hull Corporation will take over the old National plant there, and also be granted an extended license by the Post Office. (Page 107.)

THE Belfast Corporation have finally decided to erect a new power station.—The street electric lighting question in Westminster is again under consideration.—By a small majority the Cromer ratepayers have voted in favour of the disposal of the electricity undertaking. (Page 109.)

WATER-TUBE boilers are required at Dundee; small generating plant for the Toxteth workhouse.—Street lighting schemes are under consideration at Shipley and Swanage.—Electric lighting plants are contemplated at St. Luke's Hospital, Halifax.—Many authorities require twelve months' supplies of electrical stores. (Page 109.)

THE result of last year's working of a number of London electric supply companies are given. (Page 110.)

**Strike at Evershed and Vignoles' Works.**—On Wednesday last week between 200 and 250 men at the works of Messrs. Evershed and Vignoles, Ltd., came out on strike in consequence of a workman being discharged for neglecting his work. The men consider that he was harshly dealt with and demand his reinstatement—a demand which the Company, in view of all the circumstances, are not able to concede. The man is a member of the Scientific Instrument Makers' Union, but the hands were not called out by the Union, which, we understand, however, is now taking up the matter. The men are still "out," but the employees in the stores, packing department, and winding and lacquering rooms are working loyally for the Company. Every member of the staff throughout the works is doing his utmost to help the Company, and a considerable amount of work is thus being completed; including assistance given by members of the testing department and others, about 150 men are at work.

**A Street Lighting Specification.**—In March Mr. A. P. Trotter will read a Paper at a joint meeting of the Institution of Electrical Engineers, the Institution of Gas Engineers, the Illuminating Engineering Society, and the Municipal and County Engineers' Association on a standard specification for street lighting.

## ARRANGEMENTS FOR THE WEEK

FRIDAY, FEBRUARY 21st.

*Manchester Electro-Harmonic Society.*

7.30 p.m. Concert at Albion Hotel.

MONDAY, FEBRUARY 24th.

*Institution of Electrical Engineers: Newcastle Students' Section.*

7.30 p.m. At Armstrong College. "Notes on a Single phase Traction System," by V. O. Haddock.

TUESDAY, FEBRUARY 25th.

*Institution of Electrical Engineers: Manchester Section.*

7.30 p.m. At the University. "Some Recent Developments in Manchester Street Lighting," by S. L. Pearce and H. A. Ratcliffe.

*Electro-Harmonic Society.*

8 p.m. Concert (Ladies' Night) at Holborn Restaurant.

THURSDAY, FEBRUARY 27th.

*Tramways and Light Railways Association.*

7.30 for 7.45 p.m. Annual dinner and smoking concert, Trocadero.

*Institution of Electrical Engineers.*

8 p.m. Fourth Kelvin Lecture: "The Ohm, the Ampere, the Volt: a Memory of Fifty Years Before, 1862-1912," by Dr. R. T. Glazebrook.

## The London Electrical Engineers.

(To-day) THURSDAY, FEBRUARY 20th. C. Company.—Company Training, 7 to 10 p.m.

FRIDAY, FEBRUARY 21st. D. Company.—Company Training, 7 to 10 p.m.

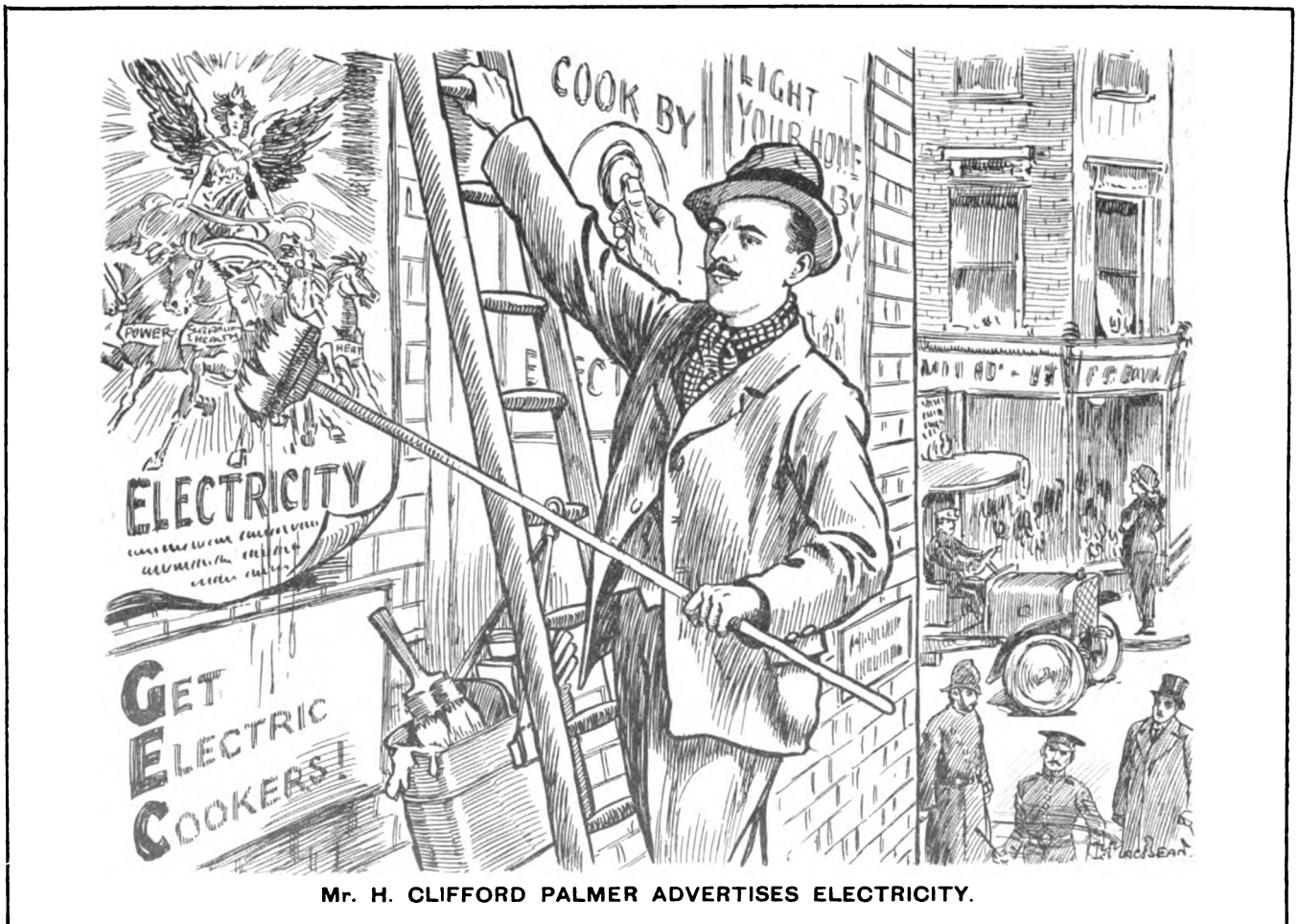
SATURDAY, FEBRUARY 22nd. A. and B. Companies (Right Half Battn)—Week-end Training at Dover. Service Dress. Parade at Victoria Station, L.C. & S.E. Line, at 1 p.m. C. Company.—Week-end Lorry run. Parade at Headquarters at 2 p.m. Service Dress. Headquarters open for Regimental business from 10 a.m. till 12 noon.

MONDAY, FEBRUARY 24th. A. Company.—Recruit Training, 7 to 10 p.m.; Company Training, 7 to 10 p.m.

TUESDAY, FEBRUARY 25th. B. Company.—Company Training, 7 to 10 p.m.

THURSDAY, FEBRUARY 27th. C. Company.—Recruit Training, 7 to 10 p.m.; Company Training, 7 to 10 p.m.

**The British Westinghouse Club.**—The spacious new premises of the British Westinghouse Club in Manchester were ceremoniously opened on Saturday last by Mr. Lange (Managing Director of the British Westinghouse Electric & Manufacturing Co., Ltd.). The club is now open to all male employees of the company, and consists of a large hall capable of seating 300 persons, a dining-room, and a two-table billiard room, as well as many smaller rooms and a miniature rifle range. In the grounds there are five tennis courts and a bowling green. The club is financed by the company and the staff in equal proportions.



Mr. H. CLIFFORD PALMER ADVERTISES ELECTRICITY.

## ADVERTISING ELECTRICITY

AT the Manchester Section of the Institution of Electrical Engineers last week, Mr. H. Clifford Palmer (Manager of the Publicity Department of the General Electric Co.) read an interesting paper on "Advertising Electricity," illustrated with some fine designs for daily paper and poster advertising. He pointed out that, out of a population of forty-two millions in the British Isles, there were only a little over half a million consumers on the supply mains, and of these only a few thousands employed electric heaters, cookers, irons, kettles, &c. We had, he said, been too busy studying, experimenting, perfecting, and economising, to devote the necessary time and thought to advertising. He did not suggest that extensive action was justifiable or desirable five years ago but submitted that we had been somewhat apathetic during the last two or three years. He proposed that an "Electricity Publicity Association" should be formed, composed of selected members of the Electricity Supply Publicity Committee (representing the supply undertakings), the British Electrical and Allied Manufacturers' Association, and the Electrical Contractors' Association, and that the main duty of the new Association should be to direct the operations (under expert advice) and control the general policy of a national educative electrical advertising campaign. Sub-committees could be formed by each Association for the purpose of obtaining the necessary funds. If every one in our large industry contributed, the subscription need only be quite nominal, and but little difficulty would be experienced by the various finance committees in collecting subscriptions from those actually interested, whether members of an association or not. For a comprehensive scheme to cover the entire country, he would like to see not less than £30,000 raised for a twelve months' campaign, but he did not suggest that such an amount was absolutely essential, or that operations could not be started with less. As an example he outlined a scheme for London and the district within a radius of fifty miles of London, and calculated on the basis of a total expenditure of £12,000 for a twelve months' comprehensive advertising effort in the area mentioned. He would divide the expenditure as follows:

- (a) Daily Press advertisements, five-twelfths.
- Editorial notices in the daily and weekly Press would be covered by the Press advertising.
- (b) Literature and circularising (this to a considerable extent would be self-supporting), one-twelfth.
- (c) Central information bureau, one-twelfth.
- (d) Bill-posting, two-twelfths.
- (e) Expenses of management and staff, one-twelfth.
- (f) Illuminated animated signs for night advertising, two-twelfths.

He recommended that the Press advertising should be in the principal morning and evening papers, and divided into two periods—from the middle of March to the middle of June (cooking, ventilating, and other domestic applications, with power intermixed), and from the middle of September to the middle of December (lighting and heating, also with power intermixed). He also recommended that the insertions should appear not less than one per week in each paper; the size of the advertisement varying from time to time according to the total sum allocated to the paper in question. For the opening of the campaign and for any special occasion (such as the opening of the London Electrical Information Bureau referred to later) full pages should be taken in papers enjoying the greatest and most influential circulation. Editorial notices could come as a sub-heading to Press advertising, since to some extent the one carried the other. By this he did not desire to indicate that the money spent on advertising would positively buy the editorial columns of London's leading daily papers without further question; but no matter what might be said to the contrary, it would be bound to obtain greater recognition by the Press than was enjoyed to-day. Every week little paragraphs, which they would welcome, could be circulated to the editorial departments of various papers. He could foresee the day when the London and provincial papers would be willing enough to insert pages of popular electrical notes, in similar manner to the pages which now exist in most of the premier papers on motor notes, fashion notes, Empire news, cycling notes, &c. With such a scheme, properly organised on a co-operative basis, and with a qualified advertising man to act for the Association, he maintained that there should be no difficulty whatever in collecting news items of public interest from supply stations throughout the country, from manufacturers, and from con-

tractors, and dispersing them in proper manner to the Press. A considerable number of inquiries, Mr. Palmer continued, would be received by the Publicity Association from its members for the supply of suitable literature descriptive of the various applications of electricity, although, undoubtedly, there would be certain bodies who would prefer to handle this work independently and locally. Others might wish to be supplied with suitable illustrations, border blocks, inset sketches, colour blocks for covers, &c., and also to be advised as to lay-outs, types, paper, size, &c., for their own locally prepared booklets. All such advice and information should be available for the use of members of the Association. Circularising could be termed "intensive" advertising, and, as it was, of course, limited in its sphere of operations, it should be handled independently by the various supply undertakings, manufacturers, and contractors. All subscribers to the Publicity Association should be entitled to purchase the Association literature at special rates.

All the "extensive" advertising of the scheme would be conducted from headquarters in London, in which would be a Central Information Bureau to act in an advisory capacity as far as publicity was concerned for the benefit of all members of the Association, and *inter alia* to supply capable demonstrators for showroom work, &c. Little would be gained, however, in using this Bureau as a demonstrating showroom, as this work would be too restricted at one address and could be better administered from local showrooms in all districts. One of the most valuable functions of the Central Bureau would be the arrangement of cooking demonstrations, and lectures in connection therewith.

Local showrooms should be properly organised on co-operative lines. Where the contractors had already been sufficiently enterprising to establish good showrooms, station engineers should recommend the local public to make use of them as if they were actually established by the undertaking itself. In other directions the showrooms already established by the supply undertaking would be the more desirable. In the smaller towns, where practically nothing had been done so far, the station engineer and the contractor might be brought together under the auspices of the Central Bureau. Then, with the possible assistance of the manufacturers, an attractive showroom might be established. All such showrooms, Mr. Palmer contended, should be more or less uniform as far as style and lay-out are concerned. A standard style could be set up by the Association, and as far as possible all the recognised electrical showrooms should be brought into line. Sales should not be effected at these authorised showrooms, but inquiries should be referred to the contractor nearest to their particular residence or place of business who was a member of the Publicity Association. For outlying districts where local showrooms would not be justified, it might be possible to organise a small travelling exhibition to move from district to district, staying for four to six days in each.

As an example of the publicity that could be secured by bill-posting, the author referred to the Strand site in London, past which, it was estimated, over one million persons pass in a single day. In billposting, bold methods should be adopted, first in the size of the bill, secondly in the selection of colour scheme, thirdly in the design, and fourthly in the point made. As a general rule the less said on a poster the more effective the bill is likely to be. No attempt should be made to make more than one point. Provision should be made for a permanent display over two periods of three months each, of about 1,100 "16-sheet double crown" (10 ft. by 6 ft. 8 ins. upright) bills on selected billposting stations in the most prominent thoroughfares in London and Greater London. For the spring and summer campaign he suggested two bills, one advertising electric cooking and the other advertising ventilation by electricity. In the autumn campaign he recommended first an advertisement of electric lighting, subsequently replaced by one of electric heating.

Electric signs would serve to advertise the general cause, but would also be an excellent advertisement for electric signs. Again, as an investment, they would have an appreciating rather than a depreciating value; because, after a suitable "run" in the metropolis, the signs could be re-erected in prominent provincial centres, and so go on perpetually doing good.

In conclusion, Mr. Palmer again emphasised the strict necessity for the proper control of actual operations by an expert advertising man. The man selected should be, he said, an advertising expert first and an electrical man second.



## DISCUSSION.

Mr. W. E. WARRILOW (Advertisement Manager of the *Electrician*) said that the I.M.E.A. should be represented on the Association proposed. He deprecated the advertising of gas by comparison with electricity. He considered that the editorial puff was now too stale, and had lost its power with the public. He found that station engineers liked to have the printing of their pamphlets done locally; this acted as an incentive to the printer to become an electric power consumer.

Mr. A. G. SEAMAN (British Westinghouse Co.) said that the electrical industry was now ripe for bold, general advertising on the lines advocated. To be successful, the scheme must be co-operative and comprehensive. There were many points which would require the most careful attention before such a scheme could mature, and the most important was the raising of funds.

Mr. F. C. RAPHAEL (Editor of *Electrical Engineering*) thought the question was one of ways and means, since the principle was apparently universally approved. Getting started was the great difficulty. The advantage of such a scheme being as great to those who did not contribute to it as to those who did, left very little direct inducement to offer those who found the money. Perhaps Mr. Palmer's Paper was merely brought before the Institution as a *ballon d'essai*, and the newly-formed Industrial Committee of the Institution, which is partly composed of representatives of the very bodies which Mr. Palmer had mentioned, was the "Association" he actually had in mind. He favoured a large amount of daily Press advertising; in one of the informal discussions at the Institution (*ELECTRICAL ENGINEERING*, Vol. VIII., p. 219) he had suggested that electricity supply authorities should contribute an average of £50 each for this purpose annually, which would give a sum of £25,000 a year. The question had still to be decided, however, whether supply authorities had power to spend money in advertising for the general good, and were not confined to such operations in their own district. The only way to get useful "editorial puffs" in the daily papers was to have first-class popular lectures on electrical subjects delivered by first-class lecturers in the principal public halls. A charge for admission should be made. There should not be free lectures in public showrooms. In conclusion, he said that the electricity department showroom, as it is run at present, is a poor sort of makeshift, and contractors had no right to insist that the supply undertaker must not sell unless they themselves provided good and adequate showrooms, in which every article suitable for use in the consumers' installations could actually be bought.

Mr. B. WELBOURN (British Insulated and Helsby Cables) said that the publicity scheme suggested should be under the auspices of the Institution. Manchester, he thought, would be a better centre to work from than London. Uniformly designed showrooms would be a great mistake.

Mr. F. WALKER (British Westinghouse Co.) thought that the author's scheme was not nearly big enough. Many firms spent more than £30,000 annually in advertising. The poor attendance at the meeting showed that the value of advertising was not properly appreciated.

Mr. A. J. GREENLY (Marcus Heber Smith) thought a publicity committee not much good in the way of helping with the advertising work proper, such as the passing of copy, &c., and presumed it would confine itself to the raising and administering of the funds. Electric power should be advertised, he said, in the various trade papers, and not in the daily papers.

Mr. L. F. HOLMAN (Osborne, Peacock and Co.) emphasised the great need of getting the money first.

Mr. F. SELLS (General Electric Co.) agreed with the principle, and thought the scheme must be handled by an independent association; the Industrial Committee of the Institution had already enough to do. Regarding showrooms, it was a great mistake to warm up a customer and then to let him go before he could make his purchase, as was the case in municipal showrooms, where sales were not allowed. Corporations could, however, overcome this difficulty by throwing their showrooms open to manufacturers, charging them rent, and allowing them to sell their goods there; any profits over ordinary trade prices could be divided between the municipality and the contractors of the town.

Mr. S. RENTELL (Editor of *Electricity*) thought electricity should be able to do as well as gas in the way of publicity, and thought supply authorities should contribute in the same proportion as the gas undertakings did to their publicity scheme.

Mr. PALMER replied briefly, and was accorded a hearty vote of thanks. After the meeting much interest was taken in Mr. Palmer's advertisement designs, the originals of which he had brought with him.

## THE SALFORD ELECTRICITY UNDERTAKING AND "BULK" SUPPLY

IN our issue of last Thursday we were able to announce that the Salford Corporation, at their Council meeting on Wednesday, the previous day, had definitely decided to accept the offer of the Lancashire Electric Power Co. for the supply of electricity "in bulk," the load guaranteed to the

Company being a minimum of 1,000 kw. with possible increases to 3,000 kw. The resolution met with strong opposition by a small section on the Council, who maintained, not absolutely without reason, that the tenders of the Manchester Corporation and the Company were not based on the same estimate of the Salford Corporation's requirements. We believe, also, that the Manchester Corporation had suffered on a previous occasion on the question of standby, and therefore without definite guarantee felt bound to assume that the tender must be for 1,000 kw. supply and an actual standby of a further 2,000 kw., which might not be earning anything by sale of current. In addition, the mains required to bring the supply from Manchester to the Salford Electricity Works (which was the point at which they were asked to deliver) would have been much longer than those required by the Lancashire Power Co. to supply at the boundary of Swinton and Salford. It is to be noted in passing that the report of the Committee recommending the acceptance of the Company's tender did not contain any mention of the method of measuring the maximum demand.

The position at the Salford Electricity Works which led up to the inviting of tenders for supply "in bulk" was as follows. The present equipment of the station comprises eight 750-kw. three-crank vertical tandem compound Browett-Lindley-Mather & Platt sets, two Willans-Siemens 1,000-kw. turbo sets, and one Willans-Brown Boveri set of the same size. In order to increase the capacity of the 750-kw. sets, and also to render them more efficient in steam consumption, it was proposed to convert the engines to the "uniflow" system, and the work on one of the sets is in hand as a trial. It is anticipated that the capacity would be increased to 1,000 kw., and it appears that the generators are capable of giving this output. This would ultimately increase the capacity of the station to 11,000 kw., or, assuming two sets always in reserve, 9,000 kw. The boiler plant is, however, at present insufficient for this larger generator capacity, and there is not room for extensions of it. On the whole, therefore, owing to possible further delays in the alterations of the engines, largely due to exigencies of load which would prevent any considerable number of the 750-kw. sets being out of commission at the same time for the alteration, and also on account of the position with regard to the boiler plant, and further increases of load coming on shortly, either a new station or taking a "bulk" supply become an urgent necessity. In fact, the Council admit that, if a single engine broke down, the position would be serious, that it is impossible to find space for more boiler plant, and as they estimate that from two-and-a-half to three years would be required, in the most favourable circumstances, to erect a new station, arrangements for a bulk supply were absolutely necessary.

To convert the extra high-tension three-phase current to low-tension D.C., three rotary-converters with the necessary transformers and switchgear are to be obtained at once, and tenders are being invited now in advance of the sanction of the Local Government Board to the loan of the £12,000 necessary for these, to allow six months to obtain delivery.

**Batti Wallahs.**—There was an informal meeting on Wednesday last week. The date of the annual dinner has been postponed to March 15th, owing to the proximity of the original date to the annual general meeting, which takes place on March 3rd.

**Old Centralians Dinner.**—The Annual Dinner of the Old Centralians was held on Saturday. Sir John Wolfe Barry, K.C.B., who was in the Chair, said that the College was never more successful than at the present moment. Its inclusion in the Imperial Technical College added increased lustre, and the students of the City and Guilds Engineering College represent about half the total number of students of the I.T.C. Within a reasonable number of months the extension of the building would enable more students to be accommodated, and would give more room for research and post-graduate work. In the course of his speech, responding to the toast of the College, Prof. Dalby told an interesting story of a new student who only turned up a week after the commencement of the term; he had received a notice that the session would start on the 10th proximo, and had interpreted this to mean *about* the tenth of the next month. Dr. G. T. Moody, who proposed the Old Centralians, and who is the new President, deplored the closing of the Chemical Department at the College. Mr. W. Duddell, F.R.S., Past-President, in replying, said that he hoped that the new laboratories and greater space would not make it too easy for the students, as the student often learnt more by being compelled to make the best use he could of limited space and a limited supply of apparatus. The membership of the Old Centralians is now 1,019. The opportunity for meeting old friends was much appreciated, and the party did not break up until some time after the close of the speeches.

## THE CONTROL OF METERS, SWITCHES, &c., FROM THE CENTRAL STATION

LAST week, through the courtesy of Messrs. Handcock and Dykes, we were able to see on the mains of the Egham and Staines Electricity Co. an interesting system at work for the control of meters used in a two-rate system of charging, from the central station, using only a single meter without clock-switches. Briefly, the system is to cause the meter shunt-circuit to be broken for, say, five minutes out of every seven during the non-peak hours by means of a relay actuated from the supply station by means of a superposed high frequency alternating current all over the system. This gives the equivalent of charging at the desired lower rate during the day-time without the need for two meters. The relay used is cheaper than an equivalent clock-switch, and the energy used to work it is less than that saved by the periodical cutting out of the meter shunt coil. The system is already in regular operation on the mains at Staines, and appears to be giving satisfaction.

The principles on which the relays and other apparatus employed are based are set forth in an original communication by the inventors, Messrs. W. Duddell, A. W. Dykes, and H. W. Handcock, accepted for publication by the Institution of Electrical Engineers. The underlying principle is to control relays, which may be inserted anywhere on the general system of mains, by means of a small, superposed, high-frequency alternating current impressed on the main current flowing in the system. This extra ripple does not affect the lamps or other apparatus in use, and as long as the feeder busbar voltage is kept constant, the amount of power supplied to consumers is practically unaffected. The output of the main generators is simply reduced by an amount equivalent to the power produced by the "ripple generator," which is simply a small alternator in series with them. In case of a continuous-current supply the matter is simple, as a condenser in series with the relay will protect it from the main current, but allow of its operation by the superposed alternations. With alternating currents, however, the relay must be made selective, so as to respond only to the desired frequency, and this has advantages in the case of continuous currents also. This effect is obtained by arranging a suitably proportioned condenser and inductance to form a resonating circuit. Unless, however, the resonance be made unduly sharp, or there be a very large difference between the frequencies, the condenser and relay may let through sufficient current at the supply frequency to attract the armature. To get over this difficulty an additional compensating circuit may be added, as in Fig. 1.  $L$  is the relay coil, the armature

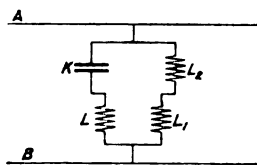


FIG. 1.

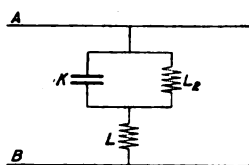


FIG. 2.

ALTERNATIVE CONNECTIONS FOR COMPENSATING RELAY.

and core being omitted for the sake of clearness. On top of this coil is wound a second coil,  $L_1$ , which may have, roughly, the same number of turns, and this coil is connected in series with a choking coil,  $L_2$ , having a high self-induction. The current through the condenser  $K$  and relay coil due to the supply frequency, say 50, leads almost  $90^\circ$  on the applied potential difference. The current through the choking coil  $L_2$  and compensating windings  $L_1$  is made to lag about  $90^\circ$ . If these two currents be adjusted to approximate equality, their action on the core of the relay can be made very small. It cannot be completely eliminated, because the two currents are not exactly at  $180^\circ$  to one another, but it is sufficient for practical purposes. By making the choking coil  $L_2$  with an adjustable air-gap in its magnetic circuit it is very easy to adjust the compensation. A compensated resonance relay of this sort will work with certainty at 5 volts at 200 frequency, and will take no notice of 100 volts at 50 frequency.

In practice the alternative arrangement shown in Fig. 2 is adopted with only one winding on the relay coil. This, although electrically identical with that in Fig. 1, may be looked upon as functioning in a different way. Due to the pressure of supply, a certain current flows at the lower frequency through the condenser  $K$ . We may supply the greater part of this current without taking it from the mains

by placing a choking coil in parallel, and adjusting the choke coil so that its self-induction and the capacity of the condenser are practically in resonance for the supply frequency. The actual relays in use consume only about 0.7 watt, and are of simple compact and robust construction.

The superposed ripple is obtained by a small alternator driven, in the case of the Staines installations, by a synchronous motor, and carrying through its armature the whole output of the main generators. The ripple voltage here is 140 volts at 200 cycles, and this is superposed on to the 2,000-volt 50-cycle, single-phase circuit. The connections are shown in Fig. 3, where  $G G$  are the main generators and

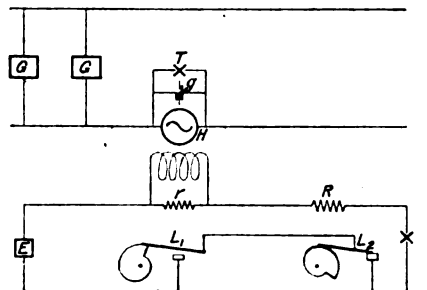


FIG. 3.—CONNECTIONS OF RIPPLE ALTERNATOR.

the higher frequency machine. It is put in and out of action by opening and closing the field circuit by the two cam-worked contacts  $L_1$  and  $L_2$ , one giving a sharp make and the other a sharp break. The armature can be cut out when required by the short-circuiting switch  $T$ , and a short spark-gap  $g$  is provided to prevent interruption in case of accident to the armature.

Although these ingenious resonance relays (to which the name "Handyell" has been given) were, we believe, originally designed with this two-rate system of charging in view, there are a number of other applications to which they may be put. The fact that they will respond only to a given frequency with an accuracy of timing well within 5 per cent., makes it quite possible for a number of differently timed relays to be placed in one circuit and any one picked out and operated independently of the others by sending a ripple of the right frequency, and this is easily controlled by varying the speed of the alternator. Thus, a relay with a rocking arm and two solenoids can be made to switch a street-lighting or other circuit on when one frequency is sent, and to switch off with a different frequency, and all that without affecting other relays in the system for other purposes. By this means considerable saving can be made, owing to the greater accuracy of lighting up that can be obtained over a system where a man makes a tour of the district to switch on by the employment of apparatus which, we are told, will prove cheaper than reliable clock-switches. There are also fields for the use of the system in railway and other signalling, train dispatching, &c., where the freedom from liability of interference by stray currents should prove of value. We look forward to interesting developments with this apparatus, the certainty of action of which is largely the result of the great perfection which has recently been obtained in the manufacture of condensers.

## THE STARTING OF INDUCTION MOTORS

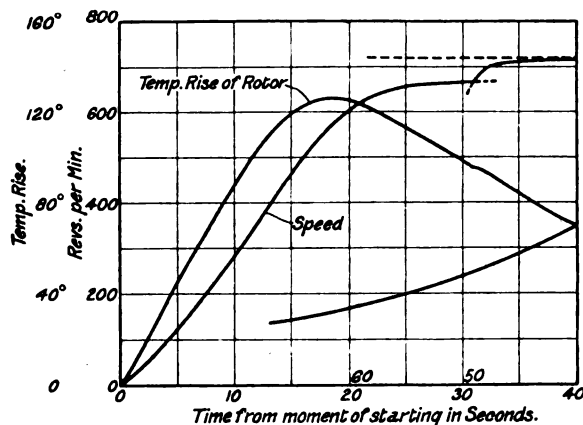
A PAPER entitled "Starting and Speed Control of Induction Motors" was read by Mr. F. C. Aldous before the Manchester Local Section of the Institution of Electrical Engineers a short time ago. Squirrel-cage and slip-ring motors for two- or three-phase working only are considered, some general descriptive matter and details being given in opening. In general the horse-power of a squirrel-cage motor which has to start on heavy load should not exceed about 5 per cent. of the k.v.a. of the total minimum generating plant, or 10 per cent. if it starts on light load. On a large power system lower figures than the above would be taken. On a self-contained system these figures may be doubled, since the permissible voltage drop will be greater.

For variable speed work the author points out that slip-ring motors are generally used as with squirrel-cage machines, where lower speeds are obtained by reducing the stator pressure the stator current is increased and consequently the heating of both rotor and stator. Discussing the question of mine ventilating-fan driving, the author points out that during the development of a new pit a fan may have to run for long periods at a reduced speed. A slip-ring

motor with rheostatic control would not be desirable, but both multi-speed and cascade motors can be used with advantage, though separate motors for the two speeds are sometimes preferred. In the case of rope-driven fans the different speeds can be obtained by changing the driving pulley.

Speed reduction of fans is also required for short periods, as, for instance, where a lower air-pressure can be used over the week-end. In this case a slip-ring motor with rheostatic control is often the best system to adopt, for though the efficiency of motor and rheostat at reduced speeds is certainly low, the power diminishes so rapidly as the speed is reduced that the loss is relatively small.

It is found that when a squirrel-cage motor starts against an inertia load, the total energy absorbed and the heating during the starting are independent of the starting voltage, neglecting the heat dissipated. If the load consists partly of friction the energy and the heating are reduced if the starting voltage be increased. It follows that when starting such loads as compressors, tube mills, &c., a high starting



SPEED AND TEMPERATURE RISE OF ROTOR DURING STARTING.

voltage is advantageous, whereas for loads consisting chiefly of inertia the value of the starting voltage is not so important. A further law is that when the starting conditions imposed on a motor are fixed, the friction torque fixed but the inertia varied, the time of starting, the total energy absorbed, and the heating vary as the inertia to be started—neglecting the heat dissipated and resistance changes. For squirrel-cage motors, since the starting voltage is fixed, the torque developed at any particular speed is fixed and the friction torque is fixed, therefore the torque available for acceleration at any particular speed is fixed, so that it is inversely proportional to the inertia, and the kilowatts input and current at any speed are constant, since the voltage is fixed, from which it follows that the time of starting, the total energy absorbed, and the heating of the motor are proportional to the inertia of the load.

Discussing the question of starting torque the author points out that for its determination it is necessary to determine the starting or short-circuit current. Motors which have an unusually large short-circuit current can be built with a relatively small slip and still develop a good starting torque, since the slip is decided not only by the starting torque required, but also by the short-circuit current. Sufficient starting torque can usually be obtained by taking a normal slip of 4 or 5 per cent., though on motors of large size this can generally be reduced. High-speed motors, especially for pump driving, requiring a comparatively small starting torque, are generally designed with a normal slip of not more than  $2\frac{1}{2}$  to 3 per cent.

When specially heavy starting torque is required, as for crane motors, and motors for operating sluice valves or small compressors, squirrel-cage motors are built with rotors of much higher resistance, giving a slip of 8 to 10 per cent. at normal load. The rotors are specially built to withstand the heat developed in them without deterioration, and are generally started by switching on full voltage. Crane motors are controlled by varying the terminal pressure by an auto-transformer with tapings.

A motor with a good overload capacity and a normal slip of 5 per cent. will give a good starting torque without taking an excessive current. In no case is there much advantage in increasing the slip above 10 per cent. The smaller the slip the better the efficiency. As an example of the effect of incorrectly calculating the starting current it is pointed out that if the actual starting current is 20 per cent. lower

than that estimated, and if twice normal torque was expected, only  $1\frac{1}{3}$  times would be obtained with the same voltage.

The question of heating is discussed with reference to a 100-h.p. squirrel-cage 500-volt 50-cycle motor driving a ventilating fan delivering 100,000 cub. ft. of air per min. If the variations of resistance are taken into account a characteristic similar to that actually obtained on test is arrived at. Starting where the motor is switched on with the rotor cold, the curves of speed and rotor temperature are shown in the curve reproduced. A point is arrived at, where the heat dissipated is equal to the  $I^2R$  rotor loss, and after this the rotor begins to cool, in this case at 80 per cent. of full speed after eighteen seconds. When switched over to full pressure the rate of cooling is momentarily reduced. The cooling curve is produced backwards, and is continued for about a minute, showing that the rotor cools very rapidly, and after about one minute almost attains its normal temperature. When first started, the rotor heats up so rapidly that, though the current is diminishing, the rate of heating increases, since the resistance of the rotor is increasing. It is seen that after thirty seconds, when the motor is nearly up to speed, the rotor still has a temperature rise of  $95^\circ\text{C}$ ., corresponding to an increase in slip of nearly 40 per cent. above its slip when cold. On switching over to full pressure the motor attains a speed of 712 r.p.m., and gradually creeps up to its normal speed of 720 r.p.m. as the rotor cools. The rotor has a maximum temperature rise of  $126^\circ\text{C}$ ., meaning an actual temperature of perhaps  $150^\circ\text{C}$ . This may appear excessive, but a rotor of good design and construction can stand temperatures far in excess of this. At normal load the rotor has a temperature rise of less than  $20^\circ\text{C}$ ., and the heating during starting is entirely local, since there is not sufficient time for heat to be transmitted to the stator. The rise could be reduced by using more metal of a higher specific resistance, but giving the same actual resistance. This is not, however, necessary, except with motors which are continually starting and stopping. Though the temperature of  $150^\circ\text{C}$ . is not sufficient to melt solder, its use is undesirable. Any screwed or riveted contacts would deteriorate, even if the design and workmanship were very carefully carried out, and the only thoroughly satisfactory design is one in which all the contacts are brazed or welded. In experiments on different contacts some years ago, it was found that the pressure drop on a tightly screwed or riveted contact was so small when the contact surfaces were clean that it was indistinguishable from the solid metal, even when the surfaces in contact were very small. However, even with machined and accurately fitting surfaces, on alternately heating the test pieces to  $200^\circ\text{C}$ . and cooling, the contact drop was found to increase very rapidly. In addition, vibration has a very bad effect on squirrel-cage rotors, and cases are known where, through these causes, the rotor has become practically open-circuited. In the early history of the induction motor there was very little trouble of this nature. Thousands of induction motors are in operation to-day with soldered rotors or with riveted or screwed joints. Many give no trouble, many others do.

There is no doubt that the rotor is the weakest part of a modern squirrel-cage motor, if screwed, riveted or sweated. All the joints should therefore be brazed or welded.

#### DISCUSSION.

Prof. MILES WALKER (Manchester Municipal School of Technology) said he was partial to the use of an auxiliary machine giving a back E.M.F., and thought this form of regulation would be widely employed for large motors. He considered the booster arrangement the simplest, and gave an example of its application, from which it appeared that a steady and gradual speed variation of about 20 per cent. could be obtained on an induction motor of 1,000 k.v.a. by means of a booster of 100-kw. capacity excited by a 10-kw. exciter. The brushes of the booster were fixed and were connected to the windings of the motor, while the booster field windings were connected to the brushes of the exciter, which were adjustable.

Mr. K. M. FAYE-HANSEN (British Westinghouse Co.) said that with modern slip-ring motors the current rush, on switching on at full voltage, might be larger than that caused by an equivalent squirrel-cage motor starting off an auto-transformer. Squirrel-cage motors were bad for variable-speed work, since their maximum torque was reduced as the square of the voltage, causing on low speeds a considerable variation in speed with changes in load, and a tendency to instability when large torque was required. Where pole-changing was adopted for speed variation it was still usually necessary to use the tapings on the auto-starter before changing from one speed to another. An auto-starter starting a motor light on a lower tapping would not be smaller than an auto-starter to start the motor against a torque using a higher tapping. He considered multiple-point auto-starters unnecessary. He thought the cooling effect of iron core would considerably modify the

author's heating curves, and pointed out that at the moment of switching on, the density in the rotor would be about 26,000 amps. per sq. in. He referred to a system of construction without joints, in which the winding is punched out of sheets, which are afterwards pulled into shape and put in the slots. A winding with independent short-circuited turns had the advantage that the tendency to creeping speeds due to higher harmonics in the field form was reduced.

Mr. W. CRAMP (Manchester Municipal School of Technology) pointed out that the author's formulae depended on the voltage and current being proportional. In many cases this would not be so, as, for instance, in starting, when the saturation would be very high. The heat capacity of the core and insulation appeared more important than the heat capacity of the windings.

Mr. EUSTACE THOMAS (Bertram Thomas) thought that the suggestion of starting up a mill altogether with the generating plant would not be satisfactory, because of the friction at the start, especially after standing the week-end.

Mr. J. FRITH (Manchester Municipal School of Technology) pointed out that the rotor conductors of squirrel-cage motors must either be properly insulated throughout, or else properly grounded all round. A light insulation was no use.

The Chairman, Dr. E. W. MARCHANT (Liverpool University), said a few words in calling on Mr. ALDOUS, who replied briefly.

## HUNTING OF ALTERNATORS

A PAPER entitled "Some Factors in Parallel Operation" was read by Mr. A. R. Everest before the Institution of Electrical Engineers on February 15th, having been previously read in Birmingham on the 12th. The author draws attention to the discrepancies often arising in practice between the actual and calculated natural oscillating frequency of alternators. The Paper shows the nature of the correction necessary, and a means of applying it.

The natural period of oscillation per min.,  $f_0$ , is conveniently expressed by  $f_0 = 9.76 \sqrt{(K_w \times \text{frequency} \div \text{stored energy in foot-tons})}$ , where  $K_w$  = synchronising power in kilowatts corresponding to one radian (electrical) of displacement from the mean position. Fig. 2 represents the E.M.F. triangle for two machines when de-phased. The cross-voltage or impedance E.M.F. consumed in one machine (CA) for small deviations is proportional to the radius voltage for one radian of deviation.  $K_w$  is therefore determined by the cross-current flowing in one machine to consume a cross-voltage equal to

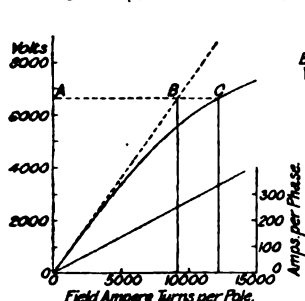


FIG. 1.—TEST CURVES FOR 1,500-kw., 6,600-volt ALTERNATOR.

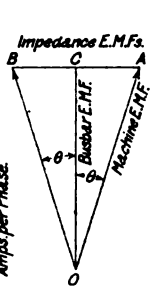


FIG. 2. VECTOR DIAGRAMS FOR USE IN CALCULATING SYNCHRONISING POWER.

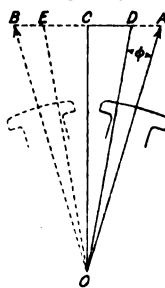


FIG. 3.

the working voltage. It is in this determination that errors arise. The usual methods indicate that the current circulating in the machine on short-circuit with excitation corresponding to the air-gap excitation for no-load working voltage (AB not AC in Fig. 1) be used.

The author points out that the case of power exchange current between two machines due to a given cross voltage, is much larger than when on short-circuit; hence the synchronising power as determined from the latter test is usually far too low. In parallel operation the angles of deviation are small, and the cross and machine voltages 90° apart. Since the circuit is highly inductive, on the short-circuit test the circulating current acts only demagnetisingly on the field-poles, but under actual working conditions the cross-current is a true power current, and only distorts the field flux. Other factors which need to be taken into consideration are the different magnetic reluctances in the different directions. This method can be used if the results are multiplied by certain correcting factors, but a preferable method is deduced from a consideration of Fig. 3, where the angle of AOC of mechanical displacement is divided into two parts,  $\phi$  being that by which the flux axis is displaced from the pole axis by distortion. The actual E.M.F. triangle is  $DOC$  (for one machine), and the real cross voltage  $DC$  is consumed as reactive drop in the machine winding. The angle  $DOC$  is given by the reactive drop, and the angle of flux distortion  $= K \times \text{armature amp.-turns per pole} \div \text{field amp.-turns per pole at air-gap}$ .

When the air-gap is not uniform from centre to edges, a further correction of 10 per cent. is suggested. For values of pole arc  $\div$  pole pitch from 0.4 to 1.0, the value of  $K$  in degrees varies from 7.0 to 40.0.

For smooth cylinder field magnets this method gives results similar to those obtained from the short-circuit method, but for flywheel alternators it is shown that the synchronising current flowing for a given angle of displacement would be very much larger than indicated by the short-circuit method. The value of winding reactance employed in this method should, as suggested by Hobart, include only that part which lies within the armature surface. In general, it is sufficiently accurate to take a value of one-half that determined in the usual way.

Examples are given to show the inaccuracy of the ordinary method. Fig. 1 shows the open-circuit and short-circuit tests on a 1,500-kw. 6,600-volt 2-phase 50-cycle machine. The oscillating frequency calculated by the short-circuit method was 40.5 per min. The "distortion" method indicated a natural frequency of 68, or without correction for variable air-gap, 63. The frequency by actual test was 68.

The author agrees with the investigators Goerges and Boucherot, who advocated that for any load the natural frequency should be calculated on the internal generated and not the terminal voltage.

In the case of dissimilar machines A and B, it is shown in the Paper that in general, writing  $K_a K_b$  for the  $K_w$  values of A and B, each calculated as one of a similar pair, the resultant value for A and B together is  $= 2K_a K_b \div (K_a + K_b)$ .

Similarly with two unequal flywheel effects,  $a$  and  $b$ , the resultant value may be expressed in the form:  $2ab \div (a + b)$ . For two machines with any values of electrical constants and flywheel effects,  $T_a$  and  $T_b$ , the natural frequency is given by:—

$$f_0 = 9.76 \sqrt{\{(\text{frequency} \times K_a K_b (T_a + T_b) \div T_a T_b (K_a + K_b))\}}$$

The flywheel requirements are given as follows:—Angular deviation from uniform rotation due to cyclic irregularity of engine not to exceed  $2\frac{1}{2}$  electrical degrees. The permissible limit of cyclic speed irregularity  $= 1/a$ , where  $1/a = k/(6 \times \text{no. of poles})$ , and  $k$  is the no. of engine impulses per rev. To avoid trouble from resonant hunting, the natural frequency should be at least 20 per cent. different from the frequency of the predominating engine impulse. In a 2- or 4-stroke cycle engine this always occurs with the frequency of the cam-shaft, and is independent of the total number of cylinders. For operating A.C. generators of ordinary regulation, the total amount of fly-wheel effect required for each kilowatt of rating may be indicated by the following formula—

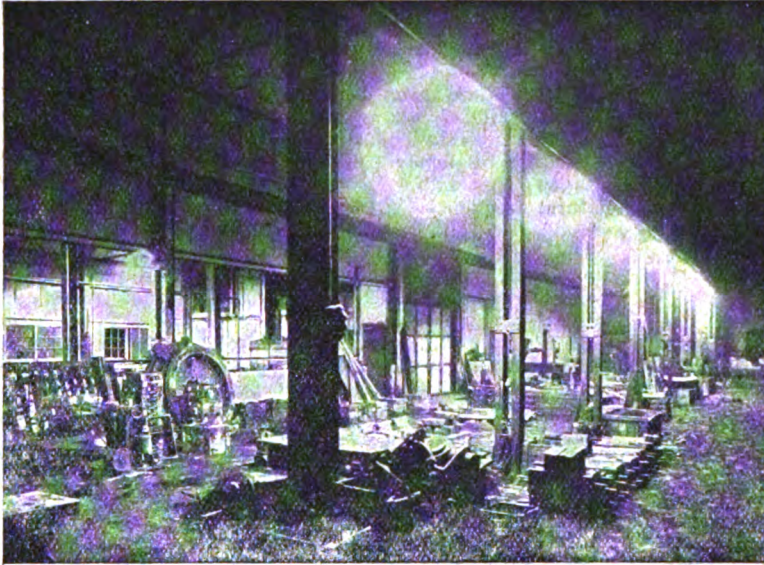
$$1.3 \times \text{poles} \times (\text{strokes per engine cycle})^2 \div \text{r.p.m.}$$

Professor Miles Walker (Manchester Municipal School of Technology) opened the discussion in London. He pointed out that the subject was assuming importance again owing to the Diesel engine bringing back to life the flywheel alternator. He could not agree that one should neglect the ampere-turns required for the teeth or for the pole-faces, which were of importance in turbo-machines. All designers knew that the short-circuit formula was not correct, and they applied a correction by taking the total ampere-turns. The only object being to get a flywheel which would not resonate, there was only need to use a formula which brought them as far as possible from the danger point. Mr. Everest's formula would be of use in designing rotary converters. Neglect of the possibility of resonance was responsible for the bad reputation they had obtained in the past, especially as the dampers fitted were generally inefficient. These should be practically complete squirrel-cages. He then showed some tachograph records of machines hunting. In a certain case, when designing a 5,000-ampere 1,000-kw. rotary, he found that one engine on the system had a frequency of disturbance of 115 cycles per min., and another of 75. The rotary also resonated at 75, but by adding an A.C. booster and altering the air-gap, the frequency was brought up to 94 cycles per min. He then showed some of Dr. Rosenberg's curves of fly-wheel effect (ELECTRICAL ENGINEERING, Vol. V., Feb. 4th, 1909, p. 110), with a curve calculated from Mr. Everest's formula added. This practically coincided with the safety curve obtained by Dr. Rosenberg. Dr. W. E. Sumpner (Municipal Technical School, Birmingham) also gave an example of this and a formula of his own, which he compared with that of Mr. Everest. He advocated the use of simplified formulae by the use of electrical instead of mechanical units, thus 1 ft. ton = 1 kw. for 3.04 seconds. Professor R. Threfall (Birmingham) and Dr. S. P. Smith (City and Guilds Engineering College, London) remarked on the vastness of the subject, and thought that at present the study of the whole subject was insufficient and inconclusive. Mr. W. Duddell read a communication from Dr. E. Rosenberg (British Westinghouse Co., Ltd.). He wanted more examples to convince him that the formula would be correct in every case, and he took exception to the flywheel requirements specified. Dr. G. Kapp, Dr. M. Kahn, and Messrs. Clough and Shuttleworth also spoke in Birmingham, and Mr. Everest replied at length in each case to the points raised.



### FACTORY LIGHTING

THE British Thomson-Houston Co., Ltd. (Mazda House, Upper Thames Street, E.C.) have sent us some notes describing the lighting of a factory at Deptford, which has been equipped with their lamps and reflectors in accordance with designs prepared by their illuminating engineer's department. The factory is that of De Fries, Ltd., and it consists of six fairly large shops, five offices, and two chemical



FOUNDRY LIGHTED BY METAL FILAMENT LAMPS IN WATERTIGHT LANTERNS.

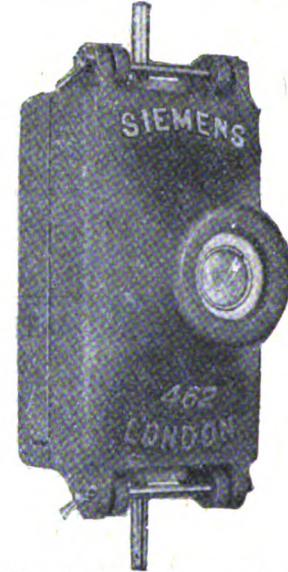
laboratories. Mazda lamps are used throughout; in the offices they are equipped with Holophane reflectors and in the workshops and laboratories with Mazdalux metal reflectors. In the case of the drawing offices and the chemical laboratories, where intense local illumination is necessary, the reflector units are attached to wall-brackets, fixed in such a position that the light is concentrated on the required areas. In the other offices and the workshops general illumination is provided by Holophane and Mazdalux reflectors, containing Mazda lamps, spaced evenly over the ceiling. As a protection against dust, &c., the reflector units in the foundry are contained in B.T.H. watertight lanterns. These lanterns in no way interfere with the reflection or distribution of the light, but they do prevent the corrosion and impairment of the reflector surfaces. The total area of the foundry is 6,308 sq. ft., and it is lighted by twelve 200-watt Mazda lamps, equipped with Mazdalux reflectors, each unit being completely enclosed in a watertight lantern. A practically uniform intensity of illumination is given over the working plane, varying only between 2.5 and 2.6 foot candles. The pattern shop, with an area of 1,752 sq. ft., is lighted by fourteen 40-watt points, equipped with Mazdalux reflectors. An illumination intensity varying between 1.45 and 1.5 foot candles is given. In the carpenters' shop, thirteen 80-watt Mazda lamps under Mazdalux reflectors illuminate an area of 2,405 sq. ft., with an intensity of 3.6 foot candles. The aim throughout has been to obtain uniformity and adequacy of illumination without glare, and the owners fully realise that these qualities react on the workers, conserving their eyesight, making the conditions more cheerful and tending generally to increase the output.

**Electrically-driven Fire Escape.**—In our description last week of the electrically-driven "turn-table ladder" just supplied to the London County Council, the time taken by the 6-h.p. motor to extend the ladder to its maximum height of 90 ft. was given as 90 seconds instead of ten seconds. The time taken by the compressed gas engines usually employed to perform this operation is about 18 seconds (depending on atmospheric conditions), while two minutes is required if manual power is used.

**Electric Drive in a Woodworking Yard.**—In our article with this title on page 48 of ELECTRICAL ENGINEERING of Jan. 23rd, one of the saws made by John Pickles & Sons was described as capable of making one cut up to 48 inches at the rate of 2 inches per minute. The Adams Manufacturing Co., who supplied us with the information, now ask us to state that the speed should be 2 feet per minute.

### A NEW FUSE BOX

MESSRS. Siemens Brothers & Co., Ltd. (Woolwich), are placing a new house fuse-box on the market for currents up to 15 amperes, which is neat in appearance, compact, and, we understand, low in price. The illustration, which is half actual size, shows a fuse-box wired with Stannos wire on the concentric system. The continuity of the Stannos sheathing is maintained by means of "Twiston" connectors

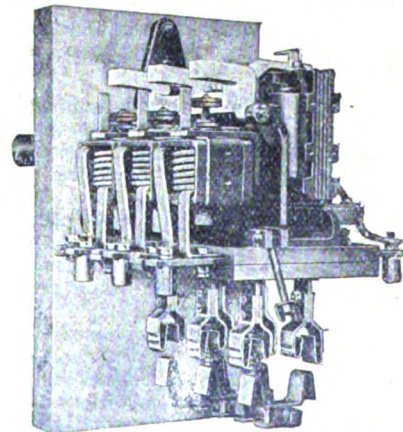


NEW PATTERN HOUSE SERVICE FUSE FOR STANNOS WIRING.

terminating at the left-hand corner, and efficient contact is ensured by means of the screw, as shown. The box is also quite suitable for use with ordinary braided wires.

### AN OIL SWITCH FOR LOW VOLTAGES

THE British Westinghouse Company, Ltd. (Trafford Park, Manchester), have brought out a small oil-break switch suitable for switchboard mounting on A.C. 3-phase 50 periods circuits up to 135 amps. and 650 volts. It is of metal and mica construction, and its simplicity and neat appearance can be seen from the illustration. The connections to the stationary contacts pass out through the side of the slate slab, as this arrangement is usually more convenient than taking the leads vertically up or down from the switch. The overload coils, on the left-hand side, operate the tripping bar in the ordinary way. On the right-hand side of the switch the no-volt release coil is fitted. The switch is fitted with a loose handle arrangement to prevent it from



OIL SWITCH WITH OIL CONTAINER REMOVED.

being closed against a short circuit or an excessive overload; also it is impossible to close the switch when there is no voltage on the circuit. The three moving contacts are mounted on a steel bar, insulated with moulded mica. The rods which connect this bar to the operating mechanism are of steel, and pass through guides secured to the base of the switch, thereby ensuring that the moving contacts have a parallel motion. It will be noticed that spiral springs are fitted, thus giving a quick break action.



## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelopes.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,327.

A magnet is wanted to give a direct effort of about 120 lbs. on a brake shoe, applied direct as a push not more than  $\frac{1}{2}$  in. from a simple bearing knob on the solenoid. The current available is 200 volts D.C. Give dimensioned sketches sufficient for construction, with particulars and calculations of the winding and of a resistance to bring on the full effort slowly.

"MAGNET BRAKE."

(Replies must be received not later than first post, Feb. 27th.)

### ANSWERS TO No. 1,325.

In cases where electric trains with collectors at both ends run through from the lines of one company to those of another fed from an entirely independent power-house, by what means are excessive interchanges of current avoided at the moments when the train puts the two systems in parallel, if the voltage on one line happens to be much in excess of that of the other?—R.

No replies of sufficient merit for an award have been received. The method employed in some cases is to provide a length of neutral rail as a "section insulator" between the systems and to connect up one end only of this to the live rail through a resistance, which is, of course, only in circuit as a train passes from one system to the other. Switches are also provided so that in case of emergency both systems can be connected through.

## ANSWERS TO CORRESPONDENTS

FLUX asks the following question:—A 35-h.p., 3-phase, 440-volt, 25-cycle, 4-pole slip-ring motor just tested starts light with the rotor windings on open circuit, and runs up to 640 r.p.m. When the slip rings are short-circuited the speed becomes 750. The slip on load is normal. There is no short or earth or rotor windings. Both stator and rotor cores are machined all over, the slots are half closed, and gap 1 mm. The leakage coefficient, tested, is 0.04. Why does the motor start as described?

The motor starts up by means of the eddy currents induced in the rotor, but these are not sufficient to give much torque, so that even the ordinary friction is sufficient to prevent full speed being attained.

T. HUGHES (Liverpool).—The makers of the carbon brush that you sent are the Morgan Crucible Co., Ltd., Battersea Works, London, S.W.

**The Electrical Trades Benevolent Institution.**—The annual festival dinner which is to be held on Wednesday, April 16th, will be presided over by Mr. G. Sutton (Henley's Telegraph Works Co.). It is announced that arrangements have been made with the Provident Clerks' and General Mutual Life Assurance Association for members of the Institution to effect life assurances on particularly easy terms, and the Institution will add 10 per cent. to the amounts assured when paid, in a similar way to that adopted by the Railway Benevolent Institution.

# MODERN ENGINES AND POWER GENERATORS.

By Rankin Kennedy, C.E.

The Coupon below entitles any reader to a complimentary copy of an illustrated booklet, describing what is probably the most valuable work upon this subject ever published.

The importance of the subject is growing day by day, and "The Book of Modern Engines and Power Generators" can easily prove of the greatest value to those who desire to be fully informed upon the latest developments in every branch of the subject.

The author, Mr. Rankin Kennedy, C.E., is well known as an authority on his subject, and in this work he explains in the clearest and most thorough manner the design and construction of prime movers; the term is here used in its widest sense, as it applies to all engines, whether worked by petrol, oil, steam, air, gas, water, or electricity, and as it includes all machinery and processes connected with power generators and distribution.

### ENTIRELY UP TO DATE.

Moreover, all these subjects have been brought entirely up to date. The previous Edition of the work achieved such an immediate success, that for the new and Revised Edition, the scope of the work has been widened and extended so as to cover every branch of the subject, by the addition of a great amount of new matter, and many new illustrations of very great interest and high value.

This new Edition is indeed already recognised as the standard work on its many varied subjects, including Rotary Engines, Gas Turbines, Gas Engines, Oil Engines, Petrol Engines, Suction and Producer Gas Engines, Blast Furnace Gas Engines, Marine Engines of every design and type, Compressed Air Motors, Air Compressors, Refrigerating Engines, Windmills, with electric storage, Fluid Hydraulic Engines, Water Pressure Engines, Hydraulic Rams, Water Pressure Turbines, and Water Raising Engines, Centrifugal Pumps and Air Lifts, Power Distribution and Transmission by Gearing, Water Pressure, Compressed Air and Electricity, etc., etc.

### OVER 2,000 ILLUSTRATIONS.

The work is profusely illustrated by diagrams, text-cuts, and plates. In all there are over 2,000, every one of great practical utility to the engineer.

Enough has been said to show that this work is indispensable to all electrical, mechanical, steam, and hydraulic engineers, and to all who are concerned with manufacturing, designing, draughtsmanship, electro-chemical, and metallurgical work, with automobiles, tramways and railways, boilers, shipbuilding, collieries and mines, etc.

We would advise those who are determined to keep abreast with all the latest specialist knowledge concerning every detail of their profession to send for the free booklet which is supplied by the publishers to those mentioning this paper.

## A FREE BOOKLET.

To the CAXTON PUBLISHING CO., LTD.,  
97, Surrey Street, London, W.C.

Please send me, free of charge, a copy of the book describing the "Book of Modern Engines and Power Generators," and showing how it can be obtained for a first payment of 1s. 6d., the balance to be paid by small monthly payments.

NAME .....  
(Send this form or a postcard.)

ADDRESS .....  
.....

# "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

## Specifications Published Feb. 13, 1913

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

Names in italics indicate communicators of inventions from abroad.

26,485/11. **Water Heater.** J. MANN. Copper tubes are bent into a grid formation and covered by tubular pieces of silica, on which is wound the heating coil, covered with a mixture of silica and lime, which is fired after being applied. One figure. [This is one of the patents on which the formation of Vacuum Electric Heaters, Ltd., was based (ELECTRICAL ENGINEERING, Vol. VIII., August 29th, 1912, p. 480.)]

1,680/12. **Automatic Regulator Switch.** B.T.-H. and E. GARTON. A knife switch is fitted with an auxiliary switch consisting of a spring-pressed plunger which bridges fixed contacts attached to studs carrying the main contacts when the knife switch is closed. Such a switch may be used on A.C. systems where current transformers are used to supply compounding coils on the regulator. The transformer may then be directly across the compounding coil when the switch is closed. The auxiliary switch controlling the transformer circuit is actuated by the knife switch, so that it opens the transformer circuit after the knife switch is closed, but before the fully closed position is reached. On breaking circuit the transformer is again short-circuited just before the compounding coil is disconnected. The combined switch may also be used for transformer switching. Three figures.

2,284/12. **Spiders for Metal Filament Lamps.** DEUTSCHE GASGLÜHLICHT. From a central stem radiate practically rigid arms at the socket end and elastic hooked arms at the other end. The ends of the rigid arms are made in the form of helical loops. Three figures.

2,874/12. **Vehicle Lighting.** B.T.-H. and E. GARTON. In systems where energy for lighting is supplied by a variable-speed generator and a storage battery in parallel, a resistance is used in series with the battery. This resistance is short-circuited in whole or in part by a suitable switch when heavy discharges have been taken from the battery. One figure.

3,281/12. **Petrol-electric Traction.** H. PIEPER. This specification relates to systems where an internal-combustion engine is coupled to two dynamos, one of which is connected with a buffer battery, while the other supplies the driving motors. Connections are shown by which the circuits of the two dynamos are separate for low speeds and in series for high speeds. Only the machine in parallel with the battery need be used when the pressure of each machine is the same. Two figures.

5,434/12. **Charging Storage Batteries.** K. VON DREGER. To minimise the loss in the series resistance generally used in charging small accumulators from lighting and power mains, the cells to be charged are connected in parallel with a large storage battery through series resistances. This storage battery is permanently in series with the mains. One figure.

9,619/12. **Adjustable Portable Standard for Incandescent Lamps.** A. S. LYHNE. One clamp only is used, but the movements are independent, one not affecting the others. Nine figures.

10,042/12. **Locomotives.** P. DAWSON and S. J. LUCAS. Driving motors are fixed on the frame with their axes above driving axles. Countershafts are arranged in approximately the same horizontal plane as the driving axles. The countershafts are connected to the motors and driving axles by chain or other flexible gearing. Two figures.

12,709/12. **Telegraphic Photography.** C. STILLE. Instead of the ordinary plate in a camera, a photo-electric cell consisting of two silver plates in sulphuric acid is used. The plate facing the interior of the camera is covered with a halogen salt. Its area is about 4 sq. in. The image is exposed successively in strips to the cell through a perforated opaque band. The cell is connected to a telephonic relay. By this means, a local battery and a similar apparatus to the Poulsen telegraphone, a varying current is sent through the line where it affects a magnetisable receiving wire in a similar way. The variations of magnetism in this wire are transformed into variations of light in any of the well-known ways. Three figures.

13,327/12. **Determining Temperature of Sea-water.** W. S. LAYCOCK and J. J. HICKS. At various heights up the stem of a thermometer, connections to indicating circuits on the ship are made, so that the position of the mercury determines which is closed. Three figures.

16,044/12. **Manufacture of Fireproof Moulded Conductors.** GEB. SIEMENS. A mixture of carbon and silicon is heated in an atmosphere of carbon monoxide or dioxide, so as to produce a moulded body of SiCO and free carbon. It is then heated to 1,600-1,700° C. in a non-oxidising atmosphere. The body remaining is composed by SiC.

## Specifications Published To-day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, E.C., at the price of 8d. each, post free.

Summaries of some of the more important of these patents will appear in our next issue.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** BULLERS and TWISS [Insulators] 6,287/12; BÖLLING [Producing sheet mica from waste], 21,445/12; SIEMENS-SCHUCKERT [Motor speed regulation] 23,341/12.

**Electrometallurgy:** GONNET [Furnaces] 19,287/12.

**Heating:** SCHENBERG [Water heaters] 2,522/12.

**Ignition:** RUPRECHT [Spark plugs] 28,412/12.

**Instruments and Meters:** RECORD [Moving coil] 3,454/12.

**Switchgear, Fuses, and Fittings:** LEITNER [Auto-battery over discharge preventer] 2,310/12; [Switches] 2,747/12; ROBB and SHAW [Cable lugs] 5,907/12; SCHUCHARDT [Incandescent lamp sockets] 12,692/12; BEUTTELL [Reflectors for linear sources of light] 12,989/12; VENNER's and GRIESBACH [Switches] 15,366/12; CHIGER [Time switches] 16,142/12; TERRY, BIGWOOD, and BROTHERTON TUBES & CONDUITS [Conduit junction boxes] 24,492/12.

**Telegraphy:** FRASER and EASTERN TELEG. CO. [Perforated tape operated typewriters] 1,822/12; VLUG [Wireless] 10,111/12.

**Traction:** VIRGILI [Submarines] 21,444/12; PIEPER [Engine-electric] 29,636/12.

**Miscellaneous:** WRIGHT and NIBLOE [Fly and insect trap] 2,872/12; GRAY [Gyrostats] 2,877/12; BRUKWICKI [Change speed and reversing gear] 4,458/12; PORDES [Portable battery lamps] 11,359/12.

The following Specifications are open to Inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Electrometallurgy and Electrochemistry:** CHAUMAT [Manufacture of chrome alum] 1,636/13.

**Ignition:** MASCOV [Reducing duration of sparks produced by magneto] 27,094/12.

**Incandescent Lamps:** FISCHER [Rendering metals ductile] 8,720/12.

## Opposition entered to Grant of Patent

26,184/11. **Furnaces.** V. STOBIE. A furnace is described for melting, reduction, or refining by illuminating gas or oil, and electricity. A steel melting furnace is illustrated. The fuel enters through pipes terminating in suitable burners depending from the roof, where also are the electrodes.

## Expiring and Expired Patents

The following Patent expires during the current week, after a life of fourteen years:—

4,124 of Feb. 24th, 1899. **Combined Radiator and Convect.** H. J. DOWSING. Several tubular incandescent lamps are arranged in front of inclined reflectors. These, together with a back cover, form triangular channels by which air ascends, becomes heated, and is directed forwards by a sloping roof over the tops of the lamps.

The following are the more important Patents that have become void through non-payment of renewal fees.

**Arc Lamps:** P. HÖGNER [Inclined carbons fed by weight or spring controlled by escapement and electromagnets, or by a motor and switch. Lateral movement strikes arc] 23,606/02.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** H. HIRST and C. E. GUNNER [Covers of junction boxes: Non-loosable bolts] 23,944/06; C. A. DAY (*Elek. Zünder Ges.*) [Moulded or cast resistance] 23,778/07.

**Dynamos:** H. G. REIST [Turbo-alternators] 23,951/06.

**Electrochemistry and Electrometallurgy:** A. SCHNELLER and D. KOELEMAN [Silent discharge tube] 25,375/03; W. P. DIGBY [Construction of bath for obtaining hypochlorites by electrolysis] 21,949/05; FELTEN & GUILLEAUME LAHMEYERWERKE [Steel refining furnace] 24,213/07.

**Incandescent Lamps:** B.T.-H. (*A.E.G.*) [Filament supports of thorium or magnesia] 24,233/06; B.T.-H. (*G.E.C.*) [Electrolytic refining of tantalum] 24,234/06; E. A. GIMMINGHAM [Joining filament to leading-in wires] 23,786/07.

**Switchgear, Fuses and Fittings:** E. H. THEOBALD [Bayonet joint for lamp holders, &c.] 23,991/07.

**Telephony and Telegraphy:** A. C. BARONIO and A. MUIRHEAD [Automatic perforated strip telegraphs: receivers and transmitters] 21,846/05.

**Traction:** E. A. RICHARDSON [Automatic block signalling] 19,875/04.

**Miscellaneous:** M. RUTHENBURG [Magnetic ore separators] 24,422/06; E. J. MURPHY and KELVIN & JAMES WHITE [Electrically-driven sea-sounders] 23,853/07.

# ADAMS IGRANIC

ADAMS  
M<sup>FG</sup> CO<sup>LTD</sup>  
BEDFORD  
AND  
LONDON

ELECTRIC CONTROL GEAR FOR MACHINE TOOLS.

## ELECTRIC TRACTION NOTES

With reference to the rumour that an important announcement was about to be made to the effect that a large portion of the suburban lines of the Midland Railway were to be converted to electric traction, we are authoritatively informed that, although the Company is considering a scheme of electrification in connection with the acquisition of the London, Tilbury & Southend Railway, at the present time nothing definite has been settled.

A special committee has been appointed by the Bristol Corporation to inquire into a proposal to purchase the Bristol Tramways and Carriage Company's undertaking.

A resolution before the last meeting of the Lowestoft Corporation, calling attention to the loss upon the tramway system, and moving for a committee to be appointed to consider the disposal of the undertaking, led to considerable uproar, and the meeting had to be adjourned in consequence.

A special meeting of the Metropolitan Railway Co. has officially sanctioned the purchase of the Great Northern and City Tube Railway. At a previous meeting, as reported in our columns, there was considerable difference of opinion on the question, and an adjournment was made in consequence.

According to the *Elektrotechnische Zeitschrift*, the Reichstag Committee dealing with the proposed electrification of the Berlin Stadtbahn have suspended their sittings until further information with regard to the capacity of improved steam locomotives, the supply of current from outside supply companies, and the proposed increase in fares, has been obtained.

The year 1912 was the first complete year's working of the Torquay tramway system after the change from the dolter surface-contact system to overhead, and the results are quite as satisfactory as was generally contemplated. The Company has been able to increase its dividend from 1½ to 3 per cent., and on all accounts there has been considerable improvement and economy in the working of the service, particularly so in the case with current consumption.

## TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

The final sittings of the House of Commons Committee inquiring into the Imperial wireless telegraph scheme were mildly exciting in consequence of the decision of the Committee to report Mr. Leo Maxse, Editor of the *National Review*, which published the articles about which so much has been heard, for refusing to produce certain letters in connection with them which he acknowledges he possesses. Mr. Maxse's evidence is not yet complete, however, and the Prime Minister, owing to the fact that only one day of the session remained when the Committee reported to the House, decided to take no action until Parliament reassembles. In answer to the Marconi Company's letter, in which they stated they would regard the contract as not binding unless it was ratified by Parliament by March 1st, the Postmaster-General has reiterated his former refusal not to release the Company from the contract.

The Marconi Co. has placed contracts for the erection of two pairs of wireless stations for Atlantic and two pairs for Pacific services. The *Electrical World* (New York) announces that receiving and sending stations, thirty miles apart, will be constructed at Oahu, in the Sandwich Islands; Tamales Bay and Bolinas, Cal.; near Belmar, New Jersey, and at a point in eastern Massachusetts. These stations will be part of a globe-girdling system which will continue to the East by way of Japan and thence ultimately to India. Twelve towers ranging in height from 400 ft. to 450 ft. will be spread out over a semicircle covering a square mile at each station,

and it is estimated that the range of each station will be from 4,000 to 6,000 miles.

The *Elektrotechnische Zeitschrift*, referring to certain rumours that the Marconi Company has now complete control of the wireless business of France, points out that the Compagnie Générale Radiotélégraphique, who acquired the French rights of the Lepel system two years ago (see *ELECTRICAL ENGINEERING*, Vol. VI., p. 591), do not come under the Marconi patents, as the Lepel oscillation system works on the shock-excitation principle, and one wave-length only is given out by the antenna. The equipments which will have to be handed over to the Marconi Company are those on the old system, generating at two wave-lengths. The decision granting this confiscation, however, is being appealed against.

A feature of the telephone position now that the Postmaster-General has taken over the National Telephone Co. is the length of time which the license of the Hull Corporation has yet to run, and the strong disinclination of the Corporation to part with their undertaking in view of the satisfactory financial results which have been obtained there. Negotiations have been going on between the Hull Corporation Telephone Committee and the Postmaster-General, and a resolution has been passed by the Committee to the effect that, subject to the terms being agreed, the Corporation are prepared to purchase from the Post Office the plant acquired by them from the National Telephone Co. in the Hull area. This implies that there will be an extension of the Hull Corporation's license.

The Bathurst-Bissao cable was down on the 11th inst., and the Ottoman Government stated on the 12th that the prohibition of secret language in telegrams applies to Smyrna, Constantinople, Gallipoli, Dardanelles and localities in the neighbourhood of the Marmora Sea.—The Bulgarian Office confirms restrictions as to telegrams in code or cypher, and any telegrams written in either language will be stopped.—Telegrams to Mexico City are subject to delay and private telegrams in code or cypher are prohibited for all places in San Salvador.—The El Arich route is down beyond Konia and on the 15th San Salvador cancelled restrictions on private telegrams.—Censorship has been established on all telegrams for Mexico excepting diplomatic dispatches. All traffic is still subject to delay.

Telephone men who may desire to secure copies of any issues of the *National Telephone Journal* (the publication of which ceased after the taking over of the Company's business by the Post Office) are informed that all the seventy numbers are available with the exception of Nos. 1, 31 and 70. Single copies may be obtained price 3d., and for sets of copies "no reasonable offer will be refused." Communications should be addressed to Mr. V. Baldwin, Room 37, Telephone House, Victoria Embankment, E.C.

## CATALOGUES, PAMPHLETS, &c., RECEIVED

**ALUMINIUM.**—A leaflet from the British Aluminium Co., Ltd. (109 Queen Victoria Street, E.C.), deals with the casting of aluminium and some of its alloys, and illustrates some examples of complicated castings in this metal.

**METAL FILAMENT LAMPS.**—A new and effective show-card in black and white has been produced by the Electrical Co., Ltd. (122-124 Charing Cross Road, W.C.), to call attention to "Aegma" drawn wire lamps.

Readers desiring copies of catalogues or pamphlets should apply to the firms in question, referring to the notice in "Electrical Engineering."

**CHAIN-PULL SWITCH LAMP-HOLDERS.**—The General Electric Co., Ltd. (67 Queen Victoria Street, E.C.), have sent us a leaflet and particulars of a chain-pull switch lamp-holder similar to that illustrated on page 90 of our last issue, which they are placing on the market in a number of special finishes as well as in the usual polished brass.



**EVERY INSTALLATION ENGINEER**

Should join his Trade Protection Organisation,  
**THE**  
**ELECTRICAL CONTRACTORS' ASSOCIATION**  
 (Incorporated).

*Inquiries cordially invited by the Secretary,*  
**L. G. TATE,**  
 20, Bucklersbury, LONDON, E.C.

**"CALOR" ELECTRIC HEATING & COOKING APPLIANCES**

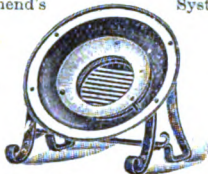
Townshend's

System (patented).

Food Warmers,  
 Kettles, Irons,  
 Grills, Toasters, &c.

Liberal Discount.

Write to-day for List,  
 just published, from the  
 Patentees and Makers:



Bright Glowing Electric Fire.

Absolutely safe.  
 Thoroughly reliable.  
 Guaranteed for 12  
 months.

**AGENTS WANTED**

in many districts; also  
 in Colonies and abroad.

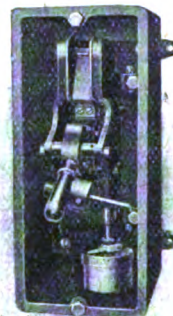
**TOWNSHEND'S ART METAL CO., LTD.,** Works & Showroom—Ernest St., Birmingham  
 London Showroom—62, Holborn Viaduct, E.C.

**SWITCHGEAR & COWANS, L<sup>TD</sup>.**

Salford,  
**MANCHESTER**

50 Amps.  
 to  
 5,000 Amps.

Max.  
 Reverse.  
 No. Volt.



Large  
 Stock  
 Kept.

**CIRCUIT BREAKERS****MICA**

Plate Tubes,  
 Rings, &c., in

**BRITISH MICA CO., LD.**

Contractors to  
 H.M. Government,  
 Lebanon Road Works,  
 Wandsworth, S.W.  
 Tel.—405 P.O. Putney  
 Telex.—"Micamini," London.

**MICANITE**

The Micanite &amp; Insulators Co., Ltd.

WALTHAMSTOW,  
 London, E.

FOR **FIBRE**  
 SHEETS, RODS  
 AND  
 TUBES.

**ELECTRICAL PORCELAIN**

OF

HIGHEST QUALITY

APPLY TO

**JAMES MACINTYRE & CO., LTD.,**  
 BURSLEM.

**CRYSELCO**  
**ELECTRIC**  
**LAMPS.**

**KEMPSTON WORKS, BEDFORD.**  
 Telegrams: "Cryselco," Kempston.  
 Telephone: 3377 Red. rd.

**GLASS TUBES AND RODS**

FOR ELECTRICAL PURPOSES

**GUILBERT-MARTIN**

9, Edmund Place, LONDON, E.C.

**F. WIGGINS & SONS,**

FOR

**MICA INSULATION**

102, 103 &amp; 104, MINORIES, LONDON.



The Fearful Frown,  
 A sorry sight,  
 Bad luck to crown,  
 He's lost Fluxite.

The  
**PRACTICAL MAN**  
 insists on having

**FLUXITE**

The paste flux that

**SIMPLIFIES SOLDERING AND LEAD JOINTING.**

It solders even dirty metals without cleaning, and is safe for electrical work. It joints lead without solder, merely by the use of a blow-lamp or blow pipe. If desired some solder can be powdered into a little Fluxite and the two applied together.

Of Ironmongers, etc., in 6d., 1/- and 2/- Tins.

Made by the AUTO CONTROLLER CO., 70, Vienna Road, Bermondsey

For instructions on Cleaning and Polishing  
 Electrical Fittings and Electric Cookers, read

**CANNING'S HANDBOOK ON****POLISHING, ELECTRO-PLATING & LACQUERING.**

Fully Illustrated. Price 2s. 3d. post free. Abroad, 2s. 6d.

**W. CANNING & CO., BIRMINGHAM.**

LONDON: 18/20, ST. JOHN'S SQ., CLERKENWELL, E.C.

MENTION BOOK EE4.

**BLAKE & INSULATING STAPLES**

Write for Samples and Prices.

**MOSES & MITCHELL,**

Chiswell Works, 122-124, GOLDEN LANE, E.C.

**BABCOCK & WILCOX**

Patent

LTD.

**WATER-TUBE STEAM BOILERS.**

Over { 9,500,000 H.P. LAND TYPE } Installed  
 { 2,400,000 H.P. MARINE TYPE } or on order.

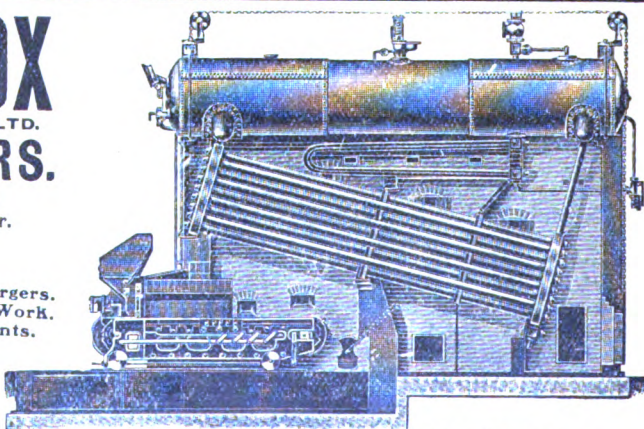
BABCOCK &amp; WILCOX also Manufacture

White-Forster Water-Tube Marine Steam Boilers.  
 Steam Superheaters. Water Softeners. Steel Works Chargers.  
 Mechanical Stokers. and Purifiers. Structural Steel Work.  
 Economisers. Electric Cranes. Steam Piping Plants.  
 Feed-Water Heaters. Coal Conveyors. Steel Chimneys.

Telegrams:  
 "BABCOCK, LONDON."

Head Offices:

Telephone No.  
 5540 HOLBORN (8 lines)

**ORIEL HOUSE, FARRINGDON ST., LONDON, E.C.****Works: RENFREW, SCOTLAND.**

Babcock & Wilcox Land Boiler fitted with Patent Superheater  
 and Chain Grate Stoker.

WHEN CORRESPONDING WITH ADVERTISERS, PLEASE MENTION "ELECTRICAL ENGINEERING."



## LOCAL NOTES

**Belfast: The New Power Station.**—At a special meeting of the Tramways and Electricity Committee last week it was definitely decided to proceed with the new power station. As reported in our columns, there has been a certain amount of opposition on the part of some ratepayers, and the Tramways Manager also presented a report in which he advised the use of Diesel engines for the tramway service. Mr. Bloxam's scheme, however, which has been approved by Mr. S. L. Pearce, City Electrical Engineer at Manchester, to build a new power station lower down the river to deal with all classes of supply, has now been adopted.

**Birmingham: Future of Electricity Undertaking.**—Councillor Marks will propose, at the March meeting of the Corporation, that the Electricity and Gas Committees be amalgamated into a Light and Power Committee, whose duties shall be to conduct the electricity and gas undertakings.

**Cromer: Electric Lighting Undertaking.**—The poll of ratepayers with regard to the proposed transfer of the Council's electricity undertaking to Edmundsons' Electricity Corporation has resulted in a majority of only 41 in favour.

**Darlington: Increase in Electricity Supply.**—The figures for current generating at the Darlington Electricity Works for December, 1912, are very striking, for they show that 409,041 units were generated, as against 260,435 in December, 1911, an increase of no less than 57 per cent.

**Dundee: Electric Driving.**—An additional four firms have discarded their reciprocating engines in favour of electric driving.

**Gravesend: Increased Cost of Coal.**—In order to counteract as far as possible the extra working expenses due to the increased cost of coal, the Borough Electrical Engineer has recommended the supply of current for cooking purposes during the daytime at 3d. per unit, during the six months ending March, and 3d. per unit during the six months ending September. Supplies at these charges are only to be given to existing consumers in order that no further capital charges may be incurred. The Committee have decided to defer the consideration of the proposal until the report and accounts for last year are completed.

**Huddersfield: Lighting Tariff.**—The Chamber of Trade has proposed to the Electricity Committee against the flat rate of 4d. per unit for lighting purposes, and suggests that, instead of the profits of the electricity undertaking being transferred to relief of rates, the charge to private users should be reduced.

**London: Westminster: Street Lighting.**—It is stated that the City Council has under consideration the question of determining the contract with the Charing Cross, West End, and City Electricity Supply Co. for public lighting in the St. Martin-in-the-Fields district. The Council have the option of determining this at the end of the fourteenth year, which will expire on September 17th, by giving six months' notice. If this option is not taken advantage of, the contract will run for the full period of 21 years. In the event of the contract being terminated, the Council will have to purchase everything in connection with the installation, except any generating plant or distributing mains used for general supply, and the price will be settled by arbitration failing agreement.

**Walsall: Position of Electricity Undertaking.**—The recommendation to appoint a consulting electrical engineer to report on the general position of the electricity undertaking, referred to in our last issue, has been adopted by the Council.

**York: Power Contract.**—The expenditure of £3,000 upon new plant, already reported in our columns, is largely in connection with an agreement with Messrs. Rowntree and Co. for a supply. At the last meeting of the Corporation it was stated that the terms of this contract are not being divulged even to all members of the Electricity Committee, and strong complaints were made. Amendments referring the recommendation back, however, were heavily defeated.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

[Notes of Contracts Open are not repeated under this heading week by week until the last date for receiving tenders, but are only inserted once.]

## Generating Stations, Sub-Stations, Mains, &amp;c.

**Dundee.**—Two water-tube boilers, mechanical stokers, economiser, coal-handling plant. City Electrical Engineer. March 7th. (See advertisement on another page.)

**Halifax.**—Mr. W. Emmott is reporting upon the cost of installing generating plant at St. Luke's Hospital.

**King's Lynn.**—Extensions to the electricity works at an estimated cost of £2,000.

**Liverpool.**—Two 50-kw. generating sets, switchboard, motors, and wiring are required for the Toxteth Workhouse. T. L. Miller, 709 Tower Buildings. February. 24th.

**London: L.C.C.**—Two 8,000-kw. turbo-generators. The time for the receipt of tenders for this plant has been extended until March 4th. (See advertisement on another page.)

**Neath.**—One 400 kw. two-phase generating set. Borough Electrical Engineer. March 3rd.

**Salford.**—Three rotary-converters with the necessary transformers, switchgear and cable connections. Estimated cost: rotaries and transformers, £8,000; H.T. switchgear, £2,000; cables, &c., £2,000. See also article on p. 100.

**Swindon.**—One 500 kw. mixed pressure turbine, switchboard panel and cable. Borough Electrical Engineer. March 10th.

**Wigan.**—High-tension, three-core paper and lead covered armoured feeder cable, transformer and switchgear. Borough Electrical Engineer, February 24th.

## Wiring

The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.

**Canterbury.**—Extensions to asylum, costing £25,000.

**Devonport.**—New Municipal buildings.

**Ilford.**—Electric lighting of South Park School, Water Lane. Architect, C. J. Dawson, 11 Cranbrook Road. March 1st.

**Llandudno.**—New police buildings. J. Holt, 9 Albert Square, Manchester.

**London: Lewisham.**—Electric lighting is to be installed in the infirmary.

**L.C.C.**—Curtain Road elementary school. (See advertisement on another page.)

**Mountain Ash.**—Isolation hospital. W. H. Williams, Town Hall.

**Paisley.**—Proposed art gallery.

**Trowbridge.**—New County Offices. County Surveyor.

**Wallasey.**—New town hall.

**Wood Green.**—Supply and fixing of conduits for electric lighting of Town Hall. Clerk, February 26th.

**York.**—Additions to secondary school for girls. Secretary, Education Offices, Clifford Street.

## Miscellaneous

**Aberdare.**—Twelve months' supply of various stores for Electricity Department. Borough Electrical Engineer. March 3rd.

**Belfast.**—Four 5-ton electric gantry cranes for Harbour Commissioners. Secretary, Harbour Offices. March 12th.

**Birmingham.**—Twelve months' supply of stores, including electrical goods, for the Tame and Rea District Drainage Board. Engineer, Drainage Board Offices, Tyburn, Birmingham.

**Croydon.**—Twelve months' supply of electric lighting sundries for Mental Hospital, Warlingham. Clerk, Town Hall.

Twelve months' supply of meters and fuses, arc-lamp carbons, lamp globes, &c. Borough Electrical Engineer. March 31st. (See advertisement on another page.)

**Great Central Railway Co.**—Twelve months' supply of electrical stores. Stores Superintendent, Gorton. March 4th.

**Hornsey.**—Meters, cables, &c. Borough Electrical Engineer. February 24th.

**London: Hampstead.**—80-watt metal filament lamps are to be substituted for the arc lamps in a number of streets at an estimated cost of £900.

**Fulham.**—Twelve months' supply of electrical stores. Clerk to the Guardians, 129 Fulham Palace Road. March 6th.

## THE RECORD ELECTRICAL Co., Ltd.

LONDON OFFICE:  
CAXTON HOUSE,  
WESTMINSTER, S.W.  
Telephone:  
3007 Victoria.  
Telegrams & Cablegrams:  
"Infusion,"  
London.

MEASURING  
INSTRUMENTS.  
RECORD'S PATENT.

WORKS:  
BROADHEATH,  
MANCHESTER.  
Telephone:  
104 Altrincham.  
Telegrams & Cablegrams:  
"Infusion,"  
Altrincham.

Write for Prices & Particulars.



**Newport (Mon.).**—Twelve months' supply of stores for Electrical Department. Borough Electrical Engineer. February 22nd.

**Pontypridd.**—Twelve months' supply of cables, insulating materials, meters, &c., for Electric Light and Tramways Departments. Borough Electrical Engineer. March 5th. (See an advertisement on another page.)

**Shipley.**—The Council are considering the question of extending the street electric lighting.

**Southampton.**—Twelve months' supply of stores for electricity and Tramways Departments. General Manager. February 22nd.

**South Wales.**—The Powell Duffryn Steal Coal Co. require twelve months' supply of electrical goods. Particulars, Aberdare. Tenders to 101 Leadenhall Street, E.C. March 10th.

Twelve months' supply of electrical goods by Bedwas Navigation Colliery Company. March 5th.

**Swanage.**—A proposal to adopt public electric lighting has been referred to the Finance Committee.

**Walthamstow.**—Twelve months' supply of cables, jointing materials, electrical fittings, arc-lamp carbons, meters, lamps, &c., for Electricity and Tramways Department. February 28th. Clerk to Council.

**Warrington.**—Twelve months' supply of motors and transformers. Borough Electrical Engineer. March 5th.

**Wimbledon.**—Twelve months' supply of cables, transformers, meters, incandescent lamps, arc lamps, &c. Borough Electrical Engineer. March 5th.

## TENDERS RECEIVED AND ACCEPTED

**Aberdeen.**—Tenders by the Oerlikon Co. and Messrs Bruce Peebles and Co. for new generating plant have been accepted at £11,000, the lowest tenders received.

**Harrogate.**—The tender of the British Thomson-Houston Co. for a 1,250-kw. horizontal turbo-alternator has been accepted at £4,279.

**London: L.C.C.**—The tender of the A.E.G. Electric Co. has been accepted at £902 for electric lighting extensions at the Camberwell School of Arts.

The tender of Messrs. Tredegar and Co. has been accepted at £434 for the electric lighting of the Vauxhall Street School.

**Salford.**—The tender of Messrs. Mather and Platt for filtration plant at the Electricity Works, at £635, has been accepted.

The Shanghai branch of the General Electric Co. received orders during a fortnight in November last for 13,000 Osram lamps from cotton mills alone. An order for 1,000 Osram lamps has also been placed by the Shanghai Tramways.

## MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. G. Smith & Sons, of 5 Philpot Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night, was £68 to £69 (last week £74 to £76).

**Siemens Brothers Dynamo Works, Ltd.**—Mr. H. S. Kennedy, who has been with the firm for a number of years, has been appointed manager of the Marine Department and will be stationed at Glasgow.

**Nalder Bros. & Thompson, Ltd.**—Messrs. Berry, Skinner and Co. (Oozells Street, Birmingham) have been appointed representatives of this firm in the Midland district, and will hold a stock of instruments.

**Ferranti, Ltd.**, held their third annual dinner at the Midland Hotel, Manchester, on February 14th last. Two hundred members were present, and, having duly dined, some of their number provided an excellent musical entertainment.

**Bankruptcy.**—Mr. C. S. Northcote, Electrical Engineer, 67 Stanthorpe Road, Streatham, S.W., has been adjudicated a bankrupt. The public examination will be held at the Court House, Wandsworth, on February 27th, at 10.30 a.m.

**Liquidation.**—The Gilbert Arc Lamp Co. is being wound up for the purpose of completing the transfer of the assets of the

Company to Engineering and Arc Lamps, Ltd., Sphere Engineering Works, St. Albans.

**Electrical Installations, Ltd.**—Some sixty members of the staff of this firm held their annual dinner at "The Horns," Kennington, on the 15th inst., Mr. Stanley C. Russ being in the chair. After the dinner some of them entertained the company with an excellent variety programme.

## APPOINTMENTS AND PERSONAL NOTES

Mr. Fred Riley, who, we recently announced, had been appointed Electrical Engineer to the Todmorden Corporation, has decided not to take up the appointment. The vacancy has been offered to Mr. J. Boyce, of Darwen, who was next on the list of applicants. It is understood that Mr. Riley has been offered inducements to remain at Rawtenstall.

Mr. W. E. Mandelick, Secretary of the Underground Railways Co. of London, will take over the secretarial duties of the City & South London Railway Co. and the Central London Railway Co. as the result of the amalgamation scheme, Mr. W. F. Knight and Mr. E. Moss, Secretaries of the prospective Companies, resigning.

Mr. J. G. Steele, Station Superintendent at West Hartlepool, has resigned owing to ill-health.

Mr. C. Mittelhausen, who recently resigned the position of Borough Electrical Engineer and Tramways Manager at Bexley through ill-health, has been presented with a pair of binoculars and a clock by members of the various departments of the Corporation.

Electrical fitters for H.M. Dockyard, Portsmouth, are required. (See advertisement on another page.)

## COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &c.

**Dividends of London Supplies Companies.**—Chelsea Electricity Supply Co., final dividend, making 5 per cent. for 1912, placing £13,626 to depreciation and carrying forward £2,832.—Central Electric Supply Co., 5 per cent.—Notting Hill Electric Lighting Co., 5s. per share.—Kensington and Knightsbridge Electric Lighting Co., 9 per cent.—City of London Electric Lighting Co., 8 per cent.

**The Institution of Electrical Engineers.**—The following is the result of the ballot, at the meeting on Thursday, of new members and members' transfer:—*Members:* H. N. Baker, F. Bhering, W. W. Blunt. *Associate Members:* H. E. Annett, C. L. Arnold, F. H. Barnett, W. S. Barter, F. C. Baumann, R. G. Beer, J. Bemrose, J. C. Bentley, L. F. Bickell, W. T. Bottomley, H. Brown, J. E. Brown, A. H. Cheeseman, L. O. Cox, H. B. Fisk, H. W. Franks, B. J. Grigsby, D. A. Hackett, W. G. Hardy, C. S. Jeffrey, W. Kidd, G. H. Langdon, W. J. Lee, S. Lees, G. B. Lincolne, J. K. MacDougall, E. Moxon, E. D. Pearmain, C. M. Perrin, G. Porter, N. V. Raven, R. H. Redman, G. E. Riley, H. Rocky, D. B. Ross, E. Rothwell, R. Sell, H. Slog, H. B. Smith, A. G. Tucker, J. A. Whatnall, W. S. Wilson, J. Young. *Associate:* A. G. Whyte. *Graduates:* R. S. Begg, H. G. Bennett, R. C. Black, E. J. Bluett, H. I. Booth, C. J. Brady, E. T. Cook, E. Edwards, S. A. Laird, A. Nath, G. Ollier, J. W. Slorach, W. Storey, E. E. Walker, W. B. Ward, W. J. Williams, A. N. Wood. *Students:* A. T. Betts, V. H. Gutteridge, J. M. Heslop, A. S. Kettle. *Candidates Transferred:*—*Associate Member to Member:* A. H. Allen, R. H. Campion, G. P. Dennis, E. I. Everett, W. Fennell, A. W. Fithian, E. G. Fleming, P. Good, A. H. Graham, S. S. Grant, A. W. Isenthal, F. M. Long, H. A. Madge, B. Matthews, J. F. Nielson, J. D. Pember, H. L. Percy, W. G. Pickvance, H. I. Rogers, E. C. St. John, J. Severs, C. M. Shaw, W. B. Shaw, E. J. Summerhill. *Associate to Member:* R. E. Dixon, A. E. Hadley, H. J. Nisbett, G. P. Roy, H. Scholey, R. E. Shawcross. *Associate to Associate Member:* M. J. Allward, W. J. Baker, S. Dale, J. A. Edmondson, H. O. Fleetwood, W. G. Hodgeson, H. S. Ingleby, E. J. Marsh, A. Marston, J. F. North, A. D. Raine, A. E. Salisbury, R. Scruby, C. E. Vance, C. J. Vaughan, J. Young. *Student to Associate Member:* R. T. Challoner, R. W. Fowler, W. R. Harding, H. M. Harrison, H. M. Hart, W. E. Jones, P. W. Scholefield, E. H. Turle. *Student to Graduate:* M. L. Ali, J. R. Boyer, A. F. Chandler, R. Larkworthy, J. B. Murray, F. G. Ride, A. R. Teixeira, R. B. Walker.

# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

NO. 322 [VOL. IX., No. 9]  
*All rights reserved.*

THURSDAY, FEBRUARY 27, 1913.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.  
SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES and TECHNICAL COLLEGE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

*Other Advertisement Rates on Application.*

*Latest Time for Receiving*

Letters for Insertion, Tuesday first post.

Small Advertisements and Official Announcements, Wednesday first post.

Displayed Advertisements, Tuesday first post.

Corrections in Standing Advertisements, Monday first post.

All letters to be addressed to "Electrical Engineering," at the EDITORIAL and PUBLISHING OFFICES: 308-306, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Circling, Fleet, London."

Telephone No.: 5500 Holborn.

Cheques to be made payable to THE KILOWATT PUBLISHING Co., Ltd., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## CONTENTS

	PAGE
SUMMARY	111
Arrangements for the Week	112
Street Lighting in Southgate	113
Internal Combustion Engines	116
Electricity Supply Policy	116
Turbo-Generators for the L.C.C. Greenwich Power House	117
Dispute between Supply Companies	117
CORRESPONDENCE	117
Girder Conduit Clips and Boxes	118
Indirect Lighting in a Picture Theatre	118
A Cheap and Effective Semi-Indirect Fitting	118
Questions and Answers by Practical Men	119
Catalogues and Pamphlets Received	120
Telephony and Telegraphy (Including Wireless)	120
Electric Traction Notes	121
PATENT RECORD	122
Local Notes	123
Tenders Invited and Prospective Business	123
Tenders Received and Accepted	124
Miscellaneous Business Notes	124
Companies' Meetings, Dividends, Reports, &c.	124

## SUMMARY

A SYSTEM of public lighting with 50-c.p. metal filament lamps hung a few feet from the kerb at some considerable height from the road has been adopted at Southgate. (Page 113.)

AT a recent meeting of the Yorkshire Local Section of the Institution of Electrical Engineers, a lecture on internal combustion engines was given by Mr. K. Cox. (Page 116.)

THE questions of the most economical number of generating stations, tariffs, management, and advertising were dealt with in a Paper by Mr. G. W. P. Page before the Students' Section of the Institution

of Electrical Engineers at recent meetings. (Page 116.)

THE new 8,000-kw. turbo-generators for which the London County Council are inviting tenders are to run at 1,500 r.p.m., and a steam consumption of 12.75 lb. of steam is to be guaranteed with a penalty over and a bonus under. (Page 117.)

THE London Electric Supply Corporation is appealing in the House of Lords in a case relating to the way in which the Westminster Electric Supply Corporation is managing the London Company's business in the Westminster area, which it is doing under an agreement between the two companies. (Page 117.)

MR. H. M. SAYERS writes referring to Messrs. J. G. & R. G. Cunliffe's recent Paper on tramway feeders, and calls attention to earlier work done on the subject. (Page 117.)

FITTINGS for bringing conduits round girders, a semi-indirect lighting fitting, and the application of indirect lighting to picture theatres are dealt with in short illustrated articles. (Page 118.)

THE construction of a wireless telegraph receiving station is dealt with in our "Questions and Answers" columns. (Page 119.)

A SYSTEM of signalling over land lines connected to long submarine cables without retransmission has been devised by Mr. J. Gott, engineer to the Commercial Cable Co.—Marconi's Wireless Telegraph Co. has expressed its determination not to continue with the Imperial wireless scheme unless the contract is confirmed by March 1st, but the Postmaster-General has threatened to enforce his rights.—Several wireless installations are to be erected by the Mersey Docks and Harbour Board.—We also give a description of the equipment of the new wireless station at Fort Myer (Vancouver), where it is estimated that a potential of 150,000 volts is obtained at the top of the antenna. (Page 120.)

WE describe the new L.C.C. trailer cars, the interesting feature of which is the braking arrangements.—The Postmaster-General proposes to construct tube electric railways for the transportation of mails in London.—It is proposed to abandon the proposed tramway near St. Paul's Cathedral. (Page 121.)

THE decision of the Comptroller-General of Patents regarding the application by the B.T.-H. Co. to amend the important specification No. 21,513/06, relating to wire-drawing for metal filament lamps, has been announced. Some of the proposed alterations have been allowed, but the opposition was on the whole successful. Opposition to the grant of a patent to C. E. Wills for number-plate indicators has been entered. A patent granted to B. Brukwicki for an electro-magnetic gear was published last Thursday. (Page 122.)

THE scheme by which the Brush Co. was to be supplied in bulk from the Loughborough Corporation Works has fallen through.—Judgment has been re-

served in the libel action by the Aberdeen City Electrical Engineer against the local branch of the Electrical Contractors' Association.—There is considerable controversy in Leicester as to street lighting.—The two Newcastle Supply Companies have become partners in an electrical showroom. (Page 123.)

EXTENSIONS are contemplated at Finchley (£15,000); Loughborough (£10,000); and Bingley (£5,500).—Mains and services are required at Woolwich, Bedford, Leek and Grimsby.—An electric lighting installation is required in Lucknow, and a further extension of time is announced with regard to the L.C.C. new turbo-generators.—Prospective buyers from Australia and South Africa are now in London.—A year's supply of electrical goods is required at West Ham, Edinburgh and elsewhere. (Page 123.)

THERE was a deficit of £4,593 on last year's working of Messrs. Bruce, Peebles & Co.—W. T. Henley's Telegraph Works pay a dividend of 15 per cent., and the British Electric Transformer Co. 10 per cent. (Page 124.)

### ARRANGEMENTS FOR THE WEEK

(TO-DAY) THURSDAY, FEBRUARY 27TH.

*Tramways and Light Railways Association.*

7.30 for 7.45 p.m. Annual dinner and smoking concert, Trocadero.

*Institution of Electrical Engineers.*

8 p.m. Fourth Kelvin Lecture: "The Ohm, the Ampere, the Volt: a Memory of Fifty Years Before, 1862-1912," by Dr. R. T. Glazebrook.

FRIDAY, FEBRUARY 28TH.

*Physical Society.*

5 p.m. At King's College, Strand. The agenda includes "Alternating Current Magnets," by Prof. E. Wilson.

*Institution of Electrical Engineers: Manchester Section.*

7 for 7.15 p.m. Annual dinner at Midland Hotel.

SATURDAY, MARCH 1ST.

*Association of Mining Electrical Engineers.*

5.30 p.m. Warwickshire and S. Staffs. Branch. "Cables for Shafts of Mines," by E. K. Scott.

MONDAY, MARCH 3RD.

*The Batti Wallahs.*

8 p.m. Annual General Meeting at Golden Cross Hotel, Charing Cross.

TUESDAY, MARCH 4TH.

*Institution of Electrical Engineers: Manchester Students' Section.*

7.30 p.m. At Municipal School of Technology. "Practical Testing of Transformers," by W. Parry.

*Institution of Civil Engineers.*

8 p.m. At Institution of Mechanical Engineers. "Notes on City Passenger-Transportation in the United States," by G. D. Snyder.

*Institution of Electrical Engineers: Glasgow Students' Section.*

8 p.m. At Royal Technical College. "Illumination," by N. McCaskill.

WEDNESDAY, MARCH 5TH.

*Institution of Electrical Engineers: Students' Section.*

7.45 p.m. "Electrical Heating and Cooking Apparatus," by S. M. Hills.

THURSDAY, MARCH 6TH.

*Institution of Electrical Engineers.*

8 p.m. "Recent Developments in the Street Lighting of Manchester," by S. L. Pearce and H. A. Ratcliff.

### The London Electrical Engineers.

(TO-DAY) THURSDAY, FEBRUARY 27TH. C. Company.—Recruit Training, 7 to 10 p.m.; Company Training, 7 to 10 p.m.

SATURDAY, MARCH 1ST. C. and D. Companies (Left Half Battalion).—Week-end Training at Dover. Service Dress. No Arms. Parade at Victoria Station, L.C. & S.E. Line at 1 p.m. Headquarters open for Regimental business from 10 a.m. till 12 noon.

MONDAY, MARCH 3RD. A. Company.—Recruit Training, 7 to 10 p.m. Company Training, 7 to 10 p.m.

TUESDAY, MARCH 4TH. B. Company.—Company Training, 7 to 10 p.m.

THURSDAY, MARCH 6TH. C. Company.—Recruit Training, 7 to 10 p.m. Company Training, 7 to 10 p.m.

FRIDAY, MARCH 7TH. D. Company.—Company Training, 7 to 10 p.m.

SATURDAY, MARCH 8TH. Headquarters open from 10 a.m. till 12 noon.

**Manchester Electro-Harmonic Society.**—A most successful concert was held last Friday, and over 300 persons were present. The programme consisted of classical music for strings and pianoforte interspersed with high-class songs. The chair was taken by Mr. W. Cramp in the absence of Mr. Pearce. The next concert will be on March 25th, with Mr. F. S. Sells in the chair, and will be the last of the season.

**The Electrical Trades Benevolent Institution.**—A report has been drawn up by the secretary and laid before the committee on the bearing of the National Insurance Act on the Institution. The working of the Act is recapitulated, and it is pointed out that the benefits are in general too small to meet the requirements of the average person employed on the staff of an electrical concern, and how desirable it is that they should be supplemented by those afforded by the Institution.



**JOBMASTER** (to Supply Representative, who has advised him to put in a chaff-cutter motor at £4 per B.H.P. per annum, plus ½d. per unit). Don't talk to me about a pound a quarter to run a brake-horse! Why, he don't cost a quid a year!

## STREET LIGHTING AT SOUTHGATE

A SYSTEM of electric public lighting, which has much in the Southgate Urban District along the whole of the portion of the thoroughfare known as Green Lanes, lying in that district. This forms part of the extensive area to the north of London which is supplied by the North Metropolitan Electric Power Supply Co., in response to whose invitation we were present on the occasion of an inspection of the new lighting by representatives of various local authorities in the North Metropolitan area on Wednesday night of last week. The party were first of all entertained by the Company at their sub-station at Winchmore Hill, where they were welcomed by Mr. J. Devonshire (Managing Director), and other officials of the Company. Mr. E. T. Ruthven Murray (Engineer-in-Chief) in a short speech explained the main features of the new lighting, and how it is supplied, and several of the gentlemen present representing other districts expressed their appreciation of the system that had been adopted. A tour of inspection was afterwards made in special tramcars, enabling comparisons to be made with the other systems of street lighting employed by neighbouring local authorities.

The new street lamps, although suspended in the manner described hereafter from the span wires of the Metropolitan Electric Tramways, are supplied independently of the tramway supply from the ordinary distributing mains through the various sub-stations of the North Metropolitan Electric Power Supply Co. The Winchmore Hill sub-station, where the party assembled, is connected to the 11,000 volt, three phase, 50 cycle ring main system supplied from the company's stations at Willesden and Brimsdown, and is looped in between the latter and the Wood Green sub-station, so that supply can be obtained from either direction. The pressure is reduced by Berry transformers provided with voltage regulator, to 8,000 volts, at which pressure energy is sent out to sub-stations, from which distribution is effected at 240 volts, three phase, four wire, for lighting and general purposes, and at 415 volts, three phase, for large motors. The high-tension cables for the tramway supply are also looped in to this sub-station to form a switching point, but no transformation is done.

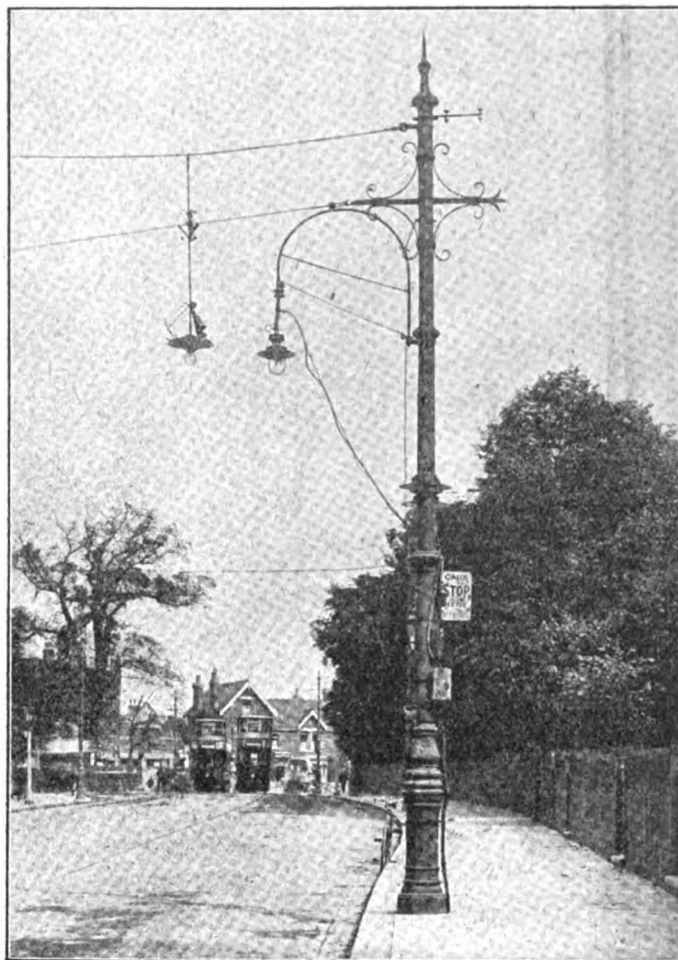
The principle feature of the method of street lighting employed is the hanging of single metal filament lamps of moderate size from the tramway span wires, in suitable fittings, at a considerable height over the roadway, a few feet from the kerb line. The system was first used at Barrow, and is therefore generally known as the Barrow system, and is due largely to the enterprise of the Wardle Engineering Co. (196 Deansgate, Manchester), who designed and supplied the necessary fittings, &c. The general arrangement is shown in the figure (in which one of the experimental gas lamps which competed unsuccessfully with the system is also seen). The leads are brought up the posts on one side and a clock switch fitted to base of the post is used to switch on and off, so that each pair of lamps is controlled independently. Alternate posts are connected to different phases of the three-phase, four-wire system, so that the load is equally balanced. The fittings are most successful from the point of view of appearance.

The method of suspension is as follows. A 7/16 galvanized steel suspension wire is fixed across the road between each pair of poles, and from this are suspended two fittings, each fitting being fixed 18 ft. 6 in. from the centre of the roadway. The fittings are 6 ft. 8 in. in length over all, and bring the lamp to a height of approximately 17 ft. 6 in. from the road level. The stems of the fittings are passed through reel insulators, which are attached to the span wire by means of "V" binders, thus preventing them from swinging, while leaving them free to move vertically. The fittings are also fixed to the suspension wire by means of a "V" binder, so that the erection of a fitting is quite an easy matter, and only occupies a few minutes.

The lanterns employed are 18 in. "Beatark" fittings, with specially designed white enamelled reflectors, giving very uniform distribution of light. With the exception of one or two lamps of one hundred candle-power fixed at the junctions of important roads, each lamp is of 50 c.p. With a view to securing complete immunity from faults, "Cab Tyre" sheathed cable has been used for the wiring of the fittings to the cut-outs.

In addition to the equality of the illumination and absence of dazzling bright spots, an important feature of the system is the almost total absence of shadows on the carriage way

in this respect, an improvement both upon centrally hung lamps or those supported over the kerb. Again, the lamps are not in the direct line of vision of either pedestrians or drivers, and the absence of glare enables objects on the roadway to be clearly seen at a remarkable distance. The system is relatively inexpensive when compared with certain others employing arc lamps, and where, as in this example, the lamps are suspended from supports attached to the tramway standards carrying overhead conductors, no additional poles are required. The method of suspension employed entirely overcomes any trouble which might otherwise be experienced with metal lamps due to the vibration of passing tramcars, gales, &c. This is borne out by the fact



ELECTRIC LAMP HUNG FROM SPAN WIRE (WITH COMPETING GAS LAMP WHICH WAS AFTERWARDS REMOVED).

that in one installation in an exposed North Coast town the average life of the lamps is considerably over 2,000 hours. We might add that this system has also been installed with success at West Ham, Barrow-in-Furness, Rawtenstall, Chester, and Penang.

In conclusion we wish to express our appreciation of the courtesy of the North Metropolitan Electric Power Supply Co., as well as our thanks to the Wardle Engineering Co. for putting illustrations and technical particulars at our disposal.

**London and Electricity Supply.**—In February, 1912, the London County Council appointed a Special Committee to consider and report as to the best means of placing London in the most advantageous position in regard to electricity supply, taking into account the fact that the Council has now powers to purchase all the London electric supply undertakings. This Committee has at last reported, but no recommendation is made. It appears that 16 meetings have been held, and that consideration has been given to a large number of matters connected with the supply of electricity in London. It is pointed out in the report now made that no expert advice has been taken, and in the circumstances it is not thought that any useful purpose would be served by the submission of a detailed report upon the work which has been done by the Committee. The opinion, however, is expressed that a committee should again be constituted to carry on the inquiry.

## The Lamp



## THE Reflectors



VELURIA.



HOLOPHANE.



MAZDALUX.



MAZDALUX.  
Angle Type.

# Open Letter



MAZDA HOUSE  
77, UPPER THAMES STREET,  
LONDON E C

Gentlemen,

We want you to feel that the Mazda lamp service is a part of your organisation - ready to assist you all the time.

Here's one way we can help you at once.

There are any number of people in your district whose places of business are not properly lighted.

We can show you how to change these places over to improved lighting - and bring you increased business, not only in Mazda lamps, but in reflectors, fittings etc. as well.

We will provide you with the materials for good lighting, in simple standard form.

Here they are :-

### MAZDA DRAWN WIRE LAMPS

Standardized in correct sizes and filament position for use in scientific reflectors  
Supplied in sizes from 10 watts up and for all commercial voltages.

### SCIENTIFIC REFLECTORS - All standardized to give definite lighting results.

VELURIA - the glass without glitter, most attractive type of efficient reflector available.

HOLOPHANE - prismatic glass of scientific design.

MAZDALUX - metal reflectors in 8 shapes for different distributions Without equal for industrial service.

- 1 -

# Mazda LAMPS



# Contractors.

- 2 -

## SCIENTIFIC DESIGNS OF FITTINGS.

### MAZDALIERS

The fittings that are standardized and which make business easy for you. They come to you in neat cardboard cartons, - already wired with necessary galleries and holders. Ready for fixing in a few minutes. Made for 1, 2, 3, 4 or 5 lights. In round or square tube - two finishes. All packed in cartons with everything necessary.

These standard materials, installed by the simple rules we give you, enable you to ensure good lighting results (without calculations) for the general run of interiors.

We provide Illuminating Experts who are freely at your command to work for and with you

- to lay out complete lighting schemes
- to assist you to make demonstrations
- to convince your customers of the benefits of better light.

Our Advertising Department will help to tell your public how you can serve them,

- by giving you copy and blocks for advertisements in local papers
- by supplies for mail distribution of attractive booklets, postcards, blotters etc.
- by attractive showcards.
- by interesting displays for your show windows

All this service is free to you and freely offered - we welcome your co-operation. Why not make full use of Mazda service and sell two or three lamps where you now sell one - to say nothing of the other materials: and the satisfaction of your customers.

Write us to-day.

Yours faithfully,

THE BRITISH THOMSON-HOUSTON CO., LTD.

## The Fittings



THE MAZDALIER  
is in

A Neat Carton



and is quickly ready  
for fixing.



THE TUNGSTOLIER.

Various designs of arms, bodies, shells and canopies, enables contractors to shew a variety of distinct fittings without carrying a large stock.

# Mazda SERVICE.

## INTERNAL COMBUSTION ENGINES

A LECTURE was given on this subject by Mr. K. Cox on January 29th before a meeting of the Yorkshire Section of the Institution of Electrical Engineers. The author thought that where a new plant had to be erected, and more especially where coal was expensive and the load fairly steady, the internal combustion engine had many points in its favour. The Diesel engine station will cost somewhat more than the steam station; but although the Diesel engine is a comparatively expensive piece of machinery it is complete in itself, its only accessories being a circulating water pump and fuel tanks. Taking a 600 kw. station (suitable for a moderate-sized works) he estimated the capital costs (including building) as follows: Turbo-generators, £8,850; gas plant with producers, £9,640; and Diesel engine plant, £11,080. The corresponding running costs he put at £52, £48 10s., and £60 7s. per week respectively for an average load of 600 kw. for 60 hours per week. This works out at 0.348d., 0.292d., and 0.447d. per kw.-hour. Owing to the low price of coal, the number of stations where Diesel engines show to the best advantage is not so great in this country as in many instances abroad. In Germany, also, considerably more use is made of by-products. In comparing large and small units, the lecturer gave the following arguments in favour of the use of small engines, except in very large installations. The thermal efficiency of a moderate-sized unit is not less than that of a large unit. The risk of failure of vital parts in large engines is greater than in small ones. The capital cost and space occupied by a number of smaller units is little more than that of a large unit. A number of units give a much more elastic station and a greater factor of reliability. He enlarged upon some of the difficulties in the construction of large engines, especially as regards water-cooling, and described various types in use, favouring on the whole the vertical tandem multi-cylinder 4-stroke pattern. The various forms in which the Diesel engine is built were mentioned, and with regard to fuel he said that the present high price of residual oil was due to lack of transport facilities. There were at present approximately 100 tank steamers being built. When these were put into commission this fuel would fall to a reasonable cost; but at the present time there was not the plant in this country to put on the market sufficient distillates from coal tar to augment the residual oil and to keep fuel oil at a reasonable figure.

Mr. H. W. Ravenshaw, in opening the discussion, referred to the compactness and convenience and economy of Diesel engines. He did not think there was much chance of oil fuel coming down in price again, but it must be remembered that all other fuels had gone up too. He referred, however, to the poor overload capacity of gas and Diesel engines, and their bad mechanical efficiency and excessive wear due to high piston ring pressure when heavily loaded. Mr. Smith preferred the gas engine working from a bituminous pressure producer to the Diesel engine at the present prices of fuel, except for the Colonies and abroad, where they had oil fuel available locally, and spoke of such plants producing current at 0.1d. per unit for a 24-hour load. Practically the whole of the cost of the fuel could sometimes be wiped out by the revenue obtained from bye-products. He paid high tribute to the reliability of both gas and Diesel engines. Mr. Weardale had not so high an opinion of the immunity of the Diesel engine from breakdown. Many internal combustion-engine troubles were, however, really due to putting in engines too small for the work they had to do. On the whole he preferred the horizontal to the vertical design. Mr. H. E. Yerbury (Chief Electrical Engineer, Sheffield Tramways) thought that there were possibilities in the gas-engine driven on town gas for extensions to municipal supply stations where space was limited, and suggested that cheaper rates should be charged for gas in bulk for the purpose. Mr. Boulden spoke of some hopeful experiments as to the production of liquid fuel from soft deposits of coal which were not being worked. Mr. Naylor criticised some of the author's capital costs. Mr. Cox, in his reply, attributed certain Diesel breakdowns to too small clearances, and cleared up a number of points of detail raised in the discussion.

**Boycott of German Electrical Goods in Prague.**—Following on the unwarranted boycott of German motors and apparatus by the Electrical Supply Undertakings of Prague (see ELECTRICAL ENGINEERING, January 23rd, page 52), these companies have issued a further circular to the effect that before installation of the home-manufactured plant is permitted, the motors and other apparatus must be subjected to a test by the supply authority. Exorbitant fees are demanded, ranging from 25 kronen for a small squirrel-cage motor to 175 kronen for a 100-h.p. slip-ring motor.

## ELECTRICITY SUPPLY POLICY

UNDER this title Mr. G. W. P. Page read a Paper before the Students' Section of the Institution of Electrical Engineers on February 19th. In consequence of the many controversial points raised, and the large number of speakers, the discussion was adjourned until yesterday evening, February 26th. The chair was taken by Mr. A. H. Scabrook (Engineer and Manager, Marylebone Electricity Supply).

Mr. Page first considers the most economical number of generating stations to supply present and future requirements. A reduction to about one-half of those now in existence is advocated, the size of the station depending on the district, but no station having a large radius of action. The author does not think that any very great saving would result from much standardisation of pressures and frequencies when all factors are taken into account. Apparatus should be hired to consumers, or else sold outright and bought back at a price determined on a suitable scale. To popularise electricity for all domestic purposes, the author favours a "sliding-scale flat-rate." He considered that 6d. per unit for the first 5 units per 25 c.p. metal filament lamp installed per annum, 2d. for the next 5, and all further units at 1d., would prove remunerative to most undertakings, and would encourage consumers to take up electric heating and cooking, as no further initial charge would have to be met. On the question of ownership the author believes that company management under moderate Central Government supervision is the most satisfactory. Advertising, he thinks, should be carried out jointly by the supply company, and the contractors from joint local showrooms by means of well-written unbiased literature, technical representatives, and lectures. One of the best advertisements would be large electric restaurants in provincial towns.

The tone of the ensuing discussions was in general in favour of flat-rate charging, with abolition of meter rents. Standardisation of pressures and frequencies was generally regarded as being of great benefit. Municipal supply found several supporters, though full wiring and fittings powers were regarded as being necessary for success. Much diversity of opinion was expressed as to the most economical number of stations. Owing to the great capital cost of transmission lines, however, the policy outlined above was generally favoured. Diesel engine stations for small towns found adherents. Mr. E. F. Hetherington (North Metropolitan Power Distribution Co.) referred to the difficulties in linking up systems of different frequencies, and advocated intermediate conversion to continuous current. The author replied at length to the points raised, and substantiated his previous remarks.

**Osram Fancy Costumes.**—The General Electric Co. have sent us some illustrations of ingenious fancy dresses that have been made up with the aid of Osram lamps and Osram advertising literature. Several of these provided by the Publicity Department of the company have been successful in winning prizes for their wearers.

**Annual Dinner of the Yorkshire Local Section of the Institution of Electrical Engineers.**—The dinner was held at the Hotel Metropole, Leeds, on February 21st. Mr. Wilson Hartnell, the chairman, presided, and the visitors included Mr. W. Duddell (President), Mr. J. F. C. Snell, Mr. Robert Hammond, Mr. A. G. Lupton (Pro-Chancellor of the University, Leeds), Mr. J. E. Kingsbury, Alderman R. A. Smithson, and Mr. E. Kitson Clarke. Mr. Lupton, in proposing the toast of the "Institution," said that he looked upon the Institution as a descendant of the spirit of the ancient trade guilds in that it fostered the growth of the electrical industry. Mr. Duddell assured them that the Institution had awakened to the needs of its members. The Local Sections were a valuable aid to the parent body in keeping them in touch with the country members. They enabled Papers to be discussed in various centres, and thereby increased the value of the journal, which was intended to be a clear exposition of the latest improvements in electrical science. Mr. R. Hammond, in proposing the "Yorkshire Local Section," mentioned that it had a membership of 246 out of a total of 7,300 for the whole Institution, and pointed out that out of the twelve stations with the lowest generating costs four stood to the credit of Yorkshire. The Chairman referred to the progress of electrical science since 1880, and urged members to assist the secretary by more freely offering practical papers, thereby giving members the benefit of their practical experience. In proposing the toast of the "Electrical Industries," Alderman R. A. Smithson wished them to understand that in taking the course he recently did with regard to the proposed large scheme of extensions to the Leeds electrical undertaking he had no wish to postpone developments, but rather to establish it, if possible, on a firmer basis. Leeds was a pioneer in the introduction of railless traction, and he considered there were great developments in store for this form of locomotion. Mr. J. E. Kingsbury and Mr. W. B. Woodhouse also spoke. During the evening, on behalf of the Local Section, the Chairman presented Mr. H. Dickinson with a set of silver candlesticks as a token of its appreciation of his late services as hon. secretary.

## TURBO-GENERATORS FOR THE L.C.C. GREENWICH POWER HOUSE

IN accordance with the decision referred to on page 689 of *ELECTRICAL ENGINEERING* of December 12th last, the London County Council is now inviting tenders for two turbo-generators of 8,000 kw. normal capacity, and several features in the specification are somewhat novel, and may be of interest.

Tenders will be considered for any well-known type of turbine, whether of the reaction, impulse, or combined types, provided that it complies with certain conditions. Notwithstanding the large size of the plant, the Council's advisers have decided to adopt a speed of 1,500 r.p.m., the highest possible for their periodicity of 25 cycles per second, and we believe this will be the first example of turbines of this size manufactured in England for so high a speed. Several machines have been made in Germany for the same speed, and for an output of 16,000 k.v.a., whilst in America several machines are now under construction for 1,500 r.p.m., with an output of 20,000 k.v.a., but these are for a higher periodicity, and are four pole. The advantages in adopting so high a speed are two-fold. First, the initial expense is very much reduced, and, secondly, with most types of turbines a very considerable increase in steam economy is obtained. The first turbines purchased for the Greenwich station were arranged for a speed of 750 r.p.m., and at the time they were purchased extreme steam economy was not considered of so much importance as reliability in running. Since then much progress has been made in the manufacture of steam turbines, and with few exceptions modern designs of turbines may be considered as thoroughly reliable in working, and consequently in the present turbines high steam economy is the predominant feature of the specification. The steam pressure is 180 lb. per sq. in., superheated to a temperature of 550° F., and with ample condensing water from the Thames, a 95 per cent. vacuum is anticipated.

Under these conditions, Mr. Fell has fixed upon a consumption per kilowatt hour of 12.75 lb. of steam, and should this be improved upon a bonus of £500 per 1/10th of a lb. of steam will be awarded, and if, on the contrary, the figure of 12.75 is not realised, a corresponding penalty will be imposed, whilst the Council reserves the right entirely to reject the plant on a consumption exceeding 13.5 lb. of steam. Included with the tender are centrifugal circulating pumps, air and extraction pumps, and these are specified to be driven by auxiliary steam turbines, which, again, appears to be an innovation on previous practice adopted at the station. We understand that this modification is dictated by the need of an independent method of driving the plant, should a shut-down of the electric supply unfortunately occur, and the change is also dictated by motives of economy, as the latent heat of the exhaust steam from the auxiliary turbines will be utilised in the hot-wells. As is well known, the temperature of the water from high vacuum condensers is only in the neighbourhood of from 70°-80° F., whilst a temperature of from 95°-100° is necessary before water can safely pass through the economiser to avoid sweating of the tubes.

The electrical side of the specification does not appear to show many novel features, as only general conditions are laid down, and it is left for each particular manufacturer to offer his own design of plant. The machines are to be wound for the full pressure of 6,600 volts, step-up transformers not being employed, and the stator coils are specified to be mica insulated throughout. The result of high speed of rotation is a very small machine carcass, consequently the problem of getting rid of the heat will be a serious one, and ample ventilation spaces with a large amount of ventilating air are essential. We notice one novel feature in dealing with this air whereby the ordinary cloth filter is dispensed with, and air washing is substituted. This has the effect not only of thoroughly cleansing the air of all impurities without the inconvenience of renewing the filter cloths, but what is of more importance, it thoroughly cools the incoming air before it enters the generator. A similar device is already in operation at the Brighton Electricity Works, and we understand that Mr. Christie, who is responsible for its adoption, is highly satisfied with the result. With a view to keeping down the short circuit current, the regulation of electrical pressure cannot be arranged within very close limits, and to overcome this difficulty a Tirrill regulator is proposed.

The financial effect of the superior steam economy of the turbines over the reciprocating engines which they are to replace is anticipated to amount to a saving of some £15,000 per annum at the present price of coal.

## DISPUTE BETWEEN SUPPLY COMPANIES

THE London Electric Supply Corporation's appeal to the House of Lords, relative to the agreement with the Westminster Electric Supply Corporation is now proceeding. The agreement in question provides for the management of the London Company's undertaking within part of the Westminster Company's area, by the Westminster Company. This agreement was entered into in pursuance of the London Electric Supply Act, 1908, and particulars were given in *ELECTRICAL ENGINEERING*, Vol. V., Oct. 21st, 1909, p. 919. The London Company supplies alternating current, and the Westminster Company direct current. Certain annual sums are paid to the London Company by the Westminster Company, together with 0.85d. per unit for all energy used. The London Company find that instead of their business in the area in question becoming larger or even remaining stationary, it has decreased considerably. It is alleged that the Westminster Company have been refusing to supply prospective consumers with alternating current, and have also offered inducements to existing consumers on the London Company's mains to change over to direct current, which is only supplied by the Westminster Company. The case was taken through all the Lower Courts, the verdict in each being that since in effect the Westminster Company had purchased, so far as the law would allow, the Westminster portion of the London Company's business, and that in the absence of any specific clauses in the agreement to the effect that they were not to induce the London Company's consumers to change over, they had not broken the agreement. Mr. Danckwerts, K.C., and Mr. Buckmaster, K.C., are appearing for the London Company in the present instance, while Sir Robert Finlay, K.C., and Mr. Younger, K.C., are appearing for the Westminster Company. The appellants contend that since the Act of 1908 does not sanction the sale of a part of one company's undertaking to another, the Lower Courts were all in error in their judgments. The relation of the Westminster Company to the London Company under the agreement was only that of agent or manager to principal or owner, so that in treating all applications for power to the London Company as coming to themselves, and in offering inducements to users of direct current, they were acting *ultra vires*. By their action they may, it is alleged, render the London Company liable to prosecution for non-fulfilment of its statutory obligations to the consumer, as well as rendering the whole of the business less remunerative than it should be. The Westminster Company are maintaining that they are only adopting ordinary business methods.

## CORRESPONDENCE

### FEEDERS FOR TRAMWAYS.

To the Editor of *ELECTRICAL ENGINEERING*.

SIR,—The abstract of Messrs. Cunliffe's Paper on feeding networks for tramways and the discussions thereon, published on page 10 of *ELECTRICAL ENGINEERING* of January 2nd, do not indicate that the authors made any reference to earlier work on the same subject. This may be due to abbreviation, and I note that Mr. Yerbury, in his communication to the discussions, mentioned Papers read in 1898, presumably those of Mr. H. F. Parshall and Mr. Trotter, both read in April, 1898. Mr. Parshall showed the commercial uselessness of unboosted track feeders, and Mr. Trotter explained a neat, graphical method of ascertaining rail drop under given data of service track conductivity, &c. In May, 1900, I read a Paper on "Distributing Systems of Electric Traction," in which, *inter alia*, I showed by general formulæ and application to a particular case methods of calculating track feeding points, track feeders, and booster capacities, for maximum economy. Also trolley feeders. The principles then laid down were applied in various tramways, of which I designed the electrical equipment for the B.E.T. Co. between 1898 and 1903, and in other cases where I advised or designed.

Allowing for certain changes in conditions, such as the Board of Trade restriction of current density in rails to 9 amperes per square inch not then in force; the increase in magnitude of the general supply business in the great cities, where both that and the tramway undertakings are in municipal hands, I think it will be found that Messrs. Cunliffe's conclusions support those of their predecessors of 1898 and 1900.

There is one paragraph in my own Paper which I would commend to the engineers of the tramways of large British cities, containing a suggestion never yet put into practice—to my knowledge—but which might solve or alleviate some of their difficulties, including, perhaps, corrugation. I transcribe it: "It seems, however, that a modification in track construction, using continuous girder supports under the rails, and dispensing with concrete and setts between them, should be a logical consequence of electrical traction; and that the conductivity of the track might be thus largely increased, and bonding made much more permanent without much increase in construction costs. The difficulty now experienced at the joints of tram rails should disappear, and the life of the road be greatly increased."

I am, yours truly,  
Caixa 4, Santos, Brazil.  
January 30th, 1913.

HENRY M. SATERS.

## GIRDER CONDUIT CLIPS AND BOXES

**SIMPLEX CONDUITS**, Ltd. (116 Charing Cross Road, S.W.C.), have designed the form of box which we illustrate here with the object of reducing installation costs where it is found necessary to pass the conduits frequently round girders. It avoids considerable trouble in fitting short lengths of tube, and provides a neat arrangement for carrying conduits round girders in factories and so on. Where it is required to drop a light from the girder, the box can be



SIMPLEX GIRDER BOX.

provided with a porcelain connection piece and a cord grip. The box itself is practically equivalent in cost to the two inspection bends which in the ordinary case would be used. Another novelty is a clip for attaching conduits to girders where the run of the tube is at right angles to the girder. These clips are made in two pieces, held together and tightened, so as to grip the tube, by a substantial brass bolt and nut. A tongue-shaped projection engages the flange of the girder. The labour required to fix these clips is almost negligible, and they can be fixed very rapidly.

## INDIRECT LIGHTING IN A PICTURE THEATRE

**THE** British Thomson-Houston Co., Ltd. (Mazda House, Upper Thames Street, E.C.), has sent us a description of a recently opened cinematograph theatre in Lime Street, Liverpool, which is the first house of its kind to adopt the company's now well-known "eye-rest" system of indirect lighting. This system, in which the lamps are mounted in bowls containing inverted reflectors, is particularly suitable



INDIRECT LIGHTING OF VESTIBULE.

for picture theatres, as it eliminates the necessity for completely darkening the auditorium.

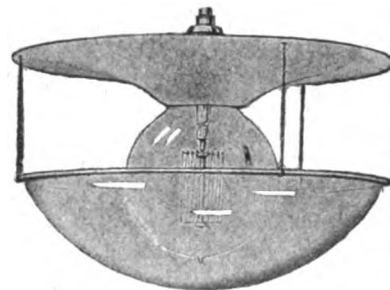
The main auditorium is lighted by four fittings, with 36 in. decorated plaster bowls, placed symmetrically around the centre dome. Two of these fittings contain four, and the other two, three, 200 watt Mazda lamps in suitable mirror reflectors. These fittings are supplemented by six small fittings under the cornice, three on either side, each containing one 100 watt Mazda lamp. Seven small fittings similarly equipped, are fixed under the gallery balcony, and

the balcony itself is lighted by three other small fittings. All these fittings were specially designed to harmonise with the decorative scheme of the auditorium. With all the lamps alight, a minimum illumination intensity of  $1\frac{1}{2}$  foot candles is given in the well of the auditorium, and  $2\frac{1}{2}$  foot candles in the balcony. At the end of each interval the large centre fittings are switched out entirely, but the small fittings are kept on during the performance, and have a dimmer in circuit which allows of a gradual adjustment of the light, so as to give a subdued illumination over the whole auditorium, which does not interfere with the screen effects but is of sufficient intensity for the perusal of programmes, and to enable the audience to find their way to their seats. The four large fittings around the auditorium dome are suspended by lowering gear, so that they can be easily cleaned and repaired from the floor. This gear also provides the necessary electrical connection between the fitting and the controlling circuits, and at the same time ensures a positive mechanical support for the fitting, independent of the lowering cable. The lighting of the vestibule, of which an illustration is given, is particularly effective, and is effected by a single decorative plaster bowl fitting suspended from the centre of the dome.

The whole of the installation work was carried out by Messrs. R. F. Winder, of Leeds, to a specification prepared by the architects, Messrs. Chadwick & Watson, of Crown Chambers, Albion Street, Leeds, on the basis of an illumination scheme designed by the Illuminating Engineers' Department of the British Thomson-Houston Co., Ltd., by whom the Mazda lamps and fittings were supplied.

## A CHEAP AND EFFECTIVE SEMI-INDIRECT LIGHTING FITTING

**THE** illustration below shows a simple and effective fitting made by the Wardle Engineering Co., Ltd. (196 Deansgate, Manchester), which, in spite of its extremely low price—7s. 6d.—is neat and even elegant in appearance. The bowl is made of thin opal glass, its diameter is 11 ins. ;



the diameter of the reflector is 12 ins. Three small brass chains about 4 ins. long, ending in simple clips, are used to suspend the bowl from the reflector. The fitting of this size is suitable for any size of lamp up to 100 c.p., either with pear-shaped or spherical bulb.

**Conduit Wiring.**—A paper on this subject was read by Mr. F. H. Taylor at a recent meeting of the Junior Institution of Engineers. The author referred to the disadvantages of "slip" conduit as regards difficulty in bending, risk of getting loose and causing the pipe to hang on the wires, difficulty of earthing, and impossibility of making a waterproof job. The Institution wiring rules only allowed its use to a limited extent in dry places, but the Phoenix Fire Office unreservedly prohibited it. It was particularly bad when buried in plaster. Of screwed conduits, solid drawn seamless tube was preferable to either brazed or welded material, owing to its better bending qualities and freedom from internal burrs or roughness. The trouble from condensation was not as great as had been made out, provided some care was taken as to the situation of the tubes; a pipe left with an open end for ventilation was sometimes desirable. Good enamel inside the tube was of more value than outside, but galvanising, in the author's opinion, gave better protection than enamelling. The points that made for efficiency were:—straight runs, avoidance of elbows and tees, liberal use of boxes for drawing through, ample size of tube, and metal bushing pieces to all ends of tube. The all-iron system, with iron-clad distribution boards, &c., had much to recommend it. The author emphasised the importance of good earthing by good clips, which make as much contact as possible with as much of the circumference of the pipe as possible, and earth wires of ample size. Isolating the electrical pipework from other conducting material was equally necessary. Rules as to the testing of the earth connections were badly wanted.

## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelopes.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,328.

A 72 b.h.p. motor, 570 r.p.m., is developing this h.p. and transmitting a proportion through 1:6 ratio spur gear, 92 per cent. efficiency; second reduction, worm-gear triple thread, 1:30 ratio, 70 per cent. efficiency; third reduction, 1:6 ratio spur gear, 90 per cent. efficiency. The efficiencies stated are at full load. What are the losses in the gear when motor is developing 10 b.h.p. at same speed?—W. A. C.

(Replies must be received not later than first post, March 6th.)

### ANSWERS TO No. 1,326.

It is required to erect a simple wireless receiving apparatus for experimental work, and some information on the following points is requested:—(1) What apparatus is necessary for enabling messages to be received up to about 500 miles? (2) The approximate length of aerial wires necessary, and whether it matters whether these are run vertically or at a sharp angle to the ground? (3) Can a suitable coherer be made by an amateur? If so, give particulars. (4) Is a telephone receiver sufficiently sensitive to be connected directly across the coherer without any other instrument, to enable messages to be received? Assuming that this apparatus is fixed on a hill some 600 ft. above sea-level, will it be too high for satisfactory working?—WIRE.

The first award (10s.) is made to L. D. Hill for the following reply:—

(1) The essential apparatus to receive from 500 miles is as follows:—Aerial, at least 90 ft. between poles; double-slide tuning inductance, detector, blocking condenser, and telephones (Fig. 3).

**Aerial.**—This will require about 300 to 400 ft. of No. 16 or 18 copper wire, and should consist of two wires in parallel to one another, suspended between insulators, on spreaders at least 5 ft. long. The aerial should be suspended from two poles, or other high objects, between 35 to 50 ft. from ground. The leading-in wires should be soldered to the middle of the span on each wire, and brought together just outside the instrument room (Figs. 1 and 2). The aerial should be as far as possible from large conducting surfaces such as buildings, and as high above ground as possible; also the portion suspended between the poles should be as nearly horizontal as possible. It does not matter much at what angle the aerial is with respect to earth, providing the lowest point is at least 30 ft. above ground (see answer to 2).

**Double-slide Tuning Inductance.**—Wind about 400 to 500 turns of No. 24 S.W.G. enamelled wire on a cardboard cylinder 5-6 ins. in diameter and 12 to 15 ins. long. Scrape two narrow strips of insulation off parallel to axis of coil to enable two sliding contacts to make contact with any turn of wire. These contacts must be so arranged that they can pass one another (see diagram Fig. 3).

**Blocking Condenser.** consists of four sheets of tin foil 2 by 4 ins. separated by waxed paper, 3 by 5 ins. Fix flexible connections to sheets, roll these up while warm from pressing, and place in an ebonite tube  $4\frac{1}{2}$  ins. long,  $\frac{3}{4}$  in. inside diameter, fix flexible leads to terminals, then fill up ends with black accumulator wax.

(2) A vertical aerial could be used, but is not nearly so efficient or effective as that described. It should be carried on a pole at least 100 ft. high in order to receive from distances of

500 miles. An umbrella aerial might be used, but, unless it is impossible to erect the aerial described, its use is not advised.

(3) **Detector.**—A "coherer" is unsuitable for long-distance receiving. Use a crystal detector. Any of the following combinations are good:—Copper pyrites and zincite; bornite and zincite; silicon and brass; platinum or gold point, galena and graphite.

Fig. 4 shows a simple detector, easily made. The detecting

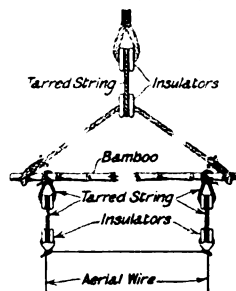


FIG. 1.

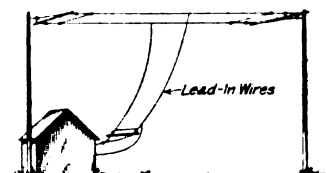


FIG. 2.

element should be fixed in cups with Wood's metal, a low melting solder. The elements recommended are copper pyrites and zincite. Fused silicon in the lower cups and a point of brass in place of top cup is also good. No battery is necessary with either of these sets. Bornite may be substituted for copper pyrites.

(4) **Telephones** are used for detecting the minute currents rectified by the crystals, and should be specially wound for the purpose. Each circuit should be wound with copper wire to a resistance of at least 1,000 ohms. I should advise you to pur-

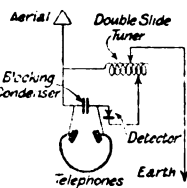


FIG. 3.

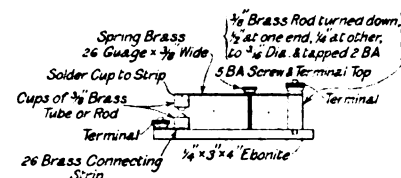


FIG. 4.

chase a first-class set. The better results amply repay the expense.

(5) No, certainly not; in fact, it is a distinct advantage to be as high as possible.

Signals have been obtained with such apparatus as described from distances over 700 miles, and wave lengths up to 4,500 metres.

**Further Points.**—A good earth connection is very important. Connect to water main, also to metal plates, let in moist ground vertically providing good surface. In spite of what has been said to the contrary by others, see that aerial is very well insulated, remembering that surface distance is required. High-frequency discharges travel on the surface and not through conducting objects, therefore insulators must have ample surface. Solder all joints and have as few as possible. Any guys to pole should have an insulator between pole and earth or fixing.

The second award (5s.) is made to P. R. Coursey, who writes as follows:—

Receiving apparatus for an experimental wireless station may take a variety of forms, depending partly on the particular type or system chosen, but more generally on the capacity of the owner's purse, and his opportunities for constructing or obtaining the various parts.

(1) A full description of everything necessary for receiving purposes cannot be given in the space available, but a general scheme may be laid out, using the following pieces of apparatus:—(a) An aerial tuning coil ( $L_1$ , see Fig. 5); (b) a variable coupling jigger,  $J$ ; (c) a variable tuning condenser,  $C_1$ , in the aerial circuit; (d) a variable tuning condenser,  $C_2$ , in the detector circuit; (e) a detector  $D$  and headpiece telephones  $T$ .

The diagram shows the method of connecting them up,  $A$  representing the aerial and  $E$  the earth lead. This earth connection may be made to a water main (care being taken to secure a good connection to a main supply pipe, and not merely to a tap or pipe leading from a cistern), or to an earth plate of considerable area, buried in damp soil in much the same way as for a



lightning conductor.  $Sw_1$  is the main aerial switch, and serves to throw over the aerial to the receiving apparatus or directly to earth when not in use, to prevent damage by lightning discharges. Good insulation must be secured in this, and also in the other switches used ( $Sw_2$ ,  $Sw_3$ ,  $Sw_4$ ), by mounting them on well insulating bases, such as ebonite, and keeping the contacts sufficiently far apart. In connection with details of construction, several of the well-known text-books on wireless telegraphy might be consulted with advantage, while some useful hints for amateur apparatus may be obtained from a book by "Alfred," entitled "Hints for Wireless Designs for Amateurs"; but the following details may be found suitable for the case in hand. For the tuning coil  $L_1$ , 300 turns of No. 28 S.W.G., bare copper wire, are wound 10 turns per centimetre on an ebonite rod 2.5 cms. diameter, with a slider to vary the number of turns in circuit. For the jigger primary  $L_2$ , 80 turns No. 30 S.W.G., s.s.c., copper wire are wound as a single-layer flat coil, starting at an inside diameter of 2 cms., and ending at an outside diameter of 10 cms., with wires brought out at 10, 25, 50, and 80 turns from the outside to the switch  $Sw_2$ , and arranged so that the 10 turns are in circuit when the switch is on contact (1); 25 on contact (2), &c. The secondary  $L_3$  may be wound in the same way, with the line to contact (1) of switch  $Sw_4$  brought out at 30 turns from the outside. Variable condensers  $C_1$  and  $C_2$  may be made of semicircular sheets of zinc mounted

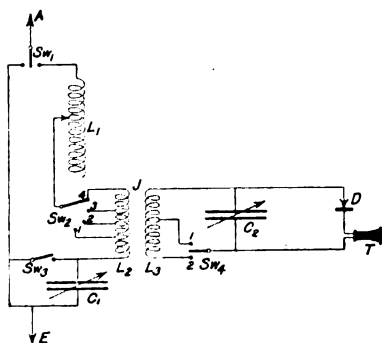


FIG. 5.

so that alternate sheets may be rotated more or less in between the fixed sheets, as in the manner usually employed in variable air condensers. It would be more satisfactory to purchase these than to attempt to construct them. The maximum capacity required in each is about 0.001 mfd. The telephone  $T$  should be a double headpiece telephone receiver wound to a resistance of at least 2,000 ohms.  $D$  may be any ordinary contact or crystal detector, such as a plumbago point lightly resting on a galena crystal.

(2) It would not be much use attempting to receive messages from stations up to 500 miles away without an aerial at least 60 ft. high. The wires should not run at a sharp angle to the ground, but be kept as far as possible vertical, although a more or less horizontal portion at the top, having a length about equal to the vertical portion, giving an aerial of the inverted L type, would be an improvement.

(3) Coherers can be made by amateurs possessed of considerable skill in glass blowing, but would not be of any use (whether amateur-made or otherwise) for a 500-mile range. Only a crystal detector, such as mentioned above, would be of much use, unless a Fleming oscillation valve is invested in.

(4) A phone receiver is of little use with a coherer, not because it is too insensitive (far from it), but because it does not provide for any decohering arrangement. The telephone should be used as above with a crystal detector. It will not be a disadvantage to erect the aerial on the top of a hill, provided that a good earth connection can be obtained.

## CATALOGUES, PAMPHLETS, &c., RECEIVED

**CONTROLLERS.**—A sheet from George Ellison (Victoria Works, Warstone Lane, Birmingham) illustrates some new drum type controllers for cranes, hoists, &c. We note that all wearing parts are liberally designed, while ample space is allowed for connecting up. Other features which may be mentioned are the accessibility for inspection and the ease with which the controllers may be dismantled for cleaning and repairs. Other illustrations show compact and rigid resistance units.

**PIPE WORK.**—A booklet, forming a comprehensive catalogue of flanged pipes and accessories, is to hand from Aiton and Co. (Derby). A quantity of most useful engineering information is given, by means of which engineers can decide the sizes of pipes which will be required for any duty, and can work out their cost, including the necessary accessories. There are full tables of dimensions and prices of pipes, and of the flow of steam and water in them, and a standard specification is given.

## TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

Mr. John Gott, the Commercial Cable Co.'s Engineer, has devised a system of signalling on submarine cables, which has for its object the avoidance of re-transmission and the elimination of the syphon recorder. Instead of the impulses for the dots and dashes of the Morse code being a series of "positive" currents divided by short periods of earthing, the impulses sent are alternately positive and negative. The wiping out of the charge in the cable is thereby facilitated. To reverse the direction of current at each successive depression of the key, an electrical and not a mechanical device is employed. The ordinary discharge current on releasing the key passes through a relay, the tongue of which connects the charging contact of the key to one or other side of the battery. At the far end of the cable or line, a moving coil relay is employed, the right-hand and left-hand contacts of which are connected together so that the impulses are once more made unidirectional. This represents the general principle of the arrangement in its simplest possible form, but of course in practice there are other auxiliary devices, and the connections are more complicated. In using the system it is expected that it will be possible to connect the cables and land lines straight through and thus to avoid re-transmission, and of course there will be the great advantage, whether the messages are relayed or not at the cable ends, that they will be received in true Morse. We understand from Mr. Gott that the method has already been tried with success on a long cable, but that its permanent employment by the Commercial Cable Co. is likely to be delayed for a few months.

The equipment of the new wireless station at Fort Myer, Arlington, Vancouver, is described in a recent issue of the *Electrical World* (New York). In addition to the information given in *ELECTRICAL ENGINEERING*, Vol. VIII., Dec. 19th, 1912, p. 711, we may say that three-phase 25-cycle current at 6,600 volts is purchased from a local company and stepped down to 220 volts for driving a 200-h.p. synchronous motor at 500 r.p.m. This motor drives a 220-volt 500-cycle alternator at 1,250 r.p.m. The pressure is stepped up to 25,000 volts. The revolving spark-gap consists of a 4-ft. wheel with fifty terminals (one per pole in generator), and gives 1,000 discharges per second. The pole spokes are  $\frac{1}{4}$ -in. copper, 8 ins. long. The minimum spark-gap is  $\frac{1}{4}$  in., but the air breaks down 3 in. ahead and behind the small-gap discharge. For safety, 12-in. wooden beams surround the wheel. The condensers, each of 0.036 mfd. capacity, are used in parallel. They are made up of steel plates set in steel cylinders and air-insulated at 300 lb. per sq. in. The signalling contacts are manipulated through relays, shunted on the low-pressure side by a resistance of about 220 ohms. The earth wires terminate in 60,000 ft. of bare copper wire laid in trenches between the towers. The sending wires connecting with the aeriels are led out through a heavily insulated window-pane, 1 in. thick, to the distributing pole, where the wires from the generator, controlled by the sending key, terminate, also the line to the detector, and a third wire which is well earthed. The transmitting and detector wires are extra-insulated from their wire supports by composition strain insulators, and from the posts by large double-petticoat porcelain insulators. The terminals of these three wires form the contacts of a three-point switch, controlled from the operating room by a system of chains and pulleys. A double-throw, single-pole switch is placed in the detector side of the line. With this switch arrangement it is evident that the operator can at will close the circuit for receiving messages, change over for sending, or earth the entire system, as in time of storms. The connections between aeriels are made by "cages" containing twenty-three phosphor-bronze wires soldered to the bridles of the spreaders. The wires between the 600-ft. main tower and two 450-ft. towers are about 400 ft. in length, and those between the two smaller towers 300 ft. Forty feet is allowed in each span for sag. From needle-point tests, which showed a spark-length of 11 in., it has been estimated that a potential of 150,000 volts is obtained at the top of the antenna.

In answer to the Postmaster-General's second refusal to free Marconi's Wireless Telegraph Co. from the terms of the contract for an Imperial wireless telegraph scheme, the Company has now informed the Postmaster-General that unless the contract is confirmed by March 1st, they will no

# ADAMS IGRANIC

ELECTRICAL CONTROL GEAR FOR LIFTS, HOISTS AND CRANES.

ADAMS  
M<sup>C</sup>C<sup>9</sup>L<sup>7</sup>  
BEDFORD  
AND  
LONDON

longer consider themselves bound by it. The Postmaster-General, however, has since intimated that he will enforce his rights in the matter.

The Mersey Docks and Harbour Board have decided to enter into arrangements with the Board of Trade, and the Post Office, for the establishment of several wireless telegraph stations on their lightships, and also one at the Dock Office.

European telegrams for Mexico in commercial codes were again accepted on the 18th inst.—On the following day the El Arich route was repaired, but failed again beyond Adana, and the Indo-European Telegraph Co. notified the failure of their cable between Odessa and Constantinople. The Saint Jacques-Doson cable was restored.—On the 20th inst., the Teheran-Meshed line was restored, and the delay and censorship of Mexican telegrams ceased.—The African Direct Cable Co. announced on the 21st inst. that work on their cable between Bonny and Duala was suspended, and on the 22nd inst. the El Arich route was restored.—The Teheran-Meshed line was not working again on the 23rd, but was repaired on the 24th inst.—The c.s. *Mackay Bennett* was in Halifax, N.S., on January 8th, and left for repairs on the 17th of that month.—The c.s. *Minia* returned from repairs on the 23rd ult. The c.s. *Relay* sailed from Halifax, N.S., on January 24th to repair the French cable off St. Pierre.—We learn that the German Cable Works are making a considerable quantity of cable for the Central and South American Cable Co., and that London boats have been chartered to take out cable.

## ELECTRIC TRACTION NOTES

In pursuance of powers conferred upon it by Parliament, the London County Council has decided to proceed with the equipment of a number of trailer cars for service, in the first place, in the Woolwich district. Horse car bodies, suitably converted, are being employed for the first batch, equipped with certain standard fittings, such as route indicators and wired for electric lighting, and these are being mounted upon light strong underframes of standard rolled steel sections, extended to support the platforms. The underframe is carried by laminated springs upon standard electric car axles in ball bearings which move in horn guides secured directly to the underframe. The automatic brake gear is of a novel character, and has been designed with the primary object of securing the safety of the trailer in the event of the coupling breaking while travelling on an up-grade. It comprises a set of inside hung brake blocks normally forced on to the wheels by a pair of compression springs carried directly between the two brake beams. The draw-bar is extensible, and slides through a frame mounted underneath the platform. To the end of the draw-bar is secured a chain anchored to a cast-iron drum keyed to a rotatable shaft upon which is also mounted a smaller chain drum, this latter drum carrying a double purchase chain connected to a sway bar in the centre of the car, which, when rotated through a small arc of a circle, serves to draw the two brake beams together by means of an equalising chain and release the brake blocks from the wheels. Thus, when the tractor car exerts a pull upon the draw-bar of the trailer, the shaft carrying the chain drums is rotated, and actuates the brake block releasing sway-bar to free the blocks from the wheels. The gear is duplicated at the two ends of the car. In order to enable the car to be backed, a brake release is provided, comprising a socketted quadrant, into which a lever may be fitted through a slot in the platform. The insertion of the lever into the socket and its movement in a direction towards the car body serves to rotate the chain drum shaft and release the blocks. In order to avoid the possibility of the trailer starting with the brake released, the shape of the slot has been so arranged that the lever can only be withdrawn when the releasing quadrant is in the "off" position, and the lever is placed so as to obstruct the entrance to the car. The whole of the brake gear is carried upon a light sub-truck independently of the underframe. Each draw-bar is provided with a single

draught and buffing spring, and the car is, in addition, provided with spring fenders at the ends, which come into action before the buffer springs are finally compressed. The auxiliary connections between the tractor and trailer comprise a leather bell cord, a jumper cable for the lighting circuit, and a pair of telescopic gates protecting the gap between the two cars. The whole of the connections are arranged so as to be quickly disconnected. The whole of the work of design and construction of the trailer cars now practically ready for service has been carried out in the Tramways Department, to whom we are indebted for the above information.

The Highways Committee of the L.C.C. recommend that the proposed tramway subway, which was intended to be built in connection with the new St. Paul's Bridge, should be abandoned. The reason for this is the danger to the foundations of St. Paul's Cathedral, which is apprehended would follow the construction of such a subway.

The proposed scheme for the construction of an extensive system of underground tube electric railways connecting various parts of London for the transport of mails by the Post Office, is now taking more definite shape, and the Postmaster General has given notice of application for the necessary Parliamentary powers. The scheme includes the construction of a line from the Mount Pleasant general sorting office to Paddington Station, one to the Eastern District Post Office, Stepney, and a line from St. Martin's-le-Grand to Mount Pleasant. The railways will be worked electrically, but apparently energy will be obtained mainly from outside sources, as power is to be applied for to enter into agreements for bulk supply for the purpose. Although the routes, levels, &c., are decided upon, particulars are not yet available as to the diameter of the tunnel, the nature of the rolling stock to be employed, nor the system of control to be adopted, and it is believed that various alternative arrangements are under consideration.

Some years ago a concession was granted for the construction of an electric mountain railway from Brigue to Riederalp and on to the Märjensee. According to the *Gazette de Lausanne*, the necessary capital has not been found, and an alternative scheme is being considered for a line starting from Fiesch, in which the Jungfrau Railway Co. is interested.

At a special general meeting of the Central London Railway Co. last week, the scheme of the Company's Bill now before Parliament was discussed and approved. The proposal is in respect of a line from Shepherd's Bush to Gunnersbury, where it will link up with the London and South-Western Railway. The Parliamentary estimate is £759,072, and it is proposed to raise £750,000 new capital with the usual one-third borrowing powers. The Central London Railway will, if this extension of 2½ miles is completed, be a direct link between the Great Eastern in the east, and the Great Western and South-Western in the west.

The question of the electrification of the North London Railway was raised at the annual meeting last week, but any action of this kind is dependent upon the general scheme now under consideration by the London and North-Western Railway Company.

Under the Metropolitan Electric Tramways (Railless Traction) Bill, which authorises the Metropolitan Electric Tramways, Ltd., to link up their tramways with the Walthamstow tramways by means of trolley omnibuses, general powers are given to the Board of Trade to sanction other new routes without the necessity for an application to Parliament. This provision, which has been inserted previously in Municipal Bills granting trolley omnibus powers, is being taken exception to by a number of Local Authorities, who fear that unless it is amended in some way, the Tramways Co. may at some later date secure powers for running in their districts.

**Osram Lamp Patents.**—On Friday, February 7th, in the High Court of Justice, Chancery Division, Mr. Justice Swinfen Eady granted an interim injunction to the Osram Lamp Works, Ltd., restraining the Oro Light & General Supply Co., Ltd. ("Oro" Lamps), their servants, agents, and workmen, from selling lamps infringing Osram Patents Nos. 23,899 of 1904 and 18,622 of 1906. The lamps in question were made by the Wolfram Co., Augsburg, Bavaria.

# "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

## Specifications Published Feb. 20, 1913

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

2,437/12. **Signalling on and Stopping Trains.** A. MINNICK. The construction and arrangement of apparatus for the system in which the track is provided with conductors and the train with electrical apparatus which becomes operative when one train is in proximity to another. A time switch on the train is normally closed, and after the circuit has been automatically opened, closes it after a given time. Twenty-one figures.

2,522/12. **Water Heater.** M. H. SCHOENBERG. In the heating chamber, which has metal inlet and outlet, are the heating coils. A short-circuiting plate is fixed to the casing and connects the metal parts, thereby avoiding possibility of shock. A lock plate interrupts the circuit when the water supply is cut off. The elements are replaceable by unskilled labour. Five figures.

4,458/12. **Reversing Gear.** B. BRUKWICKI. The mechanically connected armatures of two synchronous machines have a common short-circuited winding in which is induced, by two entirely separate magnetic fields, constantly rotating synchronously by means of a commutator, E.M.F.'s, the resultant action being to rotate backwards or forwards a magnet core on the driven shaft generating one of these magnetic fields. Close regulation is obtained by varying the excitation of one core. Two figures.

29,636/12. **Series Petrol-Electric System.** H. PIEPER. A separately excited motor drives each axle. All are in series. The pressure across each is kept uniform. For two motors a low-resistance auto-transformer is connected to the dynamo armature by slip rings. Its mid-point is connected to the common motor terminal, or two commutators may be used.

## Specifications Published To-day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, E.C., at the price of 8d. each, post free.

Names in italics indicate communications of inventions from abroad. Summaries of some of the more important of these patents will appear in our next issue.

**Arc Lamps:** CROMPTON'S and CROMPTON, 3,397/12; B.T.-H. (*G.E. Co., U.S.A.*) [Electrodes] 13,988/12.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** TAYLOR [Charging and discharging storage cells] 2,630/12; CLARKSON and MORISON [Automobile lighting] 4,716/12; YATES [Connecting conduits, &c.] 6,146/12.

**Dynamos and Motors:** PETERSEN [Electrostatic alternators] 2,442/12; BROWN, BOVERI [Self-excited D.C.] 2,734/12.

**Electrometallurgy and Electrochemistry:** SANITAS-OZONE [Generating and diffusing ozone] 2,779/12; ELEK. INDUSTRIE [Tube welding] 3,634/12; TISCHENKO [Manufacture of sheet iron by electrolysis] 8,668/12; PAULING [Reaction furnaces] 21,478/12.

**Heating and Cooking:** DIXON [Cigar lighters] 8,677/12; SCHAEFFER [Hot-air douches] 20,191/12.

**Ignition:** RIESZ [Spark plugs] 8,206/12; CHEVANCE [Distributors] 14,624/12.

**Incandescent Lamps:** B.T.-H. (*G.E. Co., U.S.A.*) 2,468/12; BEUTTELL and MANNERS-SMITH, 3,099/12; STILLMAN, 4,783/12; DU MOULIN [Repair] 12,784/12; FARKAS [Wire drawing] 14,654/12.

**Instruments and Meters:** WORLIZKA and SLUZAR [Instrument alarm] 2,517/12; FERRANTI [Meters] 3,412/12.

**Switchgear, Fuses, and Fittings:** DORMAN, SMITH and BAGGS [Fuse] 10,409/12; RAILING and GARRARD [Combined switches and plugs] 14,785/12; MILNE [Switches] 16,065/12; PERRY [Lighting brackets and pendants] 16,119/12.

**Telephony and Telegraphy:** SIEMENS BROS. & Co. (*Siemens & Halske*) [Automatic and semi-automatic telephony] 2,671/12, 2,672/12, and 2,743/12; [Semi-automatic exchange key panel] 13,415/12; LENCH [Insulator bracket for poles] 10,600/12.

**Traction:** WOOD [Trolley head] 3,146/12; SIEMENS BROS. DYNAMO WORKS and LYDALL [Safety apparatus for electric trains] 6,922/12; PIEPER [Electro-mechanical transmission] 7,153/12, 13,235/12; ROTTENBERG and NEW TRANSPORT CO. [Preventing collisions on self-propelled systems] 11,196/12.

**Miscellaneous:** SUNDBERG [Purifying copper] 4,692/12; SIEMENS BROS. DYNAMO WORKS (*Siemens-Schuckert*) [Punching discs, &c.] 11,319/12; SIEMENS & HALSKE [Electro-medical electrodes] 13,416/12; RUBEL [Manufacture of dynamo iron] 15,532/12; DAVIDSON [Portable centrifugal fans] 22,049/12.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Distribution Systems, &c.:** OKUN [Lighting] 2,125/13.

**Dynamos and Motors:** BROWN, BOVERI [A.C.] 7,258/12.

**Electrometallurgy and Electrochemistry:** ELLIS [Production of aluminium nitrates] 25,650/12; GITLINI [Ditto] 25,874/12; JUNGNER [Obtaining alkali from mica, &c.] 26,497/12.

**Ignition:** SIEMENS & HALSKE [Spark plugs] 1,064/13.

**Switchgear, Fuses and Fittings:** BERGMANN A.-G. [Electromagnetic heavy current switches with automatic release] 2,778/13.

**Telephony:** BRUCE [Switches for automatic] 1,157/13; KATZ [Selecting] 2,302/13.

**Traction:** SIEMENS-SCHUCKERT [Screw propeller motor control] 2,136/13.

**Miscellaneous:** MUNDEN and MUIR [Announcers] 14,225/12; SCHNYDER [Electromagnetic typewriters] 2,170/13; GALLOWAY [Batteries] 2,402/13.

## Amendments allowed

21,515/06. **Drawn Tungsten Wire Filaments.** B.T.-H. (*G.E. Co., U.S.A.*). The amendments asked for in this specification by the B.T.-H. Co. have been allowed with certain modifications. The proposed amendments to claims 1 and 2, whereby it was sought to substitute the words "hammered, rolled, or drawn" for the words "operated on or manipulated," have not, however, been allowed. Full particulars of the hearing before the Comptroller-General of Patents were given in *ELECTRICAL ENGINEERING*, Vol. VIII., December 19th, 1912, p. 703, as well as the preliminary announcement of the proposed amendments on September 12th, 1912, p. 510.

The following Amended Specification may now be obtained.

**Distributing Systems, &c.:** HENLEY'S and W. F. BISHOP [Cable earthing and bonding] 17,347/11.

## Opposition to Grant of Patents

21,734/11. **Signalling and Advertising.** C. E. WILLS. Opposition has been entered to the grant on this application. Number plate and similar indicators are controlled from a keyboard, the keys of which are connected so that each key controls the illumination of different groups of lamps.

22,406/11. **Elevated Luggage Transporter.** S. ARNOLD. The grant of this patent has been allowed in spite of opposition. The lay-out is arranged for transporting goods and luggage between trains in stations and goods warehouses, &c.

## Expiring and Expired Patents

The following Patents expire during the current week, after a life of fourteen years:—

4,276 of February 27th, 1899. **Automatic Dynamo Pressure Regulators.** N. BROWNE (*Tirrill Automatic Potential Regulator Co., U.S.A.*). Details of the now well-known Tirrill regulator. Reference is made to a prior specification, No. 1,535/89, in which the entire regulating resistance is cut in and out. The present invention is to overcome the tendency of the contact points to stick, and the possibility of accident to the solenoid wires permanently cutting out the regulating resistance. There are seven claims.

4,327 of February 27th, 1899 (Convention date, August 20th, 1898). **Electro-pneumatic Traction Motor Controllers.** G. WESTINGHOUSE. This specification covers the Westinghouse pneumatic system, in which the various valves are controlled electromagnetically. There are 13 claims and 20 figures.

4,801 of March 4th, 1899. **Motor Starter.** J. H. HOLMES and F. BROADBENT. Two movable arms pass over the resistance studs, which are arranged in the usual way. To start the motor, the two arms, being in engagement in the off position, are moved over the studs against the force of a weight or spring, the second arm thereby putting in the resistance. Near the end of the travel the first arm completes the circuit through all the resistance. It is held in this position by overload and no-voltage gear as usual. The second arm then travels slowly back over the resistance studs till the resistance is all out. Its rate of travel is controlled by a dash-pot or other means in conjunction with the spring or weight.

The following are the more important Patents that have become void through non-payment of renewal fees.

**Dynamos, Motors, and Transformers:** A. B. HOBSON [Transmission of armature power: Fans] 24,128/02; L. J. HUNT and SANDYCROFT'S [Short-circuited rotor connections] 23,834/04.

**Electrometallurgy:** A. HJORTH [Induction furnaces] 28,961/06.

**Incandescent Lamps:** B. T.-H. (*G. E. Co., U.S.A.*) [Tungsten or tantalum and a little silicon with the necessary binders are used for high resistance filaments for lamps and heaters] 24,707/07.

**Meters:** M. KALLMANN [Calibrating using resistances with temperature coefficient varying with current] 22,544/05.

**Switchgear, Fuses and Fittings:** B. T.-H. and H. N. SPORNBERG [Contact switchgear for A.C. motor control] 25,203/06; J. H. COLLINGS [Time switch] 24,367/07.

**Telephony and Telegraphy:** F. L. MUIRHEAD [Portable poles] 24,966/06.

**Miscellaneous:** W. E. LAKE (*Electrelle Co., U.S.A.*) [Automatic piano players] 24,501/07.

## LOCAL NOTES

**Aberdeen: Libel Action against Contractors.**—The action by Mr. J. A. Bell, the City Electrical Engineer, against the Honorary Secretary of the Aberdeen Branch of the Electrical Contractors' Association of Scotland, in which £1,000 damages are claimed for alleged libel, was heard in Aberdeen on Wednesday last week, and judgment was reserved. We gave the facts on page 95 of our issue of February 13th.

**Bath: Street Lighting.**—Additions are being made to the street electric lighting. (See "Tenders Invited.")

**Bingley: Electric Supply.**—An agreement for bulk supply for ten years from the Keighley Corporation Electricity Supply Works has been entered into.

**Gromer: Electricity Undertaking.**—The Council have decided to proceed with the transfer of their electricity undertaking to Messrs. Edmundsons' Electricity Corporation.

**Edinburgh: Contractors' Dinner.**—Mr. W. Finlay, who has done so much for the Electrical Contractors' Association in Scotland, was entertained to dinner by the Edinburgh branch last week.

**India: Calcutta Section of I.E.E.**—The newly formed Calcutta Section of the Institution of Electrical Engineers, recently held an inaugural dinner, at which Mr. M. G. Simpson (Electrical Engineer-in-Chief, Indian Government Telegraphs), presided.

**Leicester: Street Lighting.**—Improved street lighting is a matter of some controversy just now, and it is not improbable that the Electricity Department will soon have an opportunity of demonstrating what can be done in the way of modern street electric lighting.

**Liverpool: Electric Supply Accounts.**—The gross profit on the electricity undertaking for 1912 was £169,292, which sum is carried to net revenue account, together with £3,070 interest. After meeting capital charges, and adding £20,000 to renewal fund, the sum of £30,071 is transferred to relief of rates.

**Loughborough: The Electricity Extensions.**—Some months ago an arrangement was made with the Brush Electrical Engineering Co. by which the Corporation were to give a supply in bulk, the Company supplying the necessary plant. In consequence of the delay which has taken place in the negotiations with the Company, the Corporation now finds itself under the necessity of extending the undertaking irrespective of the supply to the Brush Company. The size of the Brush Company's demand was such as to render it more economical to instal alternating current plant, but under the circumstances Mr. J. F. C. Snell, who is advising the Corporation, reports that it is possible to make additions to the present continuous current system in order to cope with the normal increase in the demand. The Corporation have therefore adopted a recommendation by the Electricity Committee that the negotiations with the Brush Co. for bulk supply be postponed, and that Mr. Snell be instructed to prepare a scheme for meeting the general demands on the electricity undertaking next winter.

**Newcastle-on-Tyne: Electrical Showrooms.**—The two Newcastle Supply Companies have jointly established an "electric shop" in Northumberland Street for the purpose of advertising the uses of electricity for all purposes.

**Rhyl: Fixed Price Light.**—The Engineer has been in communication with the Fixed Price Light Co., who, however, state that they are unable to see their way to undertake any work outside the London district.

**Sheffield: Power Exhibition.**—A fuel, light and power Exhibition is to be held in Sheffield in October and November. The Advisory Committee includes Mr. S. E. Fedden, the Manager of the Corporation's electricity undertaking.

**Tasmania: Electric Lighting in Hobart.**—The electric supply installation which has been erected by the Hydro-Electric Co., has been put into operation. The public lighting contract provides for 792 incandescent lamps of 50 c.p. and 75 c.p. and forty 600 c.p. arc lamps. The British Insulated & Helsby Cables, Ltd., have the contract for the poles and cables. The Chief Engineer to the Hydro-Electric Co. is Mr. J. H. Butters, and our readers will recognise in Mr. Ashton Bremner, the assistant engineer, a one-time well-known figure in electric supply circles in this country.

**Wood Green: Electricity Supply.**—There seems every prospect of a strong Parliamentary fight over the installation of electricity supply in Wood Green. The North Metropolitan Electric Power Co. is applying for an electric lighting provisional order for the district, but the Wood Green Council,

who already possess an order, are proposing to transfer it to the Tottenham and Edmonton Gas Co. In addition to these opposing interests, the Tottenham District Council are opposing the Gas Company's Bill which deals with the transfer of the Wood Green Council's order.

**Wrexham: Rateable Value Tariff.**—The Council have approved a revised tariff for private premises on the basis of a fixed charge of 15 per cent. on the net assessment of the house, and  $\frac{1}{4}$ d. per unit for all current used. Householders will be allowed to use current for lighting, heating, and cooking purposes under this tariff.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

[Notes of Contracts Open are not repeated under this heading week by week until the last date for receiving tenders, but are only inserted once.]

## Generating Stations, Sub-Stations, Mains, &amp;c.

**Australia.**—Mr. O. L. Remington (Manager W. McLean and Co., Melbourne) is now in London, at the Hotel Cecil, and desires to get in touch with those who are interested in lines of electrical apparatus or machinery which they are desirous of putting on the Australian market.

The Postmaster-General's Department at Melbourne require Diesel engines and alternators for the high-power radio-telegraph station at Darwin. Tenders by May 14th. Further particulars at 72 Victoria Street, S.W., or 73 Basinghall Street, E.C.

**Bedford.**—In connection with the extension to the street electric lighting, some 3,500 yds. of various sizes of cable will be required.

**Bingley.**—In consequence of the agreement for bulk supply referred to in our "Local Notes" column, a loan of £5,500 for cables, sub-station and machinery, &c., is to be applied for.

**Brighton.**—One 800-ampere-hour storage battery for Southwick power station. March 10th. (See an advertisement on another page.)

**Finchley.**—A loan of £15,000 is to be taken up for extensions to the electricity undertaking.

**Galashiels.**—Further progress is being made with the proposal to erect an electricity generating station, and consultations are being held with certain experts with a view to getting further information. It appears that the chief demands will be for mill-driving purposes, and the probable cost has been put at £30,000.

**Grimsby.**—Loans of £6,000 for mains, and £2,000 for services are to be applied for.

**India.**—The installation of electric supply in Lucknow is being strongly advocated.

**Leek.**—A loan of £2,000 is to be taken up for mains extensions.

**London: L.C.C.**—A further extension of time is announced for the receipt of tenders for two 8,000 kw. turbo-generators. (See an advertisement on another page.)

The following sub-station plant will shortly be required: three rotary-converters at estimated cost of £7,800; transformers and accessories, £4,000; switchgear and cable, £2,200.

**London: Battersea.**—One water-tube boiler, mechanical stoker, &c.; one electric motor-driven centrifugal pump. March 19th. (See an advertisement on another page.)

**Marylebone.**—A loan of £42,000 is to be taken up for extensions at the electricity works.

**Woolwich.**—The London County Council has sanctioned the following loans: mains, £1,500; meters, £630; services, £1,100; hire purchase apparatus, £2,000.

**Loughborough.**—Extensions involving an expenditure of £10,000 are contemplated. (See under "Local Notes.")

**Port Elizabeth.**—Mr. H. J. Holder, the Borough Electrical Engineer, will, says the *British and South African Export Gazette*, arrive in England during March. His Town Council is a prospective purchaser of electrical generating machinery,

FOR  
STEAM JOINTS  
USE



JOHN HUDSON & CO.'S SUCCESSORS, Mansell St., London, E.

and communications may be addressed to Mr. Holder, c.o. Messrs. Davis and Soper, 54 St. Mary Axe, E.C.

**Shaldon (Devon).**—The Teignmouth Council propose to extend electric lighting to this district.

### Wiring

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Aberavon.**—New municipal buildings.

**Aberdeen.**—Additions to the Donside Paper Mills.

**Bradford.**—School, Leeds Road. Architects, W. J. Morley and Sons, 269 Swan Arcade.

**Croydon.**—Thirteen houses, Raymead Avenue; C. Banks, Oakfield Road.—Eight houses, Woodside Road; F. R. Lawson.

**Devonport.**—New municipal buildings.

**Edinburgh.**—New public wash-houses at Fountainbridge.

**London: L.C.C.**—About 210 lighting points at Hawley Crescent Elementary School, St. Pancras, N.W. March 12th. Chief Engineer.

**Lewisham.**—The electric lighting of the infirmary has now been definitely passed.

**Manchester.**—Additional wards at Swinton. Poor Law Offices, New Bridge Street.

**Smethwick.**—New school. Secretary of Education, Council House.

**Southend-on-Sea.**—New elementary school.

### Miscellaneous

**Bath.**—In a number of streets gas standards are to be fitted with metal filament lamps.

**Cheshire.**—A twelve months' supply of electrical goods is required for the County Asylum. March 11th. Parkside Committee.

**Edinburgh.**—A twelve months' supply of arc lamp globes and conduits. City Electrical Engineer. March 10th.

**Leith.**—An expenditure of £1,797 upon new electrical pumping machinery is to be incurred.

**Ramsgate.**—The Council have decided to instal a system of electrical fire alarms in the Borough.

**Shanghai.**—According to a recent report by the United States Vice-Consul, the conditions in Shanghai are particularly favourable for the use of electrically-driven vehicles. It is pointed out, however, that any such vehicles should be strong and well made, in order to withstand the climate, which is very damp during most of the year, and hot in the summer.

**West Ham.**—A twelve months' supply of electrical fittings for Guardians. March 13th. Union Road, Leytonstone.

### TENDERS RECEIVED AND ACCEPTED

**Colwyn Bay.**—The following tenders have been accepted: Browett, Lindley-Dick, Kerr generating set, £973; switch-board extension, Bertram Thomas, £125.

**Glasgow.**—The tender of Messrs. Babcock and Wilcox has been accepted for four water-tube boilers for the Port Dundas station at £13,748, and Messrs. Howden and Co. had been given a contract for four boilers for the St. Andrew's Cross Works at £6,910 and another for the supply of turbo-alternators at £17,798.

### APPOINTMENTS AND PERSONAL NOTES

Mr. F. J. Walker, secretary and manager of the St. James' and Pall Mall Electric Light Co., has been appointed managing director.

Between 80 and 90 applications have been received for the post of Electrical Engineer to the Wolverhampton Corporation recently held by Mr. C. E. C. Shawfield.

Mr. W. Lawson, late Manager of the Gas Engine Sales Department of the British Westinghouse Electric and Manufacturing Co., Manager of the Gas Plant and Large Gas Engine Sales Department of Messrs. Crossley Bros., Ltd., Manchester, has recently been appointed Sales Manager of the Power-Gas Corporation, Ltd., Stockton-on-Tees.

A meter inspector is required at Watford Electricity Works. (See an advertisement on another page.)

An electrical engineer is required to take charge of small plant, Alhambra Palace, Morecambe. (See an advertisement on another page.)

Mr. H. C. Babb, of the Dartmouth Electric Light Works, is shortly removing to the Hamilton (N.B.) Electricity Works.

Electrical engineer with experience of automatic telephone exchanges, wanted in London. (See an advertisement on another page.)

Improver wanted in a lighting and tramway station. (See advertisement on another page.)

### MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. G. Smith and Son, of 5 Philpot Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night, was £68 to £68 10s. (Last week £68 to £69.)

**Films Illustrating Cable Manufacture.**—The Electrical Co., Ltd. (122-124 Charing Cross Road, W.C.), are prepared to lend to technical societies and institutions a fine set of cinematograph films, prepared by the A.E.G. showing the various processes in the manufacture of electric cables.

**Waygood Concert.**—The 22nd annual concert of the Athletic Association of R. Waygood and Co., Ltd., will be held on Monday next at the Horns Assembly Rooms, Kennington Park, S.E., at 8 p.m.

**G.E.C. Showrooms.**—The General Electric Co., Ltd., have made considerable extensions to their showrooms at 71 Queen Victoria St., E.C., which will be devoted to arc lamps and accessories, motors and other machinery, ventilating and engineering supplies, telephones, electric light supplies, switchgear, &c. A large proportion of the apparatus is wired up and can be seen working.

**Patent for Sale.**—The owner of a patent for dynamo electric machines desires to work same in this country. (See an advertisement on another page.)

**Dissolution of Partnership.**—J. L. Crathorne and F. J. Green, Electrical Engineers, Old Kent Road, S.E., have dissolved partnership. F. J. Green continues.

**Bankruptcy.**—A deficiency of £246 is shown in the bankruptcy of W. Longdon and V. G. Cobb, trading as Longdon and Cobb, electrical engineers, 101a Derby Road, Nottingham.

### COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &c.

**Companies Struck Off Register.**—The names of the following will be struck off the register of joint stock companies in three months unless cause is shown to the contrary: Carnarvonshire Electric Traction Syndicate, Ltd.; Empire Electric Light & Power Co.; and the Improved Electric Supplies, Ltd.

**Dividends of Electric Supply Co.'s.**—Charing Cross, West End & City Electricity Supply Co., 5 per cent. for 1912. The carrying forward in the case of both West End & City undertakings is £18,000, after a liberal allowance for reserve.—The London Electric Supply Corporation, 2½ per cent. £250,000 new capital is to be raised to meet the increasing demands of the London, Brighton & South Coast Railway Co.—Newcastle-on-Tyne Electric Supply Co., 5 per cent. on the ordinary shares.

**W. T. Henley's Telegraph Works Co.**—A 15 per cent. dividend is recommended on the ordinary shares for 1912, carrying forward £45,017.

**Yorkshire Electric Power Co.**—At the half-yearly meeting last week it was stated that the sales of current increased during the December half-year by 25 per cent., and under ordinary circumstances there would have been a satisfactory margin of profit, but owing to the coal strike and the fact that one of the large turbines was out of use during a period, there had been such an increase in the works costs as to absorb this extra profit.

**British Electric Transformer Co.**—A dividend of 10 per cent. is to be paid for 1912, carrying forward £4,116.

**Bruce Peebles & Co.**—There is a debit balance of £4,593 for 1913, a result which is largely attributed to labour strikes. The prospects for the current year are, however, better owing to the recent improvement in prices and in the demand for the company's manufactures.



# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 323 [Vol. IX., No. 10]  
*All rights reserved.*

THURSDAY, MARCH 6, 1913.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT and WANTED, ARTICLES FOR SALE and WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES and TECHNICAL COLLEGE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

*Other Advertisement Rates on Application.*

### Latest Times for Receiving

Letters for Insertion, *Tuesday first post*

Small Advertisements and Official Announcements, *Wednesday first post.*

Displayed Advertisements, *Tuesday first post.*

Corrections in Standing Advertisements, *Monday first post.*

All letters to be addressed to "Electrical Engineering," at the EDITORIAL and PUBLISHING OFFICES: 206-206, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Cireling, Fleet, London." Telephone No.: 5509 Holdern.

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## CONTENTS

	PAGE
SUMMARY	125
Arrangements for the Week	126
The Ohm, the Ampere, and the Volt	127
How to Read a Meter	128
Catalogues and Pamphlets Received	128
ELECTRICAL ENGINEERING IN THE MINING AND METALLURGICAL INDUSTRIES:	
Shaft Cables	129
Recent Progress in Electric Iron Smelting	131
Development of Electricity for Mining	131
Electric Cables in Mines	132
Electrical Mining and Metallurgical Patents of February	133
Questions and Answers	133
Flexible Wires for Radiators	134
"White-Way" Street Lighting	134
Electric Tailoring Irons	134
Electric Traction Notes	135
Telephony and Telegraphy (Including Wireless)	135
Patent Record	136
Local Notes	137
Tenders Invited and Prospective Business	137
Tenders Received and Accepted	138
Companies' Meetings, Dividends, Reports, &c.	138
Miscellaneous Business Notes	138

## SUMMARY

IN the fourth Kelvin lecture delivered before the Institution of Electrical Engineers last Thursday, Dr. R. T. Glazebrook traced the history of the evaluation of the units of electrical measurement, in which Lord Kelvin played a prominent part. (Page 127.)

AN interesting meter-reading case was heard in the King's Bench Division this week, in which for 3½ years the final figure on the dial of one of the Electrical Company's meters has been read as a decimal figure instead

of a unit. The supply company are claiming £1,880. (Page 128.)

IN a Paper read before the Association of Mining Electrical Engineers last month, Mr. E. K. Scott contended that unarmoured cables should be permitted in shafts, and advocated the use of aluminium cables. He described various methods of supporting shaft cables, and described a form of casing in which split telegraph poles were utilised. Mr. Scott's views did not meet with general acceptance. (Page 129.)

RECENT progress in electric iron smelting is reviewed in a short article. (Page 131.)

MR. R. NELSON dealt with the growth of electricity for mining operations in a recent paper before the North of England Branch of the Association of Mining Electrical Engineers. The adoption of electricity for all purposes was advocated on economic grounds. (Page 131.)

AMONG the patent specifications relating to mining and metallurgy published during February is one by Messrs. A. and H. Hunte for an electric miner's safety lamp and one by the Sterling Telephone Company covering some improvement to mine-exploders. Several deal with electric furnaces, and one by T. Tischenko for the electrolytic production of sheet iron. (Page 132.)

The design of continuous current brake magnets is dealt with in our Questions and Answers columns. (Page 133.)

A WELL-PROTECTED flexible wire for radiators and a new pattern of electric tailoring iron are described in short articles, and a type of street lamp-post unfamiliar in this country is also illustrated. (Page 134.)

SOME interesting particulars are given with regard to passenger transportation in the United States. On one line the number of passengers carried per annum is increasing as the square of the population. (Page 135.)

SEVERAL automatic and semi-automatic telephone exchanges will shortly be working in France.—Figures are given of the number of wireless telegraph stations in the world, and of the system upon which they work. (Page 135.)

THE Patent Office on Thursday last published, among others, a specification by the B.T.-H. Co. covering the use of certain halogen compounds which are introduced into the bulbs of drawn-wire lamps to prevent blackening. Brown, Boveri & Co. are protecting various designs for field magnets and armatures of D.C. machines to ensure stable working, and Crompton & Co. have a patent for an enclosed flame arc lamp. Further petrol-electric patents have been taken out by H. Pieper. An amendment to an incandescent lamp specification by A. C. Hyde has been allowed under Section 8. (Page 136.)

SOME remarkable figures of saving from the use of electric cooking, &c., are shown at Eton.—The gas engine plant at Accrington is undergoing a three months' trial.—Arrangements have been made for a duplicate supply to Olympia by the Hammersmith and Fulham Councils.—£5,000 are being transferred to relief of rates from electricity profits at Belfast. (Page 187.)

AN electric lighting scheme is being considered at Aylesbury.—Important extensions are to be carried out at Barking, Bispham, Fleetwood, Haslingden, Hastings, Huddersfield, Shipley, and York.—Diesel engines are required in Egypt; transformers and generators by an Indian railway company, and an electric lighting installation for West Africa.—Several municipal electricity departments require annual supplies of stores; additional tramway rolling stock is required at Birmingham, and a steam alternator at Bridgend. (Page 137.)

### ARRANGEMENTS FOR THE WEEK

(TO-DAY) THURSDAY, MARCH 6TH.

*Institution of Electrical Engineers.*

8 p.m. "Recent Developments in Street Lighting in Manchester," by S. L. Pearce and H. A. Ratcliff.

FRIDAY, MARCH 7TH.

*Northern Polytechnic.*

7.30 p.m. Conversazione at Institute, Holloway Road.

SATURDAY, MARCH 8TH.

*Birmingham Electric Club.*

7 p.m. At Swan Hotel, New Street. "Gas Engine Practice," by W. Fennell.

MONDAY, MARCH 10TH.

*Institution of Post Office Electrical Engineers.*

6 p.m. At Institution of Electrical Engineers. "Trunk Telephone Communication Transmission Schemes and the Design of Circuits," by A. B. Hart and W. J. Hilyer.

*Institution of Electrical Engineers: Western Section.*

4 p.m. At Institute of South Wales Engineers, Park Place, Cardiff. "High-tension Continuous-current Working," by S. F. Walker.

*Institution of Electrical Engineers: Newcastle Section.*

7.30 p.m. At Armstrong College. "Condensing Plant," by W. A. Dexter.

TUESDAY, MARCH 11TH.

*Institution of Electrical Engineers: Manchester Section.*

7.30 p.m. At University. "Power Supply on the Rand," by A. E. Hadley.

*Institution of Civil Engineers.*

8 p.m. At Institution of Mechanical Engineers. "Notes on City Passenger-Transportation in the United States," by G. D. Snyder.

WEDNESDAY, MARCH 12TH.

*Institution of Electrical Engineers: Yorkshire Section.*

7 p.m. At University, Leeds.

*Institution of Electrical Engineers: Birmingham Section.*

7.30 p.m. At University. "Recent Developments in Street Lighting in Manchester," by S. L. Pearce and H. A. Ratcliff.

*Faraday Society.*

4.30 p.m. At Chemical Society's Rooms, Burlington House, W. General discussion on Colloids and their Viscosity.

THURSDAY, MARCH 13TH.

*Institution of Electrical Engineers.*

8 p.m. "The Power Supply on the Rand," by A. E. Hadley.

*Institution of Electrical Engineers: Dublin Section.*

8 p.m. At Royal College of Science.

### The London Electrical Engineers.

(TO-DAY) THURSDAY, MARCH 6TH. C. Company.—Recruit Training, 7 to 10 p.m.—Company Training, 7 to 10 p.m.

FRIDAY, MARCH 7TH. D. Company.—Company Training, 7 to 10 p.m.

SATURDAY, MARCH 8TH. Headquarters open from 10 a.m. till 12 noon.

MONDAY, MARCH 10TH. A. Company.—Recruit Training, 7 to 10 p.m.; Company Training, 7 to 10 p.m.

TUESDAY, MARCH 11TH. B. Company.—Company Training, 7 to 10 p.m.

THURSDAY, MARCH 13TH. C. Company.—Recruit Training, 7 to 10 p.m.; Company Training, 7 to 10 p.m.

FRIDAY, MARCH 14TH. D. Company.—Company Training, 7 to 10 p.m.

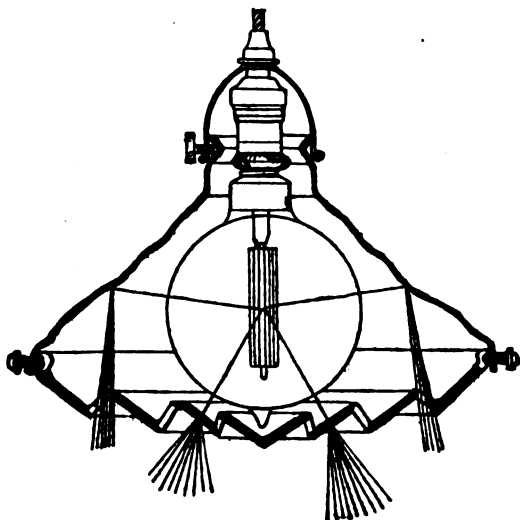
SATURDAY, MARCH 15TH. Headquarters opened for Regimental business from 10 a.m. till 12 noon.

**Street Lighting at Southgate.**—We are informed by the General Electric Co., Ltd. (67 Queen Victoria Street, E.C.), that the lamps in the Southgate street lighting scheme described on page 113 of last week's ELECTRICAL ENGINEERING are all Osram drawn wire lamps. The 100-watt size is used at important road junctions, and the general lighting is carried out by 60-watt lamps. About 210 lamps are used in all.

**Belfast Wiremen.**—We mentioned a few weeks back that the electrical wiremen in the building trades in Belfast had struck for an increase of wages, the idea being to secure £2 per week, which is the wage paid in Belfast to electricians serving in other branches. Last week all the building contractors with one exception granted the increase asked for.



The Lord Mayor of Manchester, in a speech last week, said that he did not believe that the trading departments of a Corporation should allocate large profits in relief of rates. [Last year the Manchester Corporation Electricity Department was made to contribute £24,500 of its profits to relief of rates].



HAVE YOU SEEN

THE

**"INDRA"**

PATENT SYSTEM OF  
**LIGHTING**

SEND FOR FULL PARTICULARS TO

THE **ELECTRICAL ENGINEERING & EQUIPMENT CO., LTD.**

109-111 New Oxford Street,

Telephone: Gerrard 133.

Telegrams: "THERMOTYPE, WESTCENT, LONDON."

**LONDON, W.O.**

## THE OHM, THE AMPERE, AND THE VOLT

THE fourth "Kelvin" lecture was given by Dr. R. T. Glazebrook, F.R.S. (Director of the National Physical Laboratory), on Thursday last before a crowded meeting of the Institution of Electrical Engineers. The title of the lecture was "The Ohm, the Ampere, the Volt: A Memory of Fifty Years Before (1862-1912)," and the subject was the history of the evaluation of the fundamental electrical units in which Lord Kelvin played so prominent a part.

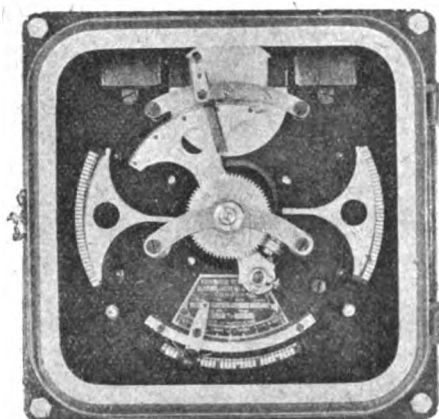
The lecturer commenced with a few personal reminiscences, describing his first meeting with Sir William Thomson in 1876 at Cambridge in connection with comparisons of E.M.F.'s by the quadrant electrometer, and referred to various subsequent occasions on which they were associated. The development of electrical units was bound up with the history of the British Association Committee on Electrical Standards, and the lecturer took the opportunity of presenting to the Institution a copy of a reprint of this committee's collected reports, which has just been published. He proceeded to sketch in masterly style the life-history of the ohm, the ampere, and the volt, illustrating his remarks by a fine collection of historical apparatus. The B.A. Committee was founded in 1861 at the Manchester meeting of the Association at the suggestion of Sir W. Thomson, and consisted originally of Thomson, Williamson, Wheatstone, W. H. Miller, Fleeming Jenkin, and Matthiessen, but other members were afterwards added. The committee first discussed the most suitable unit of resistance, and decided that it should be based on the absolute C.G.S. electromagnetic unit of Weber, and should be represented by a mercury standard. As many as eleven different "standards," some of very unreliable nature, were in use at that time. The relation of the corresponding units of current and E.M.F. to the absolute units was also defined. Experimental work was taken in hand to determine the value of existing standards in terms of the absolute unit, new determinations were made by Thomson and others, by a method similar to that of Weber, of measuring the deflection of a magnet caused by the action of a rotating coil from 1862 to 1864, and the first B.A. standards of platinum-silver were made. Dr. Glazebrook was able to show his audience some of the actual standard coils and the very rotating coil apparatus used, together with an actual Wheatstone's Bridge used for their comparison. In 1870 the original committee was

dissolved, but further observations began to show that the values adopted were somewhat in error, and it was re-formed at the suggestion of Ayrton in 1880, shortly before the famous Paris Conference, where the names ohm, volt, and ampere were adopted internationally. Lord Rayleigh made new determinations by his improved rotating-coil apparatus, as well as by the Lorenz method. Results in 1884 gave the value 106.02 cm. as the length of the mercury ohm, and in spite of Thomson's endeavours for the recognition of a more accurate figure, the "legal ohm" of a 106 cm. was settled upon in Paris, although it was not adopted in this country. In 1890 a committee, of which Thomson was a member, was appointed by the Board of Trade, and the figure of 106.3 was adopted for the length of the mercury ohm. The lecturer, with the assistance of Mr. F. E. Smith (of the National Physical Laboratory), then showed Lord Rayleigh's rotating-coil apparatus in action, and further explained the Lorenz method, in which a flat disc rotates in a field due to a pair of current-carrying coils, and the E.M.F. produced between the centre and periphery of the disc is balanced against the drop across the resistance to be measured, which carries the same current as the field coils. A further report of the B.A. Committee was submitted to the Edinburgh meeting of 1892, and formed the basis of legislation which led to the foundation of the Board of Trade Standardising Laboratory, where a standard ampere balance was also set up. Passing thus to a consideration of the absolute measurement of current, the lecturer described the original current balance of Weber, and showed some of its coils, together with the current balance and a tangent galvanometer used by Joule in his experiments on the dynamical equivalent of heat. The former was shown in action. The measurement of E.M.F. depended upon the determination of resistance and current. The units were represented originally by their relation to the E.M.F. of a Daniell cell, since superseded by the Clark, and later by the Weston cell. Tracing the course of further experimental work increasing the accuracy of the determination of standards, the lecturer referred to important comparisons made between the current balance and the silver voltameter in 1884, and to the construction of an improved Lorenz apparatus of Viriamu Jones and Ayrton for McGill University in 1897, which gave the value 106.28 for the length of the mercury ohm. In 1902 the National Physical Laboratory was founded, and important

# BROWN-BOVERI

## AUTOMATIC

### PRESSURE REGULATORS



RAPID AND ACCURATE REGULATION.  
NO SPARKING.  
NO "TOUCHING UP" OF CONTACTS.

CAXTON HOUSE  
LONDON S.W.

work was reported to the St. Louis Congress of 1904 and the Berlin Conference of 1905. Much work with the current balance at the National Physical Laboratory was recorded in 1907, and finally the last International Conference on Electrical Units and Standards met in London in 1908, where a distinction was made for the first time between the true ohm, ampere, and volt and the international ohm, ampere, and volt. It was recognised that the accuracy with which resistances and currents can be compared is much greater than that with which absolute determinations can be made, and accordingly the values were defined to the former degree of accuracy by the addition of two zeros to the figures obtained to as many places of decimals as could be relied on for absolute determinations. Lord Kelvin, however, did not live to see the units in the development of which he had played so important a part adopted throughout the world. Since the conference, important work has been done in the comparison and co-ordination of the standards of the laboratories of various countries, and figures were shown illustrating the very high degree of accuracy now obtainable. In the meantime, owing to the munificence of the Drapers' Company, a new and much improved Lorenz apparatus has been installed at the National Physical Laboratory, and experiments are in hand by Mr. F. E. Smith which it is hoped will carry the accuracy of the absolute determination of the ohm still further.

At the close of the lecture a vote of thanks was proposed by Mr. Alexander Siemens, and seconded by Prof. Silvanus P. Thompson, to whose remarks Lord Rayleigh also added a few words.

### HOW TO READ A METER

AN interesting, and in some respects remarkable, action was heard on Monday and Tuesday in the King's Bench Division before Mr. Justice Bankes and a special jury, in which the point at issue was the correct way to read the Electrical Co.'s K.G. type of meter. In 1908 the County of London Electric Supply Company installed a meter of this type for registering the power supplied in a factory belonging to Messrs. Salomons and Co., leather dressers, Robson Street, Bermondsey, and for some 3½ years the dial was read by the Company's meter readers on the basis of the last figure representing a decimal instead of a unit. The effect of this was, of course, that the quarterly accounts were exactly one-tenth the value they should have been had the final figure been counted as a unit. When the County of London Electric Supply Co. dis-

covered the error, in 1911, they rendered an account for the remaining 90 per cent. of energy which had been used, the bill for which, for the period in question, amounted to £1,880 5s. 6d.

A considerable number of defences were put into the action, and a counterclaim was actually made for damages on the ground that the consumer, whom, it was alleged, was making a loss on his business, had been misled by the Company's accounts into thinking that the cost of power was much less than it actually was, and that had he known the true cost he would have closed his works at least two years ago, hence the claim for damages to cover the losses incurred during that period. Among the points in the defence were that the meter, being capable of being misread, as the one in question had been, was an unsuitable meter within the meaning of the Company's Provisional Order; that it was not approved by the Board of Trade at the time it was installed, the Board of Trade only having approved this type of meter since the date of installation; that there had been negligence on the part of the Supply Co.'s servants; and that the meter had not been maintained in efficient working order.

The Electrical Co.'s K.G. type of meter, of which Mr. A. J. Cridge said in the witness-box no less than 168,000 have been sold during the past ten years (including 1,000 in this country), has a transverse red line before the final figure on the dial, which the makers say is solely for the purpose of assisting to estimate a fraction of a unit during a test, and that the construction of the meter is such that the whole row of figures on the dial represent units consumed. Eight or nine of the Supply Co.'s meter-readers, however, regarded this line as indicating a decimal point, and Mr. E. E. Sharp, of Messrs. Venner and Co., for the defence, maintained that he would always read such a red line in the same way. On the other hand, it was pointed out that the usual way for the Germans—and the meter in question is of German manufacture—to indicate a decimal point is by a comma, and no meter was mentioned in the defence in which the dial contained a transverse line which the makers intended to be read as a decimal point.

A number of interesting points of common law arose during the hearing of the action, and eventually the judge put six questions to the jury to answer, with the result that they found the meter was a suitable one, that it had been kept in proper order (its accuracy on the basis of the final figure being a unit was not disputed), but that the Company's servants had been negligent in the reading of it. The jury, however, did not think that Messrs. Salomons had been prejudicially affected in the conduct of their business by the rendering of the accounts at one-tenth of their actual value.

This disposed of the case as far as the jury was concerned, but judgment has not yet been entered, as there are several points of law to be decided by the judge, and which will be argued before him later.

### CATALOGUES, PAMPHLETS, &c., RECEIVED

**SWITCHBOARD INSTRUMENTS.**—We have received from Siemens Brothers & Co., Ltd. (Woolwich), a new abridged list of their round pattern switchboard instruments. This includes air-damped electromagnetic ammeters and voltmeters in several sizes for continuous or alternating current, as well as moving-coil instruments for continuous current. A large number of ranges are listed, and the instruments can be obtained with back or front connections. The shunts are built up of groups of manganin tubes with substantial end connections.

**NEWSPAPER PRINTING-PRESS DRIVING.**—A fine new booklet has just been issued by J. H. Holmes and Co. (Newcastle-on-Tyne). It sets forth the details of the widely-used Holmes-Clatworthy system of rotary web printing-press drive with hand or push-button control. The entire equipment bears the stamp of solidity and reliability, and facilities are provided for carrying out with the greatest ease every requirement essential to the rapid production of printed matter. By means of a special button it may be made impossible for the press to be started, so that there is no danger to men engaged in inspection or repair. Should the push-button system give any trouble, the controller may be immediately worked by hand. For smaller presses, where first cost is the greatest consideration, the "Castle" (single motor) system may be employed. Speed regulation is effected entirely by field regulation. We note that nearly 400 newspaper offices and printing works have been equipped during the last few years, the equipment varying from ¼ b.h.p. to 1,500 b.h.p.

**VENTILATION.**—A new pamphlet from Ozonair, Ltd. (96 Victoria Street, S.W.), describes the Ozonair system of pure-air ventilation in detail, and explains fully the principles on which it is founded. The apparatus is illustrated in various forms suited to different conditions, and a list of some important Ozonair installations is given. The pamphlet contains a great deal of information which should be of use to contractors and others interested in ventilation who are not yet familiar with the system.

# ELECTRICAL ENGINEERING IN THE MINING AND METAL INDUSTRIES

## SHAFT CABLES

A PAPER on this subject was read before the London Section of the Association of Mining Electrical Engineers by Mr. E. Kilburn Scott last month, and also has been discussed at the other branches of the Association. Mr. Scott suggested that all the metal work which is continuous from top to bottom of the shaft should be utilised as an earth return. He said that there was nothing in the Home Office Rules against this being done, and, in fact, he said that there was nothing in them to say that shaft cables should be armoured. This latter statement was, however, controverted by Mr. Robert Nelson, H.M. Electrical Inspector of Mines, in the discussion. Mr. Scott's suggestion was that even if it were not convenient to use the existing metal work, it would be cheaper to suspend old wire ropes in the shaft for the earth return than to place the same amount of metal round a cable as armour. He contended that the danger of injury to cables in shafts was far less than to those in the underground roads, &c. With regard to armoured cables, the author also called attention to the rule that the conductance of the armouring must be 50 per cent. of that of the conductor itself. When the thickness of the insulation is small compared with the diameter of the copper, as is the case with low-tension cable, this rule, he pointed out, would call for heavier armouring than that specified by the Engineering Standards Committee. In discussing the shape of the conductors for three-core cables, Mr. Scott said that for low voltages, sector-shaped conductors were considerably cheaper than circular ones, but that after 3,000-volts pressure was reached, the circular section was as cheap, as the saving in total diameter by the sector-shaped conductors became less owing to the thicker insulation, and provision had also to be made for the greater electrical stress at the corner of the sectors.

The next subject dealt with was the use of aluminium cables. Although these had never been used as shaft cables up to the present, he pointed out that they had been employed successfully for feeders on towns mains, and mentioned cases of which full details were given in *ELECTRICAL ENGINEERING* on Nov. 24th, 1910 (Vol. VI., p. 749), and Feb. 9th, 1911 (Vol. VII., p. 67). The following companies, he said, used aluminium transmission lines, viz., Newton Chambers; Weardale Coal and Iron Co.; Bolckow, Vaughan and Co.; Lambton Colliery; the Leadhills Co.; and the Craighead and Bothwell Castle Colliery Company. Mr. Scott included in

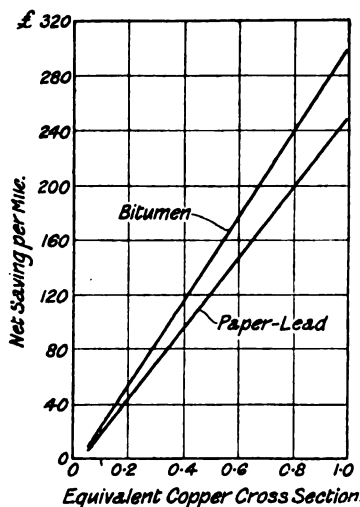


FIG. 1.—APPROXIMATE SAVING ON THE NET COSTS OF BITUMEN AND PAPER-LEAD L.T. ALUMINIUM FEEDERS, BASED ON COPPER WIRE AT 10½D. PER LB., AND ALUMINIUM WIRE AT 11½D. PER LB.

his paper some of the figures and facts published in the two articles above referred to, and also added the following table, prepared for him by Messrs. Johnson and Phillips, comparing three-core copper and aluminium cables of equal conductance (0.15 and 0.25 sq. in. respectively).

Particulars of Three-core Medium-tension Paper-insulated Shaft Cables.

Shape and size of conductors. (Sq. in.).	Ext. dia. of cable. (in.).	Per mile.		
		Net weight. (cwt.)	Gross weight. (cwt.)	Price. £.
Round, 0.15 Cu. ....	2.32	375	471	1,053
Round, 0.25 Al. ....	2.72	440	560	1,003
Sector, 0.15 Cu. ....	2.11	328	424	993
Sector, 0.25 Al. ....	2.50	388	508	918

The cables compared are lead covered, single-wire armoured and jute served and compounded overall. Fig. 1 has been calculated by the British Aluminium Co. for single low-tension unarmoured cables. The author also gave the following comparative figures of tensile strengths, &c. :—

	Copper.		Aluminium.		Steel.	
	Hard drawn.	An-nealed.	Hard drawn.	An-nealed.	Hard drawn.	An-nealed.
Tensile strength, lbs. per sq. in.	60,000	23,000	30,000	16,000	70,000	50,000
Maximum length in feet of strand which can be supported .....	15,500	5,950	25,000	13,600	20,700	14,750

Dealing next with insulation, the author said the advantage of vulcanised bitumen, as manufactured for mining cables,

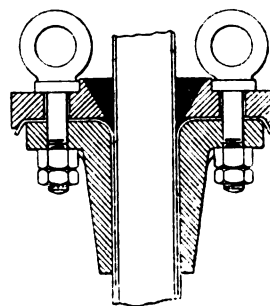


FIG. 2.—CONE SUSPENSION.

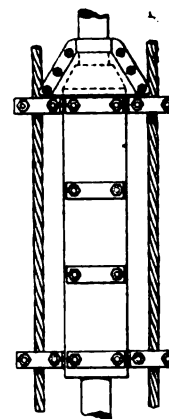
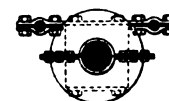


FIG. 3.—SUSPENSION WITH WIRE ROPES.



is that it resists ordinary pit waters. He also suggested the use of "cab-tyre" sheathed rubber cables, as manufactured by the St. Helen's Cable Co., pointing out incidentally that the cleating up in the shaft would be easier than with armoured cable on account of its flexibility. He also recommended "cab-tyre" sheathed sinking cables, but in the discussion Mr. Nelson said that metal armoured cables should be used for such purposes on account of safety.

Several methods of fixing shaft cables were described and illustrated. Fig. 2 shows a method of "single" suspension, at the top end only, suitable only for comparatively small depths. An iron cone is passed over the armouring, and the armouring wires are bent over at right angles and gripped firmly by a top plate held down by four bolts, and the whole



**THE**  
**UNION CABLE**  
**COMPANY, LTD.**  
**for**  
**BITUMEN**  
**INSULATED**  
**CABLES**  
**DAGENHAM DOCK,**  
**ESSEX.**

TELEPHONE: RAINHAM, 25 & 26.

is suspended by chains from a girder across the top of the shaft. In another form of single suspension which has been adopted at a colliery in Lancashire a clamp is used, consisting of a steel plate with a number of steel clamping pieces. The cable has split bushes fitted round it, through which it is gripped by the clamps, so that a succession of grips is obtained without the cable being squeezed out of the circular shape. The chains are suspended from a large beam at the top of the shaft. The cables are three-core paper-insulated, lead-covered and single-armoured. The two larger ones are each 300 yds. long and weigh about 8 tons, and the smaller ones are respectively 450, 300 and 150 yds. and weigh 1.8, 1.2, and 0.5 tons. The three smaller ones have been in nine years, and one of the larger ones 4½ years.

A method of suspension by wire ropes is shown in Fig. 8. This method is used in a colliery shaft 500 ft. deep in New South Wales to support a pair of rubber-insulated and braided 19/12 single cables; they are clipped to four-wire ropes by wooden brackets at 15-ft. intervals.

For most shaft cables in this country wooden cleats are employed. The usual form of cleat, the author said, is about 3 ft. long, 12 in. wide, and 6 in. thick. A hole is bored through it lengthwise to the exact size of the cable. Then the block is sawn in half, and after the cable has been pressed into the grooves, the ½ in. taken out by the saw is sufficient to give the necessary grip. Elm and pitch pine are generally used. The resin in the pine assists the grip of the cleat on the cable and resists absorption of water. Oak is not suitable because of the tannic acid it contains. Various methods of fixing the cleats have been described in our columns from time to time, but we illustrate in Fig. 4 a less usual method recommended by Mr. Scott, in which the cleats are fixed to chains to give greater flexibility.

The author suggested the use of unarmoured cables in casing formed of split telegraph poles, in the manner illustrated in Fig. 5. The pole is sawn in two and one of the halves grooved. Then, when the cable is in place, the two halves are secured by steel bands which are slipped over like bracelets and then driven down towards the butt. The two halves are thus closed in in much the same way as a cooper is able to close completely the joints between the staves of a

barrel. Bolts and screws are done away with altogether. The poles would be erected with the butt-end downwards, and the small end of the pole immediately below would fit into the butt-end of the one above, as shown at B, B. This, he contended, would avoid the possibility of an open joint between the various lengths, which is one of the causes of trouble with ordinary sawn casing. The poles are secured in the shaft by cutting "gains" in the side, so that each

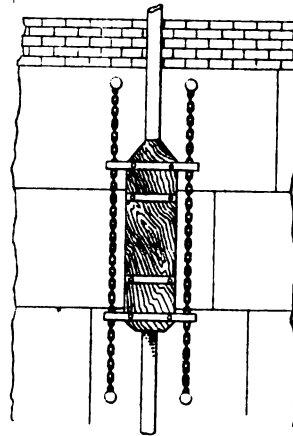
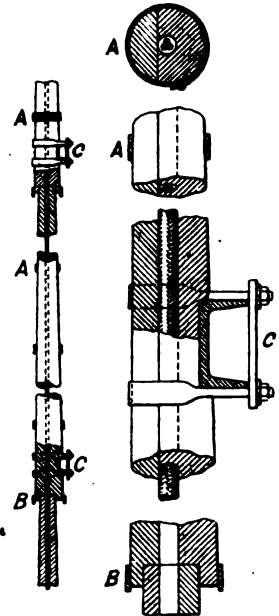


FIG. 4.—CLEAT ATTACHED TO TUBBING BY CHAINS.

FIG. 5.—CASING MADE FROM SPLIT TELEGRAPH POLES.



pole is keyed, as it were, against the buntons. The poles are held to the buntons by steel straps, as shown at C, C.

In support of his advocacy of unarmoured cables earlier in the paper, the author instanced a mine in New South Wales where the armour on a shaft cable was useless in less than six months, and another in this country where a steel rope, used in a shaft as the earth return, became so corroded that a special copper cable had to be put in instead.

Finally, Mr. Scott recommended the use of the Powell process of applying saccharine and arsenic for the preservation of wood cleats and casing, more particularly to prevent the white-out trouble. It has, he says, been used with success for cable troughing in Sydney (N.S.W.). Stockholm tar, if employed, should be, said he, boiled before use to drive off acids and water, although this diminishes the volume by about 25 per cent.

In the discussion, as already mentioned, Mr. Robert Nelson (H.M. Electrical Inspector of Mines) said that the use of unsheathed cables in shafts was prohibited by the Rules for pressures exceeding 250 volts. Although there might be less danger of damage to shaft cables than to cables in-bye, the difficulty of repairing them was greater. He was not in favour of aluminium cables for shafts; to compare the lengths of wire of aluminium and copper which would support their own weight was beside the question. That the aluminium cable had to be of 50 per cent. larger external diameter for the same conductance was important; he was himself in favour of keeping down the size of shaft cables—two 0.15 sq. in. cables were better than a 0.3 sq. in. He advocated heavy armouring, and the fact that in the case of cables of large section the Special Rules called for heavier armouring than the E.S.C. standards was, he thought, a move in the right direction. Sinking cables should also be armoured. After some remarks by Prof. Arnold Lupton, Mr. J. H. C. Brooking said that the expression of Mr. Scott's views must be taken as information, and not as gospel, and preferred not to express an opinion as to the use of cab-tyre sheathed cable in shafts. Mr. E. V. Pannell (British Aluminium Co.) said that Mr. Scott's list of collieries at which aluminium cable was used could be easily quadrupled, and complained that Mr. Nelson's estimate of 50 per cent. increase in diameter was far beyond the mark. Mr. W. H. J. Powell, the inventor of the saccharine process of preserving timber, mentioned in the Paper, spoke a few words, and was followed by Mr. C. J. Green (Callender's), who favoured the making of joints in aluminium cable in the form of a mould, rather than the mechanical joints with copper clamps. Mr. Green also reminded Mr. Scott that the heating of a cable placed in a casing made of telegraph poles would have to be considered. Mr. H. H. Berry (Berry & Skinner) called for more standardisation in mining work, and the Chairman (Mr. W. C. Mountain) closed the meeting by proposing a vote of thanks to Mr. Scott, which was heartily accorded.

## RECENT PROGRESS IN ELECTRIC IRON SMELTING

**E**LECTRIC smelting of iron ore is now carried on commercially in Sweden, Norway, and in California, and plant will shortly be put down for the same purpose in Switzerland, Italy, and elsewhere. The works at Trollhättan of the Strömsnas Aktiebolag, Degerfors, and the results obtained were dealt with on page 73 of *ELECTRICAL ENGINEERING* of Feb. 6th. The other Swedish works are at Hagfors and Domnarfvet.

The Uddeholms Aktiebolag, of Hagfors, installed a 3,000 h.p. furnace for iron smelting with charcoal in March, 1912. This is similar in construction to the Trollhättan furnace, except that it has six electrodes, each of the phases of the three-phase supply working separately on two electrodes. The Company are so satisfied with the results obtained that they have set aside the sum of £325,000 for the purchase of two further furnaces of 3,000 h.p. each to be installed at Hagfors, and three others, also of 3,000 h.p. each, for their works at Nykroppa. It is stated that the Company intends to substitute entirely electrical smelting furnaces for all their present blast furnaces. No actual figures of the results which have been obtained are available.

The Stora Kopparbergs Bergslags Aktiebolag, of Domnarfvet, were amongst the first to start experimenting with electric smelting furnaces, but, although they have obtained very satisfactory results, it appears that they have devoted the last year or two to experimental work, as they turned out very little electrically produced pig-iron last year.

Electric iron smelting is carried on in two places in Norway. At Tyssedahl, Hardanger, the Hardanger Elektriske Jern Og Staalverk installed a 3,000 kw. furnace and plant some eighteen months ago. This furnace has been working for about eight months with coke only as the reducing agent, turning out about 17 tons of pig per day. The iron produced is of a very high quality, but the energy and electrode consumptions are considerably higher than those obtained at Trollhättan, partly on account of the difficulties of working with coke, and partly due to the nature of the ore used there.

The other Norwegian plant is at Notodden, where the Tinfos Jernverk have been working a 1,500 kw. furnace for some months. Three-phase power is obtained from the water-power station of the Tinfos Papier Fabrik, to which the iron-works company is affiliated, at the rate of 38s. per kw.-year. They smelt a magnetite ore containing 45 to 48 per cent. of iron, and use coke only, producing about 2 tons of iron per electrical horse-power year.

The Noble Electric Steel Co., of Héroult, California, have a 2,000 kw. furnace for electric iron smelting, and produce a special soft foundry iron practically free from phosphorus, sulphur, or manganese. Their energy consumption is higher than the Trollhättan figures, but as the iron produced obtains a high price, the furnace is a commercial success.

Since the historic experiments at Sault Ste. Marie in 1906, the Canadian Dept. of Mines has been carefully studying the question of electric smelting, and it is stated that they will shortly issue a report demonstrating that electric smelting of Canadian iron ores is a commercial possibility.

A 2,500 h.p. smelting furnace (Elektrometals type) has been ordered for a works in Switzerland, and a company has been formed in Italy, the Società miniere di Cogne, for the purpose of establishing a large electric smelting works near Aosta, near which place there are large deposits of excellent ore. Four water-power stations of a total capacity of 37,000 h.p. are proposed.

### Examinations of the Association of Mining Electrical Engineers.

—The Association's examinations for competency in mining electrical engineering will be held this year on March 8th and 15th simultaneously in ten different centres. To qualify for a first-class certificate, candidates must sit for all four of the following Papers:—(1) Alternating current theory and practice; (2) direct current theory and practice; (3) special rules, distribution of electrical energy; (4) electric lighting, signalling, miscellaneous apparatus. For a second-class certificate Papers (1) and (2) may be omitted. Candidates who had not had mining experience may present themselves for examination and obtain a pass, which will be converted into a full certificate on subsequent production of evidence of mining experience. Diplomas or certificates already held by candidates will be taken into account, but will not exempt from any part of the examination. Every candidate will be required to pay a fee of 5s. before presenting himself for examination. Every candidate for examination must be on the register of the Association. Any further information can be obtained from the General Secretary of the Association, C. St. Clair Saunders, Bank Chambers, London Road, Derby, or from any of the Branch Secretaries.

## THE DEVELOPMENT OF ELECTRICITY FOR MINING

**M**R. R. NELSON (H.M. Electrical Inspector of Mines) recently delivered a lecture, entitled "The Development of Mechanical Power in the Mines of the North-Eastern Coalfield: A Comparison and a Contrast," before the North of England Branch of the Association of Mining Electrical Engineers in Newcastle-on-Tyne. The lecturer said that the transmission of power below ground by electricity was a development comparable with that which followed the first application of steam power to mining work. A very early suggestion regarding the future possibilities of electricity for underground work was contained in a paper by Mr. Henry Davy, contributed to the Institution of Mechanical Engineers in 1882. In 1888 an electrically-driven pump was put to work in the North Seaton Colliery. The problem of the economical haulage of heavy trains of coal below ground was solved towards the latter end of last century by the introduction of electricity. At the present time two problems lacked adequate solution. They were some mechanical means of getting the coal and of handling it at the coal face, and some better means of lighting than that provided by the oil safety lamp. About three times the light was required without increase in weight. Several lamps very nearly fulfilling these requirements were already obtainable. The system of mining known as "long-wall" was the most suitable for the employment of coal-cutting machines. This is not commonly adopted in Northumberland and Durham. Attention might be drawn to an electric coal-cutter which automatically adjusted its forward travel when a hard place in the seam was reached, preventing a demand on the motor in excess of a predetermined maximum. The present century had, he said, witnessed nothing in mining comparable with the wide adoption of electricity. Motors totalling over 100,000 h.p. were now at work in the mines of Northumberland and Durham. For pumping, coal-cutting and coal conveyance, electricity now stood pre-eminent, and a modern installation might be made "ironclad" throughout from generator to motor. The development of safety cut-outs depending on leakage had reached a high practical efficiency. An important advance had been made, comparable with that due to the invention of the safety valve in steam engineering, in this art in quite recent years. Electrical apparatus might be so protected that if the current were rightly used—that was, only where the risk of accident arising therefrom was, so far as could be seen, negligible—the standard of safety was as high as that to be attained by any machinery in any situation.

Replying to a question as to the cost of electric winding, Mr. Nelson said that he imagined the great inducement was the fact that electricity was economically necessary for 75 per cent. of the mining operations, so that it was economically unsound to adopt other methods for the remaining 25 per cent. with electrical energy at anything like a reasonable cost.

**The Edison Miner's Lamp.**—Mr. T. A. Edison has been awarded the Rathenau Medal, given annually by the A.E.G., for "the best device or process in the electrical industry for safeguarding industrial life and health" for a miner's lamp working with a two-cell Edison alkaline battery arranged in a steel container.

**Electricity for Coal Mines in Nova Scotia.**—The coal mines in the Cape Breton district near the mouth of the St. Lawrence River, Nova Scotia, are, according to the *Electrical World* (New York), rapidly adopting electricity for their motive power. A new turbine station is being built generating at 6,600 volts 25 cycles. To prevent the power factor from falling below 80 per cent., some 600-h.p. synchronous motors driving air compressors are made to take a leading current by field adjustment. These motors are started as induction motors from auto-transformers with high-pressure oil switches having a large overload capacity. A large hoist is situated near the new generating station. It handles 1,200 tons per ten-hour day. The haul is made on a 22.5 per cent. grade 4,500 ft. long. The total gross weight of 30 cars per trip is 82,500 lb. For this work use is made of a direct-current motor mounted on the winding drum shaft and supplied with energy from a motor-generator. This motor has an intermittent load rating of 1,600 h.p., and operates normally at 50 r.p.m. In the near future two more electrical coal hoists of the same character will be installed, and will haul 24 cars up a 32 per cent. grade at a maximum speed of 30 ft. per second. The gross weight per car will be 2,900 lb., and the length of the slope between 3,000 ft. and 5,000 ft., with an output of 1,200 tons in eight hours. In order to diminish the load at starting the cars in this mine will not be started on the grade, but from a level stretch of track laid at the working face of the mine.

## ELECTRIC CABLES IN MINES

**M**R. G. W. ANDERSON read a paper recently before the Manchester Geological and Mining Society raising a number of practical points regarding the installation of cables in mines. Regarding the types of cable to be employed, rubber, he said, were only used in short lengths for making off or tailing other cables, or for temporary or special purposes. Paper cables had the disadvantage of being hygroscopic, and in the author's opinion bitumen was the most suitable insulating material. He explained the method of construction of bitumen cables, and passing on to the question of sheathing he pointed out that under the new rules it was necessary that the conductivity of the coverings must be equal to 50 per cent. of that of the largest conductor that they enclose. This, however, did not entail more than very slight reinforcement of the sheathings of any but large-size cables above the usual standards adopted by manufacturers. He enlarged upon the necessity for protection of the armouring from corrosion. Armouring was considered undesirable for trailing cables. They are usually laid up with an earth conductor having a conductance of not less than 50 per cent. of that of the largest main conductor, with a minimum conductivity equivalent to 0.022 sq. in. of copper.

The space between generating station and headgear was perhaps the most prolific field of any for cable breakdowns. The best means of grappling with this difficulty was either to build a well-ventilated surface culvert in which the cables would be carried on brackets; or to sling them overhead from a catenary wire. Old haulage rope would generally be used for this purpose.

The author then dealt with methods of suspension of cables in shafts, recommending hard wood cleats for gripping the cable by friction and resting either on existing structures or on segmental girders erected for the purpose. Single suspenders on the wedge principle are sometimes used. In the author's opinion, the safest method of lowering shaft cables was to fasten the cables by lashings or small, specially made clamps, to a wire rope controlled by a hauling engine.

For the installation of cables in roadways, intake airways should be selected, and the position chosen for the run should be such as to afford the greatest security from mechanical damage. In main roadways where there are good walls and sound roofs, the cables may be fixed in a permanent manner by cleats. Where there is a liability of damage from falls, the cables should be suspended in such a manner and with so much slack that they will readily tear away without fracture. For installing, it is advisable to take the new roadway cable down the pit intact on its drum, jacking it up on an improvised trolley running on tub wheels, and paying out as the trolley moves along.

With regard to cable boxes the principal requirements were: absolute watertightness and mechanical strength; long bearing glands, which will prevent any undue strain being put upon the cable or the internal fittings of the box, while they are capable of making a very effective connection with metallic sheathings; adequate means of bonding through from sheathing to sheathing; and such design as will reduce to a minimum the risk of cavities or "blowholes" forming in the compound.

## ELECTRICAL MINING AND METALLURGICAL PATENTS OF FEBRUARY

### Mining.

**A**MONG the Patent Specifications published by the Patent Office during February may be mentioned No. 1,013 '12 by H. Hunte and A. Hunte. It deals with miners' safety lamps. The accumulator is enclosed in an aluminium case. The lid is recessed on the top to receive a sunk rotary switch. A lamp, mounted within a thick U-glass, surrounded by a metal cage whose base has spring projections which constitute part of the switch. A rubber joint prevents access of air. The accumulators have lugs instead of terminals. These lugs fit over pins on the inside of the case, and by closing the case the whole is locked. No wires are used, all connections being by copper rods and spring plungers. A quarter turn of the lamp cage lights the lamp, a further quarter turn puts it out. Similar lamps may be mounted in front of, or at the bottom of, the casing.

Patent No. 5,217 '12, communicated to The Sterling Telephone and Electric Co., Ltd. by Schaffler and Co., of Vienna, describes some improved details for mine exploders. The driving spring, which is wound by the handle, is released by hand by a separate ratchet gear. The spring can only be released

when wound to a definite extent, and when released the ratchet pawl is prevented from dropping back and stopping the machine until the spring has run down a definite amount. It is thus impossible for the exploding current to be too feeble.

### Metallurgical.

The Patent Specifications published during February which have more particular bearing on the metallurgical industry include No. 2,709/12 by S. Cornthwaite. Open-hearth steel-melting furnaces, either tilting or fixed, are provided with a movable roof, air and gas ports and regenerative chambers, &c. At least two furnaces are required. A single gas producer supplies both. A trolley is provided carrying electrodes above the furnaces for heating either. To insert the electrodes into the furnaces motor-driven rack and pinion gear is provided. In operation gas is used for melting the charge in one. The gas supply is then transferred to the second, and the remaining treatment of the first charge is done electrically. The process is thus continuous. Specification No. 7,367/12, by J. Rennerfelt, applies to arc heated cylindrical crucible furnaces. Means are provided for the use of both horizontal and vertical watercooled electrodes. These are given longitudinal, transverse and radial motions, and may be arranged for two- or three-wire direct or for alternating currents. For adjusting the lengths of the arcs, the electrodes slide in copper-gauze packing within a tube insulated from the cooling jacket by asbestos. The electrodes are protected from the furnace heat by refractory shields moving with them. The crucible is provided with ribs to prevent local overheating of the charge by oscillation of the crucible due to deflection of the arcs downwards. In No. 19,287 '12 L. Gonnet proposes to do away with the sole, or hearth, in horizontal electrode furnaces. This sole usually serves both as an electrode and as a receptacle for the products of fusion. To withdraw it necessitates the stoppage of the furnace. In the design proposed the charge is introduced through a strainer and falls on a grating made of interchangeable parts placed alongside one another and formed with tronconical orifices which retain the small particles until they fuse. The metal passes through the grate and can be removed through a special door. The electrodes are maintained the correct distance apart by a relay. In No. 21,290 '12, by J. M. Bocuze, a means is described whereby in radiation furnaces for melting precious metals the necessary rotary movement of the crucible and reciprocating vertical movement of the electrodes is obtained in a simple way without preventing the crucible being rocked to run off the metal.

In Specification No. 8,668 '12, by G. Tischenko, a process for the manufacture of sheet-iron in band form is claimed. The iron is first deposited on a continuously rotating horizontal, lead-lined drum. The band is then separated from the drum near its line of emergence from the electrolyte and guided to a water-bath; thence through a glowing furnace and a grinding or polishing machine. It is then passed through a corroding vat and a hot-water bath and is finally wound on a roll.

**Prizes for Papers on Mining Subjects.**—The Council of the Association of Mining Electrical Engineers announces that the following prizes are offered for Papers for the present session:—An Association prize of five guineas for the best Paper read at any branch; a prize of two guineas given by Mr. Carlrow for the best Paper by a member of the East of Scotland Branch; a prize of four guineas given by Mr. A. Anderson and Mr. Matthew Brown for the best Paper by a working colliery electrician who is a member of the West of Scotland Branch; and a premium of two guineas given by Lord Joicey for the best Paper by a member of the North of England Branch. Any further particulars can be obtained from the General Secretary of the Association, Bank Chambers, Derby, or any of the Branch Secretaries.

**The Association of Mining Electrical Engineers and its Examinations.**—At a meeting of the London Section of the Association of Mining Electrical Engineers last month, Mr. W. C. Mountain (who was in the chair) said that the Association had now a thousand members and eleven branches, including a branch in Australia, and there were now 55 members in the South of England Branch, including 10 at the Dover coalfields. The system of examinations had been a success. At present they had 120 certificated members, and it was proposed to hold the next examination in the Northampton Institute this month. Speaking personally, he could confidently say that the fact that a man held a certificate from the Association carried considerable weight with employers in engaging men for responsible positions in collieries.

## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelopes.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,329.

In a workshop with 2-phase, 4-wire installation, two single-phase meters are provided by the Supply Co. for purpose of charging. A two-phase meter is also connected for checking purposes. The load is mixed, and consists of: (a) lights; (b) some two-phase induction motors; and also (c) a single-phase motor. It has been found that the meters agree when (a) and (b) are running, but when (c) is switched in the single-phase meters register less than the two-phase meter. The meters have been tested separately and found correct.—S. C. R. (Replies must be received not later than first post, March 13th.)

### ANSWERS TO No. 1,327.

A magnet is wanted to give a direct effort of about 120 lbs. on a brake shoe, applied direct as a push not more than  $\frac{1}{4}$  in. from a simple bearing knob on the solenoid. The current available is 200 volts D.C. Give dimensioned sketches sufficient for construction, with particulars and calculations of the winding and of a resistance to bring on the full effort slowly.

"MAGNET BRAKE."

The first award (10s.) has been given to "M. M." for the following reply:—

The formula usually employed is  $P = \frac{B^2 A}{72,200,000}$

whence

$P$  = pull in pounds,  
 $A$  = area in sq. inches,  
 $B$  = density of lines per sq. in.

Take an arrangement as shown in Fig. 1. For convenience two solenoids are suggested; the cross-bar is pulled down

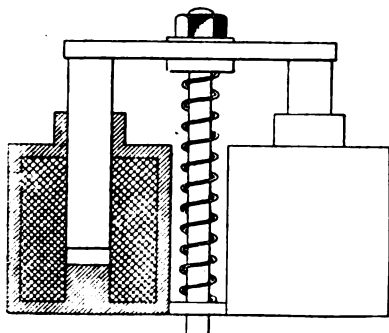


FIG. 1.

by the cores and returned to its place by the helical spring. With a density of 50,000 lines per sq. in. and allowing 30 per cent. for leakage, this gives us  $\frac{70 \times 50,000}{100 \times 1} = 35,000$  in gap.

The spring has to be overcome, and if we allow 20 lb. extra for this we have 70 lb. pull for each core.

Then:—

$$\text{Area} = \frac{70 \times 72,200,000}{35,000 \times 35,000} = 4.13$$

$$\therefore \text{Diameter} = 2.3 \text{ in. (approx.)}$$

$$\text{Ampere turns} = 0.3183 B l,$$

where  $l$  = length of air gap =  $\frac{1}{2}$  in.

If each coil is 6 in. in length and we wind with No. 14 D.C.C. copper wire, we shall have about 540 turns per coil.

The current will then be  $\frac{3,133 \times 35,000}{10,000 \times 1} \times \frac{1}{2 \times 540} = 10$  amperes approx.

This is rather a large current from No. 14, but probably the solenoid will only be used at intervals.

No reply of sufficient merit for a second award has been sent in. Mention may be made, however, of the reply of "L. B." which commences as follows:—

To apply the full effort gradually, it is better to use a dashpot, either oil or air-cushioned. With a resistance either in series or as a potentiometer, when the voltage on winding is sufficient, by a small percentage, to overcome the weight and friction, the solenoid is immediately lifted, so that this method is useless.

The design shown in Fig. 2 is the most economical form for a short stroke of  $\frac{1}{4}$  in., and by making the plunger a good fit in tube a compression air dashpot is obtained which, with a

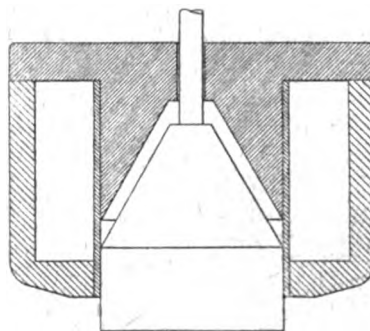


FIG. 2.

small air vent hole, will give the cushioning effect desired. The external cast-iron magnetic circuit can have several ventilation holes, as the section need not be large. Saturation of this circuit helps greatly to keep the attracting force constant. The cone-shaped plunger also gives a more constant pull than a flat end, which would only give a pull less than half that obtained with cone at beginning of stroke.

"L. B." uses the same formula as "M. M." to work out the sectional area required, but unfortunately there is an error in the calculation. We therefore give his sketch without the dimensions.

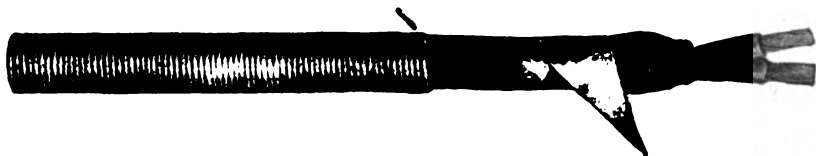
**Metal Filament Lamp Tests.**—A series of life tests of thirteen makes of metal filament lamps has just been completed by the Westminster Electrical Testing Laboratory. The results are published in a volume, on sale at 2½ guineas.

**New Procedure in U.S. Patent Cases.**—According to the *Electrical World* (New York) an "Assessor" (a disinterested person skilled in the art) may be appointed by the consent of all parties in a judicial patent action to sit with the judge and assist the court in its deliberations. This is following German practice.

**International Congress of Consulting Engineers.**—The "Chambre Syndicale des Ingénieurs Conseils" of Brussels, and the French institution of the same name, are organising an International Congress of Consulting Engineers, to be held in June or July of this year at Ghent during the exhibition. The congress will be open to "experts" as well as fully independent engineers. The formation of an International Committee, societies in other countries, and the discussion of the sphere of work and the professional etiquette of the consulting engineer, are included in the programme. Further information can be obtained from the offices of the Belgian Society at 18 Rue Marie-Thérèse, Brussels.

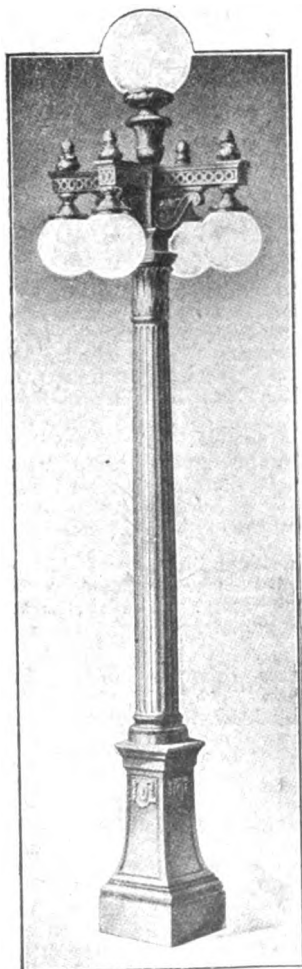
## FLEXIBLE WIRES FOR RADIATORS

THE accompanying illustration shows a specially designed wire which Siemens Brothers and Co., Woolwich, are supplying for use with all kinds of heating apparatus, such as radiators and irons, and it is also suitable for portable hand-lamps in garages and other places. It contains two rubber-insulated flexible conductors of fine tinned copper wires, and can be provided when necessary with an earthing wire to meet the Home Office Regulations for workshops. The wire is supplied with either a polished cotton-braid finish or a flexible metallic covering, the latter being recommended where the wire is likely to be subjected to severe mechanical use. In either case, a special feature of the wire is the



ARMOURED FLEXIBLE FOR RADIATORS, &amp;c.

provision of a wrapping of metallic foil immediately beneath the cotton braid which protects the rubber insulation from grease, oil, and other injurious substances. It is desirable that the surface of any metallic protective covering employed for this class of wire should be perfectly smooth, so that it can be handled without any possibility of the slightest injury being caused to the user, such, for instance, as would result from the sharp points of broken wires of a metallic braiding. It will be seen from the illustration that this condition is fulfilled by covering the wire with a special wrapping of segmental aluminium or brass, the rounded outer surface of which gives the finished wire a very neat appearance. It need only be added that the finished product possesses the required degree of flexibility without being springy.



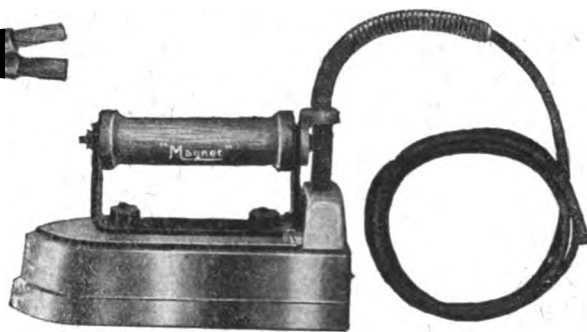
STREET LIGHTING STANDARD FOR METAL FILAMENT LAMPS.

## "WHITE WAY" STREET LIGHTING

IT is generally recognised that bright lighting in business streets is a great incentive to prosperity, and illumination of this character is known in America by the characteristic name of "White Way" lighting. A type of lamp-post, specially designed for the purpose with a view to decorative effect as well as brilliancy of illumination, is being introduced into this country by the British Thomson-Houston Co., Ltd. (Mazda House, Upper Thames Street, E.C.), and an example is illustrated here. The post has four side arms and a central upright lamp, the whole being supported by an artistic pillar. The equipment may consist of Mazda lamps of any size from 60 to 200 watts, enclosed in special diffusing globes made of Alba glass. The globes are made of the same glass as the well-known Alba semi-indirect lighting bowls, only thinner. This glass has a low absorption factor, and diffuses the light so thoroughly that the whole exterior surface appears evenly illuminated. We are informed of a case in America where one side of a street was equipped with these fittings and soon had almost a monopoly of the business until the other side was similarly lighted.

## ELECTRIC TAILORING IRONS

THE General Electric Co., Ltd. (67 Queen Victoria Street, E.C.), have brought out a design of electric tailoring iron which should entirely dispel the adverse criticisms regarding insufficient heat, high maintenance cost and fragility which have sometimes prevented the obvious advantages of electric irons being taken advantage of in the tailoring and allied industries. These irons have been most thoroughly tried in actual use, and the amount of heat developed in a 700-watt iron is well shown by the way it will scorch a wooden board if laid down on it. The "Magnet" tailoring iron, as the accompanying illustration shows, follows the lines of the "Magnet" domestic iron. The elements are



"MAGNET" TAILORING IRON.

replaceable, and a new element can be readily inserted at a cost of a few shillings. These irons are made in weights varying from 12 lb. to 25 lb.—the former specially adapted for dressmakers' use, the latter for heavy tailoring work. Attention is drawn to the flexible connection which in the old type of iron has been one of the chief causes of complaint. The flexible cord in this new iron is of strong make, heavily insulated with rubber, and covered with a thick layer of asbestos, and finally finished off with heavy cotton braidings. The connection with the heating element is made in a substantial box. Fitted behind the handle of the irons to this box is attached a strong spring, extending for about 9 ins. along the flexible connection, thus preventing any undue wear on it. The heating element consists of a narrow metal ribbon strip, made of a special alloy, which is utilised in such a way as to give it a long life and efficiency in working.

**Finnish Water-power Concession.**—A Berlin banking group, consisting of the Deutsche Bank, the Bank für Handel u. Industrie, the Akt.-Ges. für Licht- u. Kraftanlagen of Berlin, and others, have acquired a concession to develop the Wallinkoski waterfall of some 44,000 h.p., the second largest in Finland. Work is to be commenced at once, and it is expected that some of the power will be taken for the Helsingfors-Wiborg-Petersburg railway, which may shortly be electrified.

**Annual Dinner of the Manchester Local Section of the Institution of Electrical Engineers.**—This dinner, held on Friday last, was presided over by Prof. E. W. Marchant in the absence of Mr. A. A. Day, Chairman of the Section. Dr. Ferranti, in his speech proposing the Corporations of Manchester and Salford, voiced his well-known views on municipal trading, and put in a plea for co-operation between local authorities and public companies. Councillor S. W. Royse (Lord Mayor of Manchester), in his reply, defended municipal control of electric supply, but did not believe that the trading departments of a Corporation should allocate large profits in relief of rates, but should devote them to reductions in prices. Prof. E. Rutherford proposed the toast of the Institution, and emphasised the strong connection between physical research and electrical engineering. He would like to see more physical Papers in the Journal. Mr. W. Duddell agreed that mathematical and physical Papers were quite suitable for the Journal, but they were sometimes difficult to discuss at meetings. The Institution was now about to move in the way of research. He further referred to the lending library and to the examination scheme, saying that the examinations were going to be so arranged that anyone who really knew his work could sit at once without having to cram. Prof. E. W. Marchant also replied, and Mr. W. Cramp proposed the guests, regretting that the constitution of the Institution was not still more democratic. Many matters, he said, were settled in London, which might be first referred to the local Sections before being finally settled. Again, many documents came to the Chairmen of the Local Sections marked private and confidential, which he thought should be open to the whole committees.



# ADAMS IGRANIC

ELECTRICAL CONTROL GEAR FOR LIFTS, HOISTS AND CRANES.

ADAMS  
M<sup>FG</sup> C<sup>Y</sup> LTD  
BEDFORD  
AND  
LONDON

## ELECTRIC TRACTION NOTES

Mr. G. D. Snyder read a paper entitled "Notes on City Passenger Transportation in the United States" before the Institution of Civil Engineers on March 4th. New York has 133.17 miles of line and 95 miles under construction. The length of line in Chicago aggregates 74.56 miles. The municipality now proposes to construct fifty-six miles of underground railways at an estimated cost of about £48,000,000 without equipment, the latter amounting to about £17,500,000. In Boston there are 24.48 miles of line and 6.88 miles under construction. In Philadelphia there are 7.41 miles of line and 17 miles on private right of way. In all there are 250 miles of high-speed city lines in the United States and 174 proposed. The length of trains has increased from three cars on the first elevated to ten cars in the New York subway. The density of traffic on this line is four million passengers per mile of track per annum. The number of passengers per annum is increasing as the square of the population. New York had forty-three passengers per head of population in 1860, 322 in 1910, and at the present rate of increase the number will be 913 in 1950. The fare is almost universally 5 cents. Automatic block signals are not used on the older elevated lines nor on the local tracks of the New York subway except at special points. They are used on express tracks in New York and Chicago, and for multiple-unit trains in Boston and Philadelphia. A headway of ninety seconds can be maintained with automatic block signals with a speed of forty m.p.h. A headway of twenty seconds has been maintained without signals and with low speed. On three-track lines express trains are run in one direction in the morning and in the other in the evening. The earlier lines were built with private capital under perpetual franchises, but the municipalities are now building the lines and leasing the right to work them for a term of years. Underground lines cost £415,000 to £2,000,000 per track mile and elevated lines £100,000 to £300,000—without equipment.

The first General Meeting of the reconstituted Institution of Railway Signal Engineers was held at the Grand Hotel, Birmingham, on Feb. 25th. Mr. A. T. Blackall, the Signal and Telegraph Engineer of the Great Western Railway, was elected President, and Mr. J. Sayers, the Telegraph Superintendent of the Midland Railway, Vice-President, for the ensuing year. A paper by Mr. R. J. Insell on "Signalling and its Connection with the Construction and Management of Railways" was read and discussed. Information regarding membership may be obtained from the Hon. Secretary, Mr. W. H. Cotterill, Telegraph Department, Midland Railway, Derby.

The Aberdeen Suburban Tramways Co. is considering the adoption of trolley omnibuses for an extension of their system to Donside.

## TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

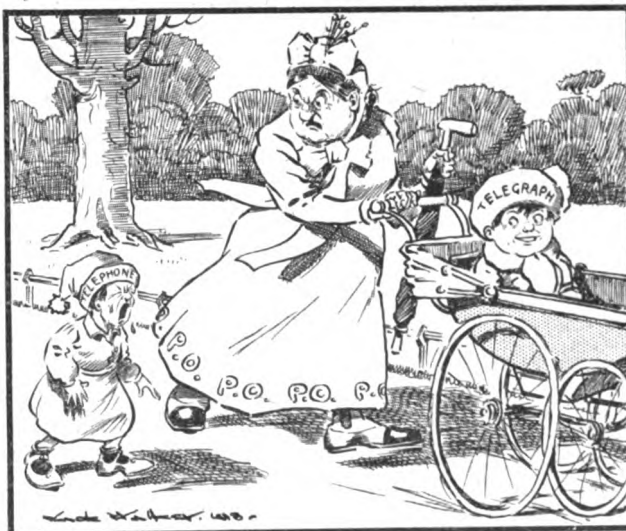
Several automatic and semi-automatic telephone exchanges will shortly be working in France. The postal authorities have decided to instal semi-automatic exchanges according to the American MacBerty system in Marseilles and Angers, apparatus for 7,500 lines in the former, and 1,400 in the latter case. It is intended to introduce this system into all new Paris exchanges if it comes up to expectations. The network in Nice is now being converted to the full automatic Strowger system, while another automatic exchange is under construction in Orleans.

A list of wireless stations published by the "Bureau des Welt-telegraphenvereins" gives the following informations: (1) Coast stations: Great Britain, 43, of which 37 Marconi and 6 other systems; Canada, 33, of which 31 Marconi, 2 other systems; Germany and German Colonies,

22, all Telefunken; France, 17, all systems other than Marconi or Telefunken; Italy, 19, all Marconi; Russia, 19, 15 Telefunken, and 4 Marconi; Brazil, 11, 5 Telefunken, 4 Marconi, and 2 other systems. The United States has over 142 coast stations. (2) Ship installations: Great Britain, 643, of which 15 Telefunken, 571 Marconi and 57 other systems; Germany, 302, all Telefunken, although 37 of them are given as partly Marconi; France, 203, 41 Marconi, 162 other systems; Italy, 123, all Marconi.

The Eastern Telegraph Co. announced on the 25th ult. that the Zante-La Cané (Crete) and the three cables between Zante and Patras were broken. Telegrams for Greece, excepting Zante, Corfu and Pyrgos could only be accepted via Malta-Zante at senders' risk and subject to delay.—Another possible route exists via Malta-Alexandria-Sitia-Syra at a rate of 2 francs per word.—The El Arich route was down beyond Beyreuth on the same day and was put right on the 26th ult.—With regard to communication with Mexico, it is cut to Amecameca de Mexico, Ascension de Chihuahua, Coyame, Chemase, Choapan, Carrizal de Michoacan, Cilas, Espila, Falomir, Guadeloupe de Chihuahua, Ixtlande Juarez, La Union de Guerrero, Matamoras, Izucar, Nazas, Ojitas de Chihuahua, Hacienda, Ojinaga, Petatlan, Cenoles, Quimichis, San Jose de Gracia, San Luis de la Loma, Yecpan de Galeana, Yizimin, Villa Alta, Valladolid de Yucatan, Lihuatanejo. All telegrams for the interior of Mexico are subject to delay.—Code and cipher are accepted for all places in Mexico.—On the 26th ult. communication with all places in the State of Morelos, Mexico, was interrupted.—Our advices on this day also state that the cable between Lemnos and Salonika was down, entirely cutting off the latter place by the Eastern routes.—The Bathurst-Bissao cable was repaired on the 27th February as well as one of the Zante-Patras cables, but traffic for Greece, excepting Zante, Corfu and Pyrgos, is still subject to delay via Zante.—The Greek Administration has agreed with Servia to join the lines between Salonika and Uskub.—Messages between Salonika and Europe only are transmitted over these lines.—The Eastern Co. on the 28th ult. repaired the second Zante-Patras cable, thus relieving traffic for Greece of delay via the Malta-Zante route.—From special sources we hear that the Galveston-Vera Cruz cable was down on 12th February last and also that the New York-Haiti cable of the French Co. was interrupted from 4th to 20th January last.—A ship's anchor was responsible for damage to one of the cables between Jamaica and Cuba, but was quickly repaired.—On 3rd inst. the via Fao and El Arich routes were down between Constantinople and Ismid.

Reproduced, with permission, from Monday's "Daily Graphic."



THE STEPMOTHER.

"Now, come on, you little brat; if you think I'm going to spend all my time looking after you, you're mistaken!"

# "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

## Specifications Published Feb. 27, 1913

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

2,442/12. **Electrostatic Alternators.** W. PETERSEN. The high harmonics which are formed when the machine runs light are made to circulate in resonating circuits in armature and field, so as to produce higher harmonics. The machines are asynchronous and may be made self-exciting. Thirteen figures.

2,468/12. **Incandescent Lamp Blackening.** B.T.-H. (*G.E.C., U.S.A.*). To prevent blackening of the bulb and the disintegration of the filament in drawn-wire lamps, a volatile compound of the filament material, which is unstable at the running temperature of the lamp, but stable and formed from its elements when colder, is inserted in the bulb. Many halogen compounds are suitable. All traces of water vapour must be eliminated and the pressure must be very low, generally less than 1/1,000 mm.

2,630/12. **Booster Connections for Battery Charge and Discharge.** To charge a battery at double its normal rate or for other purposes, with four boosters two armatures are connected between a pair of booster bus-bars connected to a D.P. double-throw change-over switch. Another two armatures are connected between two other booster bus-bars. Each pair of bus-bars is treated as the terminals of a single machine, and the two pairs are connected to a D.P. double-throw change-over switch. Three of these switches are used, therefore, and the armatures may be put all in series, all in parallel, or two in series and two in parallel. Three figures.

2,734/12. **D.-C. Dynamos.** BROWN, BOVERI. Stable working of self-excited D.-C. machines is effected by arranging for the ratio of magnetic material practically saturated at low values of total flux to the whole cross section of the magnetic path between 1:4 and 1:10, or even 1:12. This may be effected by adjusting the air gap or the contour of the pole faces and armature teeth. Six figures.

2,746/12. **Engine Starter.** H. LEITNER. A fixed and a free-wheel pulley or gear-wheel are arranged on the dynamo shaft and similar wheels on the engine shaft. The fixed wheel on each shaft engages with the free-wheel on the other. The two free-wheels are free in opposite directions. The gear through which the motor drives the engine is much higher than the reverse gear. Two figures.

3,099/12. **Double-ended Straight Filament Incandescent Lamps.** A. W. BEUTTELL and J. A. MANNERS-SMITH. A number of filament sections are arranged end to end. At least one support of each filament end is movable and tensions each filament section. Ten figures.

3,397/12. **Enclosed Focussing Flame Arcs.** CROMPTONS' and C. CROMPTON. The gases are withdrawn from the top of the arc enclosure through circulating passages and long up-cast pipes to the condensing chambers a considerable way up the lamp. They return by direct down-cast pipes to the bottom of the arc enclosure. Three figures.

4,783/12. **Incandescent Lamp.** C. F. STILLMAN. The filament is arranged at right-angles to the spider stem. This lamp was illustrated and described in *ELECTRICAL ENGINEERING*, Vol. VIII., p. 231, May 2nd, 1912, in an article on Earl's Court Exhibition.

6,922/12. **Safety Alarms for Electric Trains.** SIEMENS BROS. DYNAMO WORKS and F. LYDALL. Instead of the brakes being applied, should the driver release his hold of the master controller, leaving the reversing drum in an operative position, pressure is applied to an alarm circuit to the guard's van or other points on the train. Three figures.

7,133/12. **Petrol Electric Vehicles.** H. PIEPER. Petrol engines drive direct on to the axles, and are assisted in times of stress by electric motors supplied from engine-driven dynamos. A buffer battery is also carried. Speed regulation is effected by adjusting the dynamo pressure, by adjusting the motor field, or by using the battery instead of the dynamo. Three figures.

12,784/12. **Repairing Incandescent Lamps.** M. DU MOULIN. A reinforcing ring of soft, easily fusible glass is applied to the edges of the severed lamp bulb when the joint is remade. Two figures.

13,233/12. **Petrol Electric Vehicles.** H. PIEPER. As applied to railway trains, each motor-car is a complete unit with engines, dynamos, motors, and battery. For starting, each car is connected as a complete unit, but for running, the electric machines and batteries are connected in series. The change is effected when speed regulation by field variation would be started. It is carried out by magnetic clutches between the motors and the driving wheels. Speed regulation may also be effected by varying the number of batteries in circuit. Seven figures.

14,654/12. **Metal Filament Wire Drawing.** K. FARKAS. The wire is heated electrically, and, while hot, is drawn in one direction. It is then reheated and drawn finer in the opposite direction. Three figures.

## Specifications Published To-day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, E.C., at the price of 8d. each, post free.

Names in italics indicate communicators of inventions from abroad. Summaries of some of the more important of these patents will appear in our next issue.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** FOSTER and POCKLINGTON [Variable-speed dynamo control] 3,105/12; COOPER [Resistance manufacture] 3,325/12; TURNER [Insulating of apparatus] 5,856/12; LEITNER [Variable-speed dynamo control] 11,175/12; DIAZ and AZAROLA y GRESILLON [Preventing theft of electrical energy] 11,259/12; SMITH and SCHUTER [Covering conductors with plastic material] 22,534/12.

**Dynamos and Motors:** B.T.-H. (*G.E.C., U.S.A.*) [A.C. motors] 9,210/12; PINTSCH'S ELEC. MFG. Co. and VIDAL [Brush holders] 15,471/12.

**Electrometallurgy and Electrochemistry:** BOULT (*Dynamit A.-G.*) [Gas-reaction furnace] 3,342/12; PLAUSON and TRISCHENKO [Electrolytic production of ductile iron] 10,882/12; GES. FÜR ELEKTRO-OSMOSE and ILLIG [Apparatus for electro-osmose] 29,826/12.

**Switchgear, Fuses, and Fittings:** SHELTON (*Sächsische Gruppenwechselschalter*) [Switches and connectors] 3,590/12, and 30,024/12; WYNNE [Switches] 5,462/12; B.T.-H. & GARTON [Electro-magnetic switches] 5,576/12; BYNG and TAYLOR [Conduit fittings] 6,052/12; WILSON and CANDOLITE Co. [Candle lamp-holder] 7,729/12; TROOD and DALE [Connectors] 9,911/12; CURTIS [Regulator] 16,938/12.

**Telephony and Telegraphy:** BROWN [Relays] 27,953/11; HEYLAND [Production of high frequency currents] 3,555/12; SCHIESSLER [Submarine cable and long-distance overhead] 4,061/12; GOLDSCHMIDT [Parallel working of microphones] 15,915/12; TELEPHONFABRIK A.-G. [Secret intercommunication telephones] 16,084/12.

**Traction:** DESCHAMPS [Railways] 3,123/12; KONIG [Indicating position of vehicles on railways] 17,909/12.

**Miscellaneous:** KROPFMAN [Dental engines] 7,643/12.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Distributing Systems:** BROWN, BOVERI [Regulation] 27,069/12. **Electrometallurgy:** HELFENSTEIN [Furnace: electrodes pass through charge container, also details of gas exit] 2,577/13.

**Ignition:** "MAFAM" Motor APPARATE GES. [Magnet] 1,093/13. **Switchgear, &c.:** VON KERCKHOVEN [Dynamo regulators] 1,512/13.

**Telephony:** SIEMENS & HALSKE [Exchanges] 3,132/13. **Miscellaneous:** SMITH [Electrocuting animals] 2,152/12.

The following Amended Specifications may now be obtained. **Incandescent Lamps:** B.T.-H. (*G.E.C., U.S.A.*) [Treatment of tungsten for wire drawing] 21,513/06.

**Telegraphy:** S. G. BROWN [Relays] 20,451/11.

## Amendment to Specification

6,487/12. **Incandescent Lamps.** A. C. HYDE. As a result of the extended investigation under Section 8, this Specification has been amended. It deals with the mounting of continuous filaments (see *ELECTRICAL ENGINEERING*, Vol. VIII., p. 492).

## Opposition to Grant of Patent entered

27,521/11. **Moving Targets.** J. B. LE MAITRE. The target is stopped on the shot being fired by a relay controlled either by the sound-waves due to the firing or else by the circuit of a wireless transmitter being completed by the movement of the trigger of the gun, the waves so emitted striking a detector in the relay circuit. A special screen is also described.

## Expired Patents

The following are the more important Patents that have become void through non-payment of renewal fees.

**Distributing Systems, Cables and Wires, &c.:** T. HARDEN and AMALGALINE, LTD. [Joining lead-covered cables] 25,845/06.

**Dynamos and Motors:** M. WALKER [Rotary field magnet design to keep field coils in position] 24,351/04; B.T.-H. (*G.E.C., U.S.A.*) [Reducing pressure between adjacent commutator segments in high-speed machines with multiplex windings] 24,992/07; [Core construction for compensating windings, &c.] 25,116/07; A. SCHERBIUS [Speed control of asynchronous motors, keeping a high-power factor] 25,305/07.

**Electrometallurgy:** W. EVANS (*A.E.G.*) [Welding] 25,272/07. **Ignition:** ELECTRIC IGNITION Co. and F. H. HALL [Tremblers for induction coils] 25,770/06.

**Traction:** E. W. TIMMIS [Electro-magnetic point and signal mechanism] 22,808/01; W. R. SYKES [Cutting in or out an intermediate signal cabin] 24,607/03; B.T.-H. (*G.E.C., U.S.A.*) [Switch for motor of semaphore signal] 24,993/07; E. H. COCKSHOTT [Electro-magnetic track brake] 25,026/07.

## LOCAL NOTES

**Chatham: Street Lighting.**—The new street electric lighting scheme which has been carried out by the Kent Electric Power Co. was inaugurated last week.

**Darwen: New Plant.**—A new 1,250-k.v.a. 3,000-volt steam turbo-alternator which has been installed at a cost of £5,250 was started up by the Mayor last week. The set has been supplied by Messrs. Dick, Kerr and Co. The installation of this plant has involved the ordering of a 300-kw. static transformer and a 300-kw. rotary-converter, which have been supplied by the British Westinghouse Co.; a 200-k.v.a. motor-generator, which has been supplied by Dick, Kerr and Co., and a new high-tension switchboard, supplied by Messrs. Ferranti, Ltd.

**Dundee: New Supply Station.**—The Dock Street Supply Station is now completed, and is capable of relieving the Dudhope Crescent Road station to the extent of 1,500 kw. Specifications have been issued for the steel-work and chimney for the extensions at the power station, Carolina Port.

**Eton: Electric Cooking.**—Some remarkable figures were produced at the last fortnightly meeting of the Board of Guardians in relation to the saving made in the use of electricity for electric cooking and electric lighting. When gas was used for lighting and cooking the total annual cost was £228, whereas since electricity has been installed for both these purposes the total cost has been reduced to £78, showing a total saving of no less than £149. Further, it is the emphatic opinion of all concerned that the lighting and the ventilation in all the buildings has improved very considerably. The above figures, by the way, represent to some extent the use of carbon filament lamps, so that a considerable further saving may be anticipated when the use of metal filament lamps becomes general.

**London: Supply to Olympia.**—The Fulham and Hammersmith Borough Councils have entered into an agreement for seven years under Section 3 of the London Electric Supply Act, 1908, whereby a separate duplicate system of lighting by electricity will be provided for Olympia. For the purpose of giving this supply, the Fulham Council will lay a cable, supply a feeder-box belonging to the Hammersmith Council, from which point the latter will lay the duct to their substation in Olympia, the necessary cable being laid in it by the Fulham Council. The supply will be single-phase, A.C., at 2,800 volts, and the Hammersmith Council will pay the Fulham Council 2d. per unit, measured at the Olympia substation, the minimum payment being £100 per annum.

**Sunderland: Obsolete Plant.**—A special meeting of the Electricity Committee is to be called to consider tenders for the purchase of the obsolete machinery at the Dunning Street power station. As notified in our advertisement columns a few weeks back, the Corporation are desirous of selling the whole of the plant at Dunning Street.

**York: Lighting Tariff.**—As from March 31st, the flat rate for lighting supply will be 8½d. per unit up to 4,000 units per quarter, with special arrangements for supplies in excess of that quantity.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

[Notes of Contracts Open are not repeated under this heading week by week until the last date for receiving tenders, but are only inserted once.]

## Generating Stations, Sub-Stations, Mains, &amp;c.

**Aylesbury.**—The question of electric supply is receiving considerable attention. The Council obtained a provisional order in 1899, but this, together with another obtained subsequently, was revoked by the Board of Trade because the Council could not make up its mind how to proceed. A further order has since been granted, but the position seems very much the same now. A poll of the town, however, has been taken with the result that 1,452 votes were accorded in favour of the Council undertaking the scheme and 439 against.

**Barking.**—The Electrical Engineer has been instructed to prepare a report upon extensions at the generating station.

**Bispham.**—A Local Government Board inquiry has been

held concerning a loan of £8,178 for the Council's electricity undertaking.

**Bombay.**—Bombay and Baroda Railway Co. Transformer and motor-generator. March 14th. London Office, 110 Bishopsgate, E.C.

**Bridgend.**—Steam alternator. Borough Electrical Engineer. March 21st.

**Darwen.**—A loan for a cable at an estimated cost of £1,700 is to be applied for to supply the Darwen Spinning Company's mill.

**Egypt.**—Diesel-engine-driven pumping station at Baltim. Sir A. L. Webb, K.C.M.G., Queen Anne's Chambers, S.W.

**Fleetwood.**—An extension scheme involving an expenditure of £7,170 has been inquired into.

**Galashiels.**—Mr. T. C. Parsons, late Burgh Electrical Engineer at Govan, has been retained to report as to an electric lighting installation here.

**Haslingden.**—Loans of £3,750 and £1,500 have been granted for cables and services.

**Hastings.**—A Local Government Board inquiry has been held regarding loans of £4,000 for plant; £500 meters; £1,500 services; £500 transformers, and £1,600 for certain alterations of plant at the electricity works.

**Huddersfield.**—Two boilers, economiser, steam pipes, &c. Borough Electrical Engineer.

**London: Hampstead.**—A loan of £4,100 is to be taken up for extensions.

The Finance Committee of the L.C.C. have sanctioned a loan of £10,483 for electrical extensions.

**Islington.**—The Finance Committee of the L.C.C. have sanctioned loans of £5,500 and £8,486 for mains and transformers.

**Newport, Mon.**—The Borough Electrical Engineer recommends capital expenditure upon new plant and alterations to existing plant amounting to £12,794.

**Nottingham.**—Following the recent report as to the inadvisability of attempting to use some local water-power for generating electricity, the Corporation are proposing to install an exhaust steam turbine at the St. Anne's Well Road generating station.

**Shipley.**—A £14,000 extension scheme has been reported upon by the Electrical Engineer.

**Swinton.**—One 25-kw. transformer and switchboard; also mains. Clerk. March 10th.

**York.**—One 3,000-kw. turbo-alternator with condensing plant and switchboard; two water-tube boilers, &c.; storage battery; high-tension cables. City Electrical Engineer. March 10th.

## Wiring

The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.

**Ashton-under-Lyne.**—£30,000 extensions to infirmary.

**Cardiff.**—Technical Institute. Cathays Park. Director of Education, City Hall.

**Glasgow.**—New factory, Earl's Park. Messrs. Wallace, Scott and Co.

**Llandudno.**—Proposed enlargement of Assembly Room. Town Hall.

**London: L.C.C.**—178 lighting points at Victory Place elementary school, Walworth. March 19th. Chief Engineer.

**Newcastle-on-Tyne.**—New baths.

**North Shields.**—Extensions at Nurses' Home. Architect, W. Stockdale, 81 Howard Street. March 12th.

**Portsmouth.**—Mr. R. J. Wallis-Jones is advising the Guardians with regard to an electric lighting installation.

**Prestatyn.**—Electric heating installation, Victoria Hall. Mr. Box.

**Rochdale.**—Headquarter buildings for Territorials. Surveyor, East Lancashire Territorial Association, Town Hall Chambers.

**Stockport.**—New Grammar School. Architect, R. H. Spalding, 36 and 37 King Street, London, E.C.

**Swindon.**—County Police Station. Surveyor. March 10th.

**Wigan.**—Proposed new girls' high school.

## THE RECORD ELECTRICAL Co., Ltd.

LONDON OFFICE:  
CAXTON HOUSE,  
WESTMINSTER, S.W.  
Telephone  
3007 Victoria.  
Telegrams & Cablegrams:  
"Infusion,  
London."

MEASURING  
INSTRUMENTS.  
RECORD'S PATENT.

WORKS:  
BROADHEATH,  
MANCHESTER.  
Telephone  
164 Altrincham.  
Telegrams & Cablegrams:  
"Infusion,  
Altrincham."

Write for Prices & Particulars.

## Miscellaneous

**Birmingham.**—Additional tramway rolling stock. General Manager. March 11th.

**Heston and Isleworth.**—A twelve months' supply of stores for Electricity Department. Borough Electrical Engineer. March 8th.

**Liverpool.**—A twelve months' supply of electrical fittings for premises of Liverpool Select Vestry. Clerk, Parish Offices, Brownlow Hill.

**London: War Office.**—Firms desiring to tender for cables, electrical stores, scientific instruments, &c., are requested to communicate to the Director of Army Contracts. No application is necessary from firms whose names are already on the War Office lists.

**L.C.C.**—The estimated cost of the construction of the tramways from Catford to Southend is £61,510, and it is proposed to put the work in hand at once.

**South Shields.**—A twelve months' supply of stores for the electricity undertaking. Borough Electrical Engineer. March 10th.

**Swinton.**—A twelve months' supply of stores for Electricity Department. Clerk. March 10th.

## APPOINTMENTS AND PERSONAL NOTES

Dr. A. R. Forsyth, late Sadlerian Professor of pure mathematics at Cambridge, has been appointed Chief Professor of Mathematics at the Imperial College of Science and Technology, South Kensington.

A recommendation has been made that the salary of Mr. W. Fennell, the Borough Electrical Engineer at Wednesbury, should be increased by £25 per annum.

The salary of Mr. J. H. Bowden, Borough Electrical Engineer at Poplar, has been increased from £600 to £700 per annum.

Mr. C. W. Bentley, at present Assistant Manager of the Musselburgh Electric Tramways Co., has been appointed in succession to Mr. A. A. Watkins, who has received an appointment in the Colonies.

Mr. P. Taylor has been appointed to succeed Mr. J. Boyce as Chief Assistant Engineer to the Darwen Electricity Works, Mr. Boyce having gone to Todmorden.

Mr. Justice Parker, who is well known to our readers in connection with many important electrical patent cases, and who is also Chairman of the Special Committee now investigating wireless telegraph systems, has been appointed a Lord of Appeal, to succeed the late Lord Macnaghten.

The following increases of salaries in the York Electricity Department are recommended:—Mr. J. W. Hame, City Electrical Engineer, from £500 to £550; Mr. E. J. Nichols, Chief Assistant Engineer, £170 to £180, maximum £200; Mr. T. R. Stancombe, Installation Superintendent, maximum £150.

## TENDERS RECEIVED AND ACCEPTED

**Birmingham.**—The contract for the supply of "Tantalum" Traction lamps for the lighting of the Corporation tramcars has been placed with Messrs. Siemens Bros. Dynamo Works. It is anticipated that some 20,000 lamps will be required.

**London: L.C.C.**—The following tenders have been received for rotary converters at the Shoreditch sub-station: Dick, Kerr and Co., £8,022; British Westinghouse Co., £8,713; General Electric Co., £9,145 10s. The estimate of the Chief Officer was £7,300, and the tender of Dick, Kerr and Co. is recommended for acceptance.

The following tenders have been received for the wiring of the Camberwell and Cressy Road car sheds: Williams and Bach, £2,139 11s.; Electrical Installations, £2,146; G. E. Taylor and Co., £2,314 11s.; G. Weston and Sons, £2,572 4s. Lund Bros. and Co., £2,623; Leonard G. Tate and Co., £2,682 14s.; Tilley Bros., £2,696 13s.; W. C. Tackley and Co., £3,077 17s. The tender of Williams and Bach is recommended for acceptance.

The tender of Siemens Bros. Dynamo Works at £7,800 has been accepted for 125,000 drawn-wire metal filament traction lamps. The Council also invited tenders from the General Electric Co. and the British Thomson-Houston Co., both of

whom quoted £10,237 10s., and Siemens Bros. Dynamo Works also put in an alternative tender at the same price.

The following tenders have been received for 880 yds. of high-tension cable: Siemens Bros. and Co., £248 5s.; W. T. Henley's Telegraph Works, £251 15s.; Western Electric Co., £251 15s.; British Insulated and Helsby Cables, Ltd., £253 6s.; W. T. Glover and Co., £254 2s. Messrs. Siemens Bros. and Co.'s tender has been accepted.

**Hammersmith.**—A contract has been placed with Messrs. Chamberlain and Hookham for all sorts of A.C. meters from 3 to 500 amperes.

**Rochdale.**—For the extensions at the electricity works the following tenders are to be recommended for acceptance: turbo-alternator, W. H. Allen, Son and Co.; steam turbo-alternator, J. Howden and Co.; motor-alternator, General Electric Company.

## MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. G. Smith and Son, 5 Philpot Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night, was £69 to £69 10s. (last week, £68 to £68 10s.).

**Long Life of a Metal Filament Lamp.**—The British Westinghouse Co. send us a copy of a letter from a customer stating that a 50-c.p. 220-volt Auriga lamp has been in use for about eighteen hours a day since February, 1910, that is, about 20,000 hours, and is still running.

**Change of Address.**—The Dictaphone Co. (late of 195 Oxford Street, W.), have moved into commodious offices and showrooms at Kingsway House, Kingsway, W.C.

**Staff Ball.**—The annual staff ball of Bruce, Peebles & Co. was held at Edinburgh on Friday last. The opportunity was taken of presenting Mr. Lee Murray, who has just retired from the position of general manager, with an illuminated album, signed by about 700 members of the staff and works.

## COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &amp;c.

**Waste Heat and Gas Electrical Generating Stations.**—A dividend of 8 per cent. for the year has been declared. The company's new stations at Port Clarence and Ayresome were finished during the past year, and another at Bowden Close was put into operation in September. The directors have under consideration the erection of further plants in their district.

**County of London Electric Supply Company.**—A final dividend making 6 per cent. for the year has been declared.

**W. T. Henley's Telegraph Works.**—At the annual meeting last week, Mr. George Sutton, the Managing Director, said that last year's turnover represented the largest in quantity that the Company had ever had. Quite a satisfactory feature was that this was not due to any abnormal contracts. With regard to orders on the Company's books, one was for the construction and laying of the cables for the electrification of a portion of the Central Argentine Railways, and it amounted to nearly £100,000. This was the largest order of its kind that had ever been placed.

**British Electric Transformer Co.**—Very satisfactory progress was reported at the annual meeting last week, when Mr. A. F. Berry presided. The volume of work done in 1912 was considerably in excess of that turned out in 1911, and particularly has the foreign and colonial work increased. Some 28 supply authorities are now hiring out "Tricity" cookers.

**Bruce Peebles & Co.**—At the annual meeting last week Mr. F. E. Andrews, who presided, said that the loss on the year's working, already referred to in these columns, was more apparent than real, and did not affect the cash position to any appreciable extent. During the course of his speech he made some strong comments upon the effect of the National Insurance Act and the general tendency of present-day legislation, which, he said, was placing burdens upon industry, and it was difficult to see what recompense, either direct or indirect, manufacturers could possibly derive from it.

**The Strike at Evershed and Vignoles' Works.**—This strike, which arose out of the dismissal of a workman for reading instead of going on with his work, has been settled by the withdrawal by the men of the demand for his reinstatement. The company has undertaken to take back the strikers into its employ.

# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 324 [Vol. IX., No. 11]  
*All rights reserved.*

THURSDAY, MARCH 13, 1913.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES AND TECHNICAL COLLEGE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

Other Advertisement Rates on Application.

Latest Time for Receiving

Letters for Insertion, Tuesday first post.

Small Advertisements and Official Announcements, Wednesday first post.

Displayed Advertisements, Tuesday first post.

Corrections in Standing Advertisements, Monday first post.

All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 203-205, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Circling, Fleet, London." Telephone No.: 5509 Holborn.

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## CONTENTS

	PAGE
SUMMARY .....	139
Arrangements for the Week .....	140
Recent Developments in the Street-Lighting of Manchester .....	141
ELECTRICAL ENGINEERING LITERARY SECTION:	
New Publications .....	143
Reviews of Books .....	143
Electrical Engineering Book-list .....	ix
Questions and Answers by Practical Men .....	149
A Bench Grinder .....	150
New Incandescent Lamps .....	150
Slow Break Switches .....	150
A New Semi-Indirect Fitting .....	150
Three-phase Extensions at Marylebone .....	151
Catalogues and Pamphlets Received .....	151
Patent Record .....	152
Electric Traction Notes .....	153
Telephony and Telegraphy (Including Wireless) .....	153
Local Notes .....	153
Tenders Invited and Prospective Business .....	155
Tenders Received and Accepted .....	156
Miscellaneous Business Notes .....	156
Companies' Meetings, Dividends, Reports, &c. ....	156

## SUMMARY

A PAPER by Mr. S. L. Pearce and Mr. H. A. Ratcliff, before the Institution of Electrical Engineers, dealt with the successful trials of electric street lighting in competition with high-pressure gas at Manchester, and described some effective experiments with graded frosting of globes for the purpose of improving the uniformity of illumination. Several interesting points were raised in the discussion in London: the enormous saving in labour by the use of lowering gear, the false economy of cheap carbons, the reasons for the enormous

discrepancy between rated and actual candle-powers of high-pressure gas lamps, and the question of dioptric globes. The Paper has also been discussed at Manchester. (Page 146.)

OUR "ELECTRICAL ENGINEERING Literary Section" contains a list of new publications, reviews of a number of technical books, and gives a selected list of recommended works on all branches of electrical engineering. (Page 143.)

A PROBLEM in connection with efficiencies of gearing is discussed in our "Questions and Answers" columns. (Page 149.)

A CONVENIENT form of bench electric grinder, an incandescent lamp with a diffusing globe, and a new semi-indirect lighting fitting are described in short illustrated articles. (Pages 150.)

THE Marylebone Borough Council have passed recommendations for the purchase of converters, condensers, pumps and switchgear for their three-phase extensions. The new steam turbine plant, which will have a steam economy 35 per cent. in excess of that of the existing machines, installed six years ago, will be used for the bulk of the load, the continuous-current plant being employed only on peak and as reserve. (Page 151.)

AMONG the subjects dealt with in the specifications published last week by the Patent Office are train or car lighting dynamos with cut-out switches worked by the main field; a system of automatic driverless railways by J. J. Deschamps; a high-frequency generator invented by A. Heyland; and a variable-speed A.C. motor with shifting brushes patented by the B.T.-H. Co. (Page 152.)

SERIOUS corrosion of the rails and overhead construction has been experienced in the Simplon tunnel. We also refer in our "Electric Traction Notes" to some further schemes of electric traction in Switzerland, and to opinions expressed in Germany on the Melbourne electric traction scheme. (Page 153.)

THE Bognor electric lighting scheme is being proceeded with, and supply is to be available in July.—A protest has been made against the allocation of £1,200 from electricity profits to relief of rates at Swansea.—In view of the adverse balance on the past year's working, the price of current is to be increased at Walsall.—An inquiry is being held into an application by the Corporation and the Gas Co. for a Provisional Order at Truro. (Page 153.)

LOANS are to be applied for at Bristol (£25,000); Colchester (£7,660); Peterborough (£7,000); Walsall (£4,840); Stoke-on-Trent (£4,570); and Wigan (£3,000).—Additional generating plant is to be installed at Southampton.—A loan of £8,052 for extensions has been sanctioned at Darlington. (Page 155.)



## ARRANGEMENTS FOR THE WEEK

(TO-DAY) THURSDAY, MARCH 13TH.

*Institution of Electrical Engineers.*

8 p.m. "The Power Supply on the Rand," by A. E. Hadley.

*Institution of Electrical Engineers: Dublin Section.*

8 p.m. At Royal College of Science. "Recent Developments in the Application of Electricity to the Textile Trades," by S. F. Crowley.

FRIDAY, MARCH 14TH

*Physical Society of London.*

5 p.m. At University College, Gower Street. The Papers down for reading include "Some Oscillograms of Condenser Discharges and a Simple Theory of Coupled Circuits," by Professor J. A. Flemming, who will also give an exhibition of Braun Cathode-Ray Tubes.

*Institution of Electrical Engineers: Students' Section.*

7.30 for 8 p.m. At "Tricity House Restaurant. Informal Dinner.

*South-Western Polytechnic Institute, Chelsea.*

8 p.m. Presentation of prizes and certificates by Sir Alfred Cripps. At 9.15 p.m. the building will be open to public inspection.

SATURDAY, MARCH 15TH.

*Batti-Wallahs Society.*

Annual Dinner.

MONDAY, MARCH 17TH.

*Institution of Electrical Engineers: Newcastle Students.*

7.30 p.m. At Armstrong College. "Regulation of Pressure and Continuity of Supply of Electricity under various Aspects," by E. Wyatt.

TUESDAY, MARCH 18TH.

*Institution of Electrical Engineers: Manchester Students.*

7.30 p.m. At Municipal School of Technology. Annual General Meeting.

*Institution of Electrical Engineers: Scottish Section.*

8 p.m. At 207 Bath Street, Glasgow. "Recent Developments in the Street-Lighting of Manchester," by S. L. Pearce and H. A. Ratcliff.

*Institution of Civil Engineers.*

8 p.m. At Institution of Mechanical Engineers. Further discussion on "Notes on City Passenger-transportation in the United States," by G. D. Snyder.

WEDNESDAY, MARCH 19TH.

*Association of Mining Electrical Engineers:  
North of England Branch.*

Paper by F. Milburn.

## The London Electrical Engineers.

(TO-DAY) THURSDAY, MARCH 13TH. C. Company.—Recruit Training, 7 to 10 p.m.; Company Training, 7 to 10 p.m.

FRIDAY, MARCH 14TH. D. Company.—Company Training, 7 to 10 p.m.

SATURDAY, MARCH 15TH. Headquarters opened for Regimental business from 10 a.m. till 12 noon.

MONDAY, MARCH 17TH. A. Company.—Recruit Training, 7 to 10 p.m.; Company Training, 7 to 10 p.m.

TUESDAY, MARCH 18TH. B. Company.—Company Training, 7 to 10 p.m.

THURSDAY, MARCH 20TH. Easter Camp.—Parade at Headquarters at 12.45 p.m.

C. Company.—Recruit Training, 7 to 10 p.m.; Company Training, 7 to 10 p.m.

FRIDAY, MARCH 21ST. D. Company.—Company Training, 7 to 10 p.m.

SATURDAY, MARCH 22ND. Headquarters open for Regimental business from 10 a.m. till 12 noon.

**Fire.**—A somewhat serious fire occurred at the Sphere Engineering Works of Engineering and Arc Lamps, Ltd., St. Albans, on Saturday night. The alarm was given by one of the employees at the North Metropolitan Electric Supply Station next door, at nine o'clock. The cause of the outbreak has not been discovered. The fire apparently originated at the south-east corner of the building, and three gables were completely burnt out for two-thirds the length of the works, and the coil-winding department was also completely destroyed. The shafting was much injured, but damage to the machinery is not extensive, the principal loss being suffered by finished stock and raw material. The damage to the stock, building, and contents is about £4,000, which is fully covered by insurance. It is hoped to have all the machines, &c., working within five weeks, and although part manufacture has already been resumed, yet the company request the indulgence of clients for delays in delivery.

**Institution of Electrical Engineers: Western Section.**—At the Annual General Meeting, which was held on Monday last at Cardiff, Mr. H. Faraday Proctor (Engineer and General Manager, Corporation Electricity Dept., Bristol) was elected Chairman and Mr. D. E. Roberts (Cardiff) Vice-Chairman. The following were elected to seats on the Committee, from which Mr. A. Ellis (Tramways Manager, Cardiff) has found it necessary to resign:—Prof. D. Robertson (Merchant Venturers' Technical College, Bristol), Messrs. H. D. Munro (City Electrical Engineer, Exeter), E. G. Okell (Borough Electrical Engineer, Plymouth), F. Tremain (Superintending Engineer P.O. Telegraphs, Bristol), A. J. Newman (Mains Superintendent, Bristol), A. B. Randall (Resident Engineer, Salisbury Electric Light and Supply Co., Ltd.), and W. A. Scott (Cardiff).



There would be less risk of accident if Mr. Pearce and Mr. Bailey were to charge more nearly in parallel.

## RECENT DEVELOPMENTS IN THE STREET LIGHTING OF MANCHESTER

OUR readers have already been made acquainted with the "experimental" street lighting recently carried out in Manchester, and the competition between gas and electric street lighting in that city (ELECTRICAL ENGINEERING, March 7, 1912, p. 115, and Oct. 31, 1912, p. 594).

In a paper presented to the Institution of Electrical Engineers, Mr. S. L. Pearce (City Electrical Engineer, Manchester) and Mr. H. A. Ratcliff have given some further particulars, describing, particularly, experiments carried out with the globes of the arc lamps in order to obtain the greatest possible uniformity of illumination.

It will be remembered that the arc lamps are 550-watt flame arc lamps, mostly centrally hung from span wires; they were originally placed 28 ft. from the ground, but the height was reduced to 27 ft. 6 in. The former of the two articles mentioned above described and illustrated the initial

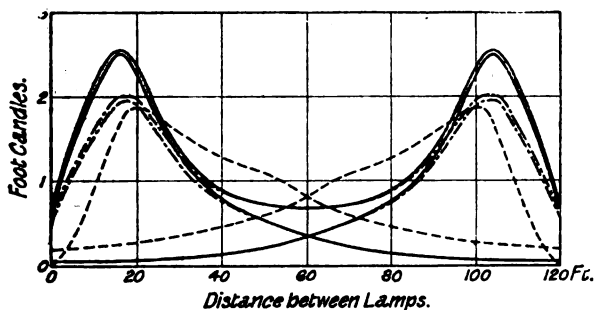


FIG. 1.

Tests with the First Experimentally-obscured Globes.

change made in the spinnings and the shape of the globes so as to obtain more uniform lighting, and the curves which we now give show the results of the further experiments described in the paper. The photometric measurements were carried out on the lamps in the streets and a flicker photometer was employed.

In taking the tests the authors found incidentally that the high-pressure gas lamps gave a steadier light than the arc lamps, but, although this was very noticeable in the flicker photometer, it could hardly be detected with the naked eye. On the other hand, it was found that the gas lamps varied enormously in candle-power from day to day, and the candle-power of a particular three-light lamp might vary at least 50 per cent. before the mantles were renewed. Among other disadvantages of the gas lamps were (a) extensive and highly dangerous leakage of high-pressure gas; (b) the detrimental effect of a foggy or heavily smoke-laden atmosphere on the mantles, resulting in a serious diminution of candle-power just at a time when it is most required; (c) partial and occasionally complete failure in frosty weather; and last, but not least, as shown by the figures already published, the cost of the gas lighting was by far the greater.

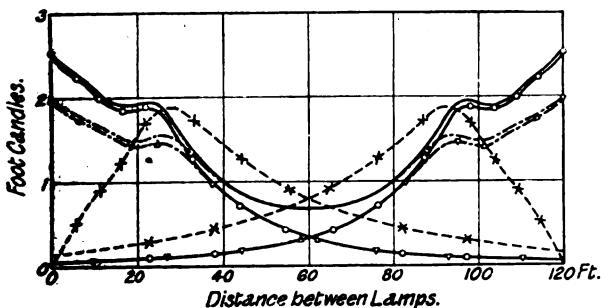


FIG. 2.

Tests with the Latest Type of Outer Globe, having a Graded Frosting.

The reports by Mr. Haydn Harrison and Mr. Abady, already published, very closely confirmed the values of candle-power and illumination claimed by the Corporation Electricity Department as a result of the tests made by their own staff, and both series of tests showed that the gas lamps were not giving anything like the candle-power claimed by the manufacturers.

This latter result is by no means an isolated one, for the authors give figures of tests of other high-pressure gas lamps in which similar enormous discrepancies, amounting to 50 per cent. are apparent between the rated and actual

candle-powers. Tests with a luminometer also established without question the greater penetrative power of the light from the arc lamps in foggy weather.

We now come to the part of the paper dealing with the experiments and tests made in connection with the arc-lamp globes, which are of considerable interest, and importance. Figs. 1 and 2 may be compared to show the advantages obtained by the graded frosting of the globes, to be described later. Both figures relate to the lamps in Portland Street, Manchester; the full-line curves in both represent illumination on a horizontal plane 8 ft. 3 in. above ground level, the dotted curves are for the illumination on a vertical plane, and the chain-dotted curves the illumination on the ground. The shadows immediately under the lamps, due to the ash trays, are clearly indicated in Fig. 1, and their absence in Fig. 2. By the original alteration in the spinnings and the shape of the globe in the lamps in Portland Street, the candle-power at  $20^\circ$  below the horizontal was enormously increased, but it may be mentioned that the shape of the polar curve and the value of the candle-powers so obtained was very similar to that from the lamps of a different make used in Piccadilly; polar curves of the latter are shown in Fig. 3. Fig. 4 shows the polar curve for the 11-ampere lamp fitted with the clear inner and outer globes. This curve possesses many excellent features, but at the same time, the authors remarked, it can be modified with considerable advantage according to the class of work for which the lamp is intended to be used. For street-lighting work,

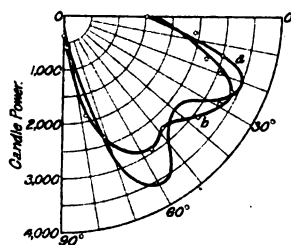


FIG. 3.

Polar Curve for 550-watt Flame Arc Lamp, as used in Piccadilly.  
a. With Clear Globes.  
b. With Slightly Opalescent Outer Globes.

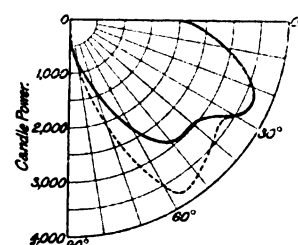


FIG. 4.

Polar Curve for 550-watt Flame Arc Lamp, as used in Portland Street. (The dotted portion shows the effect of original experimental obscuration.)

the upper portion of the curve between  $15^\circ$  and  $25^\circ$  from the horizontal is of most importance, but the portion between the  $40^\circ$  and  $65^\circ$  rays could be reduced with advantage. The absence of appreciable candle-power between  $80^\circ$  and  $90^\circ$  is a result of the rather pronounced shadows cast by the ash-trays. The first attempt to reduce the distribution of light between the  $40^\circ$  and  $65^\circ$  rays, and at the same time to improve the distribution in the neighbourhood of  $20^\circ$  below the horizontal, was by the use of dioptric globes. The results were not entirely successful, and seemed to demonstrate a rather objectionable feature of dioptric globes, namely, the strongly defined optical centre, in consequence of which the light distribution is very considerably distorted if there is any appreciable change in the arc position. Attempts were then made to modify the shape of the polar curve by suitable obscuration of the outer globes. The necessary obscuration was at first obtained by the application of whitening on the inside of the lower portion of the outer globe, and the results obtained were rather remarkable. Unfortunately, owing to the nature of the obscuration, it was a very difficult matter to do two or more globes exactly alike, and consequently reliable test figures were only obtained with considerable difficulty. Owing to the comparatively opaque and very materialistic nature of the obscuration, the effect was merely to cut down the light between the  $40^\circ$  and  $80^\circ$  rays, there being otherwise very little diffusion or alteration in the shape of the polar curve, although slight traces of reflection were apparent which had the effect of improving somewhat the candle-power nearer the horizontal. The shadows under the lamps were not greatly reduced. There was a very great improvement in the curve of illumination on the horizontal plane, and the glare was appreciably reduced. Globes obscured in this manner have actually been in use in Portland Street for over six months. Endeavours were then made to obtain from the globe-makers suitably obscured globes, but the greatest difficulty was experienced in obtaining exactly what was required. Apparently the

makers were able to supply globes completely opalescent, sand-blasted, or acid-etched, and even globes so treated on only a portion of their surface; but no manufacturer would undertake to give a graded effect, at any rate on a diffracting globe, although a flashed opalescent globe with a graded effect on the lower portion was eventually obtained.

The experimental etching of globes was therefore undertaken. The process employed was very simple. The globes were clamped on to a special lead stand and filled to the desired height with the etching acid. The grading effect

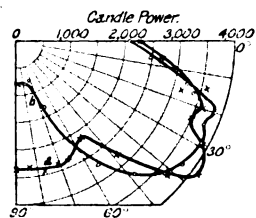


FIG. 5.

Polar Curves for 550-watt Flame Arc Lamp.

a. With Clear Outer Globe, having a Dense Frosting on the Lower Portion, extending up to about 40° from the horizontal.  
b. With Clear Outer Globe, having a Graded Flashing on the Lower Portion, the Flashing being Densest at the Bottom.

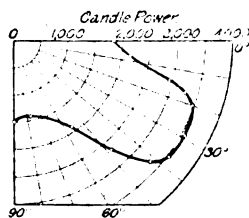


FIG. 6.

Polar Curve for 550-watt Lamp, fitted with Clear Globes, and having a Graded Frosting on the Lower Portion of the Outer Globe. The Frosting is Densest at the Bottom of the Globe, and disappears at an angle of about 40° below the horizontal.

was then obtained by allowing the acid to run out of the globe through an adjustable orifice in the lead stand, and any desired degree of frosting could be obtained by regulating the rate of flow.

Figs. 5, 6, 7 and 8, which are explained by their foot-lines, show a variety of polar curves obtained with different combinations of globe, and it is obvious that Nos. 7 and 8 are very suitable for giving a fairly uniform illumination on a horizontal plane.

Experiments were also made in equipping the lamps with enamelled iron reflectors of various shapes, but the results were not very successful from the point of view of the distribution of the light. One objection to the use of reflectors is the dark shadows cast above an angle of about 80° to the vertical, as a result of which the blackness of the buildings and the darkness above the lamps is very much intensified. This is particularly noticeable in foggy weather. It is very evident from the results, the authors concluded, that the most satisfactory curves of light distribution are obtained either with suitably frosted outer globes, or with dioptric inner globes used in conjunction with partially opalescent outer globes. There is very little to choose between the two methods on the score of light distribution. The dioptric globes undoubtedly have a slight advantage in this

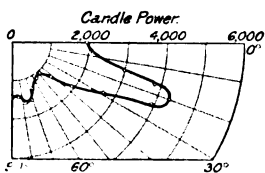


FIG. 7.

Polar Curve for 550-watt Lamp, with Dioptric Inner Globe, and the same Outer Globe as for Fig. 5 (a).

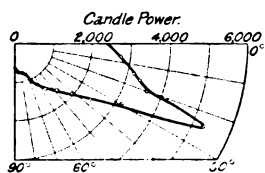


FIG. 8.

Polar Curve for 550-watt Lamp, with Dioptric Inner Globe, and the same Outer Globe as for Fig. 5 (b).

respect, but when it comes to the consideration of general advantages and disadvantages, there is much to be said in favour of the partially frosted outer globes. They are comparatively inexpensive to produce, and the degree of frosting may be easily varied or graded as required; they have no optical centre, and consequently slight relative displacement of globe and arc is of no serious consequence; the intrinsic brilliancy of the light source is considerably reduced with a corresponding reduction of the glare effect, provided that the lamps are fixed sufficiently high; shadows under the lamps are entirely eliminated, and the sharpness of the shadows cast by objects is toned down very considerably; and finally, with dioptric globes, a completely uniform distribution of light does not appear to be obtainable without the use of special outer globes.

#### DISCUSSION IN LONDON ON MARCH 6TH.

Mr. A. H. SEABROOK (Chief Electrical Engineer, Marylebone) fully agreed with the use of centrally-hung lamps, but favoured the use of lowering gear rather than tower wagons. During the past 18 months the Oxford Street lamps had been changed from tower-wagon trimming to lowering gear, and the cost of the lowering gear had been practically wiped out by the saving of labour in about 18 months. An appendix to the Paper, giving an analysis of costs, allowed 0.2d. per lamp-hour for carbons; Mr. Seabrook endorsed this figure, as he had tried using a carbon which cost 0.16d. per lamp-hour, and had proved to be false economy. He asked whether the Authors' figure of cost, £6 per kw. connected, plus 0.232d. per unit metered, was intended to cover profit, and pointed out one or two directions upon which the estimate was on the safe side, so that possibly a price of between £5 and £4 per kw. might be more correct.

Mr. HAYDN T. HARRISON said that one of the reasons that the high-pressure gas was so absolutely out of court was that in Manchester they were working at a lower pressure than in London; if they had used the same pressure as in London they would have saturated the sub-soil with so much gas that there would have been objections from all directions. That was the reason of the difference between 27 candle-power per c. ft. of gas at Manchester and nearly 50 candle-power per c. ft. in London (Regent Street, Victoria Street, &c.). Dr. Bloch, an eminent German authority in Germany, had stated in his recent book that with high-pressure gas-lighting, at the present moment it was possible to obtain 25.5 candles per c. ft. horizontally (18 spherical and 16 mean hemispherical). The minimum illumination aimed at for the Manchester electric lighting, viz., 0.5 foot-candles horizontal, was higher than was necessary in towns of lesser importance. Finally, Mr. Harrison said that there was less glare from the flame arcs than high-pressure gas; the high-pressure gas lamps in Regent Street (London) gave nearly 3,000 candle-power in 9 sq. ins., which was an intrinsic brilliancy a great deal higher than with flame arc lamps.

Professor SCHWARTZ chiefly devoted his remarks to matters connected with the design and accuracy of photometers, but also mentioned that experiments made by two of his students, Messrs. Weston and Taylor, confirmed the great variation in the candle-power of the high-pressure gas lamps found by the Authors in Mosley Street, Manchester. For instance, four high-pressure gas lamps on a 5 ft. plane showed a maximum illumination of 2.55, 3.4, 4.55, and 6.5 foot-candles from each lamp respectively.

Mr. FRANK BAILEY (Chief Electrical Engineer to the City of London Electric Lighting Company) complained of a remark made by Mr. Harrison to the effect that the results of experimental work of a similar nature in the City of London had not been published, and pointed out that they had been published in the technical Press (ELECTRICAL ENGINEERING, Vol. VI., p. 803, and Vol. IX., p. 20). He did not approve of graded frosting of globes; they should try to avoid interfering in any way with the globe, so as to preserve it as long as possible in the state in which it was received from the makers. It was the greatest difficulty in the world to maintain globes in their original condition for more than a few days in the ordinary city atmosphere, and therefore they should not start by treating the globes in a manner which only assisted trouble from dirt. His experience with dioptric globes had been far more favourable than that of the Authors. Incidentally, he mentioned that the dioptric globe was the outcome of a very brilliant piece of work by Mr. Trotter, who never seemed to get the credit for its initiation. It was a very difficult matter to get the best theoretical shape in the most practical form, and, as the glass-makers did not care to undertake the expense of making the necessary mould, in the City of London they had had to make the mould themselves. In addition to focussing the rays and making them go in a particular direction, the dioptric globe also shielded the arc from draught, and in consequence he had not experienced the flickering noticed at Manchester. Arc lamps flickered far less than incandescent gas lamps.

Mr. K. EDGECUMBE (Messrs. Everett, Edgcombe & Co.), speaking on the question of the metre height for street tests, said there was a little more in it than the fact that it was a convenient unit. About 18 months ago the German Verband authorised the metre as the height for horizontal illumination measurement in street work, and that was probably the reason which had led to its recommendation as the standard in this country. He suggested some definite or concrete figure. They knew that the arc lamp was better than gas—although, no doubt, gas people had some opinions about that—but the difficulty was to arrive at a comparative figure, that for the purpose of comparing costs of different methods of illumination they might take the average illumination between two lamps and multiply it by the distance, and so obtain a figure of "foot-candle-yards." For instance, he had calculated from the figures in the Paper that the gas lighting gave about 47 foot-candle-yards, and electric light 62 foot-candle-yards. Taking the figures of £5 15s. for 3,000 hours' burning for gas, and £3 5s. for electric light, this worked out to 2s. 6d. per foot-candle-yard for gas and 1s. for electricity per thousand hours' burning. (The report of this discussion will be concluded in our next issue.)

# " ELECTRICAL ENGINEERING " LITERARY SECTION

## NEW PUBLICATIONS

We shall be pleased to post any of the undermentioned works to any address in the United Kingdom, Colonies, or Abroad at the prices given. Orders should be addressed to the Kilowatt Publishing Co., Ltd., 203-6 Temple Chambers, Temple Avenue, London, E.C., accompanied by a remittance.

"Elementary Manual on Applied Mechanics," by A. Jamieson. 452 pp. 7½ in. by 5 in.; about 280 figures. (London: Charles Griffin and Co., Ltd.) 10th edition. 8s. 6d.; abroad, 4s.

"A Handbook of Wireless Telegraphy," by J. Erskine-Murray. 442 pp. 8½ in. by 5½ in. 196 figures. (London: Crosby Lockwood and Son.) 4th edition. 10s. 6d. net; abroad, 11s. 4d.

"The Design and Construction of Steam Turbines," by H. M. Martin. 372 pp. 11 in. by 7½ in.; 528 figures. (London: Offices of "Engineering," and Longmans, Green and Co.) 25s. net; abroad, 26s. 4d.

"Spon's Architects' and Builders' Pocket Price-Book and Diary, 1913," edited by C. Young and S. M. Brooks. 808 pp. 6½ in. by 3½ in. (London: E. & F. N. Spon, Ltd.) 2s. 6d. net; by post, 2s. 8d.

"The Gas, Petrol, and Oil Engine," by Dugald Clerk, F.R.S., and G. A. Burls. Vol. II.: The Gas, Petrol, and Oil Engine in Practice. 838 pp. 9 in. by 6 in. About 480 figures. (London: Longmans, Green & Co.) 25s. net; abroad, 26s. 3d.

"Die Funkentelegraphie," by H. Thurn. 128 pp. 7½ in. by 5 in. 58 figures. (Leipzig: B. G. Teubner.) M. 1.25; by post, 2s.

"The New Steam Tables," by C. A. M. Smith and A. G. Warren, with an Introduction by Sir J. A. Ewing, F.R.S. 101 pp. 8½ in. by 5½ in. (London: Constable & Co., Ltd.) 4s. net; abroad, 4s. 4d.

"Design of Polyphase Generators and Motors," by H. M. Hobart. 265 pp. 9½ in. by 6½ in. 125 figures. (New York: McGraw-Hill Book Co.) 12s. 6d. net.

"The Universal Electrical Directory" (J. A. Berly's), 1913. 1,556 pp. 9½ in. by 6½ in. (London: H. Alabaster, Gatehouse, and Co.) 21s.; British and Colonial Sections only, 12s.

"Iron and Steel," by O. F. Hudson, with a Section on Corrosion by G. D. Bengough. 173 pp. 9 in. by 5½ in.; 47 figures. (London: Constable and Co., Ltd.) 6s. net; abroad, 6s. 6d.

"Essentials of Electricity.—Direct Currents," by W. H. Timbie. 271 pp. 7 in. by 4½ in.; 224 figures. (London: Chapman and Hall, Ltd.) 5s. 6d. net; abroad, 5s. 9d.

"Bells, Indicators, Telephones, Fire and Burglar Alarms, &c.," by J. B. Redfern and J. Savin. (Electrical Installation Manual.) 123 pp. 6½ in. by 4½ in.; 85 figures. (London: Constable and Co., Ltd.) 1s. 6d. net; by post, 1s. 7½d.

"Application of Electric Power to Mines and Heavy Industries," by W. H. Patchell. 333 pp. 9 in. by 5½ in.; 95 figures. (London: Constable and Co., Ltd.) 10s. 6d. net; abroad, 11s. 5d.

"The Law Relating to Electric Lighting, Power, and Traction," by the late J. Shiress Will. 4th edition, by W. E. T. Jones. 611 pp. 10½ in. by 6½ in. (London: Butterworth & Co.) 27s. 6d.; British Colonies, 29s.

"A First Book of Electricity and Magnetism," by W. P. Maycock. 351 pp. 7 in. by 5 in.; 162 figures. (London: Whittaker and Co.) 4th edition. 2s. 6d. net; by post 2s. 10d.

"The Baudôt Printing Telegraph System," by H. W. Pendry. 147 pp. 7½ in. by 5 in.; 72 figures. (London: Whittaker and Co.) 2s. 6d. net; by post 2s. 9d.

"The Design of Alternating-Current Machinery," by J. R. Barr and R. D. Archibald. 496 pp. 9 in. by 6 in.; 340 figures and 17 working drawings. (London: Whittaker and Co.) 12s. 6d. net; abroad, 13s. 5d.

"Electrical Machine Design," by A. Gray. 528 pp. 9½ in. by 6½ in.; 317 figures. (New York: McGraw-Hill Book Co.) 17s. net.

"Methods of Measuring Electrical Resistance," by E. F. Northrup. 389 pp. 9½ in. by 6½ in.; 158 figures. (New York: McGraw-Hill Book Co.) 17s. net.

"Reports of the Committee on Electrical Standards Appointed by the British Association for the Advancement of Science." 783 pp. 8½ in. by 5½ in.; 56 figures and

10 plates. (Cambridge: The University Press.) 12s. 6d. net; abroad, 13s. 6d.

"Psychology and Industrial Efficiency," by H. Münsterberg. 321 pp. 8½ in. by 5½ in. (London: Constable and Co., Ltd.) 6s. net; abroad, 6s. 5d.

"Qualitative Determination of Organic Compounds," by J. W. Shepherd. 348 pp. 7 in. by 5 in.; 21 figures. (London: University Tutorial Press, Ltd.) 6s. 6d.; abroad, 6s. 11d.

"La Télégraphie et la Téléphonie Simultanées et la Téléphonie Multiple," by K. Berger. Translated by P. le Normand. 134 pp. 10 in. by 6½ in.; 111 figures. (Paris: Librairie Gauthier-Villars.) 4s. 6d. net; by post, 4s. 9d.

## REVIEWS OF BOOKS

**The Law Relating to Electric Lighting, Power, and Traction.** By the late J. Shiress Will. Fourth edition by W. E. T. Jones. 611 pp. 10½ in. by 6½ in. (London: Butterworth and Co.) 27s. 6d.; British Colonies, 29s.

The period of nearly ten years which has elapsed since the last edition of this work, practically the only generally recognised one on the law relating to electric lighting, power, and traction, has been mainly one of co-ordination and remedying those little omissions from which all legislation suffers, and perhaps electrical legislation most of all. The outstanding piece of legislation, of course, has been the passing of the Electric Lighting Act of 1909, in which many of the anomalies of the existing law were swept away. This has accounted for the fact that in recent years there have been so few private Bills promoted asking for powers which in themselves are applicable to all undertakings, and a large saving of expense has been brought about by their insertion in the general law under which all undertakings have to work. The position of electric supply in London has also been more or less straightened out in regard to the ultimate fate of the supply companies, although the position of the local authorities remains as before, and the ideal of the supply of electricity in London being under a single control will still not be realised without further legislation. The Special Committee of the L.C.C. has no doubt had this matter under consideration. The issue by the Home Office of rules as to the use of electricity in mines and factories has also brought about many interesting changes in the legislative position since the previous edition of "Shiress Will," and the new edition under the editorship of Mr. W. E. Tyldesley Jones, who has been very prominent in recent years both at the Parliamentary Bar and elsewhere, is fully due. Apart from those alterations due to the exigencies of revision and modification, the form of the volume remains unchanged, with the exception that the chapter on "Leakage and Electrolysis" has been deleted, the reason for this being that it is now the settled practice of Parliament not to allow protective clauses in respect of this, as it is felt that the Board of Trade Regulations are sufficient for the purpose. The index to the volume is most complete, and "notes" which give briefly cases and precedents are also comprehensive.

**Electrical Photometry and Illumination.** By H. Bohle. 222 pp. 9 in. by 6½ in. 200 figures. 35 tables. (London: Charles Griffin and Co., Ltd.) 10s. 6d. net; abroad, 11s.

Only those who have lived for a few years in a colony can appreciate the difficult task of a writer who, so domiciled, undertakes to produce a book upon a new and rapidly developing branch of science or of engineering. Prof. Bohle has made this attempt, and has amplified a course of lectures into a text-book on photometry and illumination comparing favourably with others which have appeared on the

same subject. It is primarily intended for second-year engineering students, and the mathematics, though not abstruse, are likely to be rather out of the depth of those who do not keep their integral calculus in working order. The author is one of that school which prefers to deal with flux rather than with candle-power, and, in consequence, the simplest problems are tangled up with  $4\pi$  and integrals. Prof. Bohle is so far out of touch with English and American practice that he calls the unit of illumination the candle-foot, not being aware that it has been superseded by foot-candle by nearly all writers, since, like the metre-kerze in Germany, it yields a consistent and intelligent plural. The candle-metre is said to be termed "lux," but the author forgets that a candle-metre is 0.108 foot-candle, and the Hefner-metre is 0.084 foot-candle. Until this ambiguity is cleared up it is not safe to use the Continental term "lux."

It is suggested that the corrections for influence of atmospheric conditions on the pentane lamp found by Paterson differ from the results of Butterfield, Haldane, and Trotter. There is no disagreement. The former investigator gave a straight line law, true for a normal range; the latter gave a curve for a large range, to which the straight line is an exact tangent.

The treatment of photometers is somewhat academic. Two methods of measuring the angular distribution of the light of an arc against its horizontal ray are described. A ray at about  $40^\circ$  or  $50^\circ$  would be much more practical as a standard. As is usual among mathematical writers, the Rousseau curve is "explained" by integral calculus, and Russell's practical simplification is dismissed in eight lines.

The concluding chapter on illuminating engineering shows that the author has given a good deal of attention to practical applications. Those who like working in flux and lumens instead of candle-power will find many interesting examples. Prof. Bohle is indebted somewhat heavily to the pages of *The Illuminating Engineer*, both for matter and for illustrations, but writing this book in South Africa, he could have found no better collection of material. The index refers to paragraphs, and the illustrations are numbered in a strange and original manner.

#### Application of Electric Power to Mines and Heavy Industries.

By W. H. Patchell. 333 pp. 9 in. by  $5\frac{1}{2}$  in.; 95 figures. (London: Constable and Co., Ltd.) 10s. 6d. net; abroad, 11s. 5d.

The greater part of Mr. Patchell's book, which is founded on a course of lectures at King's College, deals with the various applications of electric power to mines, and a pretty complete survey of the subject is given. The introductory chapter sums up the legislative situation and gives some brief notes on the advantages of electrical working, questions of power supply, &c. One of the best chapters in the book is the second, on cables in mines, which contains a wealth of practical detail illustrated by actual examples, but it is a pity that the all-important subject of mining switchgear should have been included at the end of this instead of being expanded into a separate chapter. In like manner shot-firing, underground lighting, signalling and telephones are crammed into about seven pages at the end of a chapter containing descriptions of various patterns of coal cutter. The section on haulage gears, however, is fuller, and is a happy combination of knowledge of mining conditions and sound mechanical and electrical engineering. Electric winding is also treated in an interesting way and various patterns are described and illustrated. The succeeding chapters on ventilation and air compressing and pumping are also in a style useful both to the electrical man in setting forth the conditions that he has to meet and to the mining man in understanding the capabilities of the electrical side of the plant. Finally we have three chapters entitled, respectively, "Rolling Mills," "Machine Tools and Cranes," and "Electric Welding and Furnaces." Although in these—particularly in the first two—a good sketch is given of the subjects, we should have preferred if they had been omitted and the book devoted entirely to mining matters by expanding the sections which we have mentioned above. From the quantitative treatment which such subjects as ventilation receive, and the practical detail in other parts of the book, we must assume that the book is intended for the engineer actually engaged, or about to be engaged, in carrying out the applications of electric power referred to, but we are bound to say that those turning to electro-metallurgy would find the last chapter very insufficient. Such inequality of treatment of the ground covered, however, does not prevent the work being a good one on an important subject.

**The Design of Alternating-Current Machinery.** By J. R. Barr and R. D. Archibald. 496 pp. 9 in. by 6 in.; 340 figures and 17 working drawings. (London: Whittaker and Co.) 12s. 6d. net; abroad, 13s. 5d.

Although published under the joint names of Messrs. Barr and Archibald, the compilation of this treatise was practically completed by Mr. Barr before his death, but the final preparation for the press and a certain amount of minor revision and correction are due to Mr. Archibald. The book is described as a companion volume to the late author's "Principles of Direct-Current Electrical Engineering," which we remember welcoming on its first appearance as a book in which the practical and the theoretical were happily blended. It is, however, a sequel rather than a companion, as the treatment is distinctly more advanced. Before plunging into the design of alternating-current machinery, there are a few chapters on the functions and properties of insulating materials. Transformers are taken first, and after a general discussion a lucid and straightforward method of design is worked out by the aid of actual examples. In like manner alternators are discussed from various points of view before the design is followed through. We should have expected a larger proportion of the space to be given to turbo-alternators, especially in the section devoted to mechanical construction. The armature winding section contains very clear and useful diagrams, and the treatment of harmonics in E.M.F. waves is most interesting. We notice that the author in common with other modern writers, calls the double frequency harmonic the second harmonic, the triple frequency the third, and so on, instead of following the nomenclature of the older writers on sound, who always called the original frequency the fundamental, the double frequency the first harmonic, and so on. Whatever be the merits of either system, their co-existence can only cause confusion. Various other points of theory and practice are discussed, including a separate chapter on parallel running. The actual process of design is illustrated by a valuable series of drawings of machines, forming folding plates at the end of the book. The final chapters deal with the rotary-converter, but this does not receive quite the fulness of treatment that is found in other parts of the book.

**Design of Polyphase Generators and Motors.** By H. M. Hobart. 265 pp.  $9\frac{1}{2}$  in. by  $6\frac{1}{2}$  in.; 125 figures. (New York: McGraw-Hill Book Co.) 12s. 6d. net.

In the author's own words, the purpose of the present treatise is to set forth the fundamental methods of procedure employed in designing electrical machinery. This purpose is well carried out, and, taken in conjunction with the extensive bibliography of modern papers and specialised subjects, the electrical part of the design is amply covered. The general plan followed in this work was evolved after various methods of procedure had been tried by the author when lecturing on design to students at various technical colleges in London. The first part of the book deals with the design of a large slow-speed alternator, then follow some short notes on the modifications necessary in the design of a turbo machine. Considerable space is devoted to the design of squirrel-cage induction motors, with a few notes on slip-ring motors. The author's remarks on synchronous motors v. induction motors and on induction generators are particularly interesting. All the calculations carried out are done very thoroughly, and a vast amount of comparative data collected by systematically studying finished machines of different makes has been averaged and is given in convenient form so that one can readily obtain design information on standard machinery. A number of practical problems are given as exercises.

**Electrical Machine Design.** By A. Gray. 528 pp.  $9\frac{1}{2}$  in. by  $6\frac{1}{2}$  in.; 317 figures. (New York: McGraw-Hill Book Co.) 17s. net.

To those who require the maximum information on electrical machine design in the minimum space this really excellent book may be thoroughly recommended. The design of direct-current generators and motors, alternating-current generators, synchronous motors, induction motors and transformers, is ably discussed—hardly any problem seems to have been omitted. The principle adopted is to build up the design for a given rating by the use of a few fundamental formulæ and design constants, the meaning and limits of which are well explained. The constants appear to have been compiled from a mass of comparative data collated over a considerable period. There are valuable notes on the properties of insulating materials and grading, as well as on the insula-



tion of high-pressure transformers. A number of vector diagrams are given, together with mathematical investigations into many phenomena. Besides the results so obtained, values obtained from practice are given, so that the mathematical part of the book does not interfere with the remainder, and may be omitted if desired until the reader wishes to undertake a refined investigation into some special problem, when he will find the material at hand. The mechanical stresses likely to occur in different parts of all the machines discussed are gone into, and examples of construction are freely given. A useful feature is a table of all the symbols used, their significance, and the page where they are first introduced.

**Reports of the Committee on Electrical Standards Appointed by the British Association for the Advancement of Science.** 783 pp. 8½ in. by 5½ in.; 56 figures and 10 plates. (Cambridge: The University Press.) 12s. 6d. net; abroad, 13s. 6d.

Following upon Dr. Glazebrook's Kelvin lecture at the Institution of Electrical Engineers, the publication of this series of reprints of the reports of the B.A. Electrical Standards Committee is of particular interest as it covers, of course in greater detail, much of the ground so ably mapped out on that occasion. An introduction by Dr. Glazebrook and Mr. F. E. Smith, of the National Physical Laboratory, sketches the progress of the development of electrical standards, and the actual reports of the Committee, which constitute the body of the book, form a practically continuous detailed history of the subject from the first formation of the Committee in 1862, when there was chaos in electrical standards of measurement, to the report submitted to last year's Dundee meeting of the British Association, which discusses errors of one or two parts in 100,000. It may be noted that the report of the International Conference of 1908 is included as an appendix to the B.A. Committee report of 1909, and the final Order in Council establishing the standards as an appendix to the report of 1910. To all those interested in accurate electrical measurement, much of the work will form interesting and stimulating reading, as well as containing valuable information in a convenient form. Its utility is but little diminished by the fact that much of the quantitative detail has been progressively superseded as higher accuracy has been obtained. These reports reveal to us not only a fine example of the real pioneering research prosecuted by Kelvin and his disciples, but also the wonderful perfection of the work built on this foundation by his followers.

**The Gas, Petrol and Oil Engine.** By Dugald Clerk, F.R.S., and G. A. Bous. Vol. II. The Gas, Petrol and Oil Engine in Practice. 838 pp. 9 in. by 6 in.; about 480 figures. (London: Longmans, Green and Co.) 25s. net; abroad, 26s. 3d.

The long-promised second volume of Dr. Dugald Clerk's work on the gas engine has now appeared, the delay having been entirely due to pressure on the author's time. Dr. Clerk has for this reason found it necessary to invite the collaboration of Mr. G. A. Bous in the preparation of this volume, which deals entirely with the internal combustion engine in practice, its theory and history having received adequate attention in the first volume already published. The present work can in no way be considered a reprint of the older book on the gas engine by this author, as the whole has been entirely re-written and brought up-to-date by the addition of much new matter, as will be seen from the fact that each of the two new volumes is considerably larger than the single earlier one. The development of the gas engine occupies about a third of the volume, and is separated into two chapters comprising the four- and two-stroke types respectively, and much valuable detail of modern developments is given, though there does not appear to be any mention of the new "Duplex" two-stroke engine constructed by Mather and Platt, which was described by Mr. A. E. L. Chorlton in October last, the reason probably being that this work was already in the press at that time. It is unnecessary to detail the contents of the work beyond remarking, that besides the usual features, the subjects of fuels, governors and igniting arrangements are fully dealt with, and that both petrol and heavy oil engines, the latter, of course, including the Diesel engine, receive a very large share of attention. The chapter on marine gas and oil engines covers fifty pages and ranges from descriptions of light petrol engines for motor-boats to the latest Diesel marine practice for ocean-going ships. Much original data as to the work of the authors and others have been culled from the proceedings of the Institutions of Civil, Mechanical and

## NEW and STANDARD BOOKS on ELECTRICAL ENGINEERING

Just Published. Fourth Edition Revised and Considerably Enlarged. 450 Pages with 195 Illustrations. Price 10s. 6d. net.

### Wireless Telegraphy ITS THEORY AND PRACTICE

A Handbook for the use of Electrical Engineers, Students and Operators.

By JAMES ERSKINE-MURRAY, D.Sc.

**TELEPHONY: A Comprehensive and Detailed Exposition of the Theory and Practice of the Telephone Art.** By SAMUEL G. McMEEN and KEMPSTER B. MILLER. 950 pages. 670 Illustrations. Royal 8vo, cloth. 17s. net.

**THREE-PHASE TRANSMISSION.** A Practical Treatise on the Economic Conditions governing the Transmission of Electrical Energy by Underground and Overhead Electrical Wires. By WM. BREW, M.I.E.E. 185 pages, 82 Illustrations. Demy 8vo, cloth. 7s. 6d. net.

**FACTORY ACCOUNTS: Their Principles and Practice.** By EMILE GARCKE and J. M. FELLIS. Sixth Edition, revised and enlarged. Demy 8vo, cloth. 314 pages. 6s. net.

**ELECTRIC TRACTION AND TRANSMISSION ENGINEERING.** By SAMUEL SHELDON and ERICH HAUSMANN. 317 pages. 127 Illustrations. Large crown 8vo, cloth. 12s. net.

**ELECTRIC WIRING, DIAGRAMS & SWITCH-BOARDS.** By NEWTON HARRISON. Crown 8vo, cloth. 5s. net.

**ELECTRICAL & MAGNETIC CALCULATIONS.** By A. A. ATKINSON. Crown 8vo. 9s. net.

**ELEMENTARY ELECTRICAL ENGINEERING.** In Theory and Practice. A Class Book for Junior and Senior Students and Working Electricians. By J. H. ALEXANDER. 220 pages. 181 Illustrations. Crown 8vo, cloth. 3s. 6d.

**A POCKET-BOOK OF ELECTRIC LIGHTING AND HEATING.** By S. F. WALKER. Fcap. 8vo. 448 pages. 270 Diagrams. 7s. 6d. net.

**WIRELESS TELEPHONES: and How they Work.** By J. ERSKINE-MURRAY. Second Edition. 1s. 6d. net.

**DYNAMO, MOTOR, AND SWITCHBOARD CIRCUITS FOR ELECTRICAL ENGINEERS.** A Practical Book dealing with the subject of Direct Alternating, and Polyphase Currents. By WILLIAM R. BOWKER. Second Edition, revised. Medium 8vo, cloth. 109 Diagrams. 7s. 6d. net.

**ELEMENTARY ELECTRICAL CALCULATIONS.** A Manual of Simple Engineering Mathematics. By T. O'CONNOR SLOANE. 314 pages. 43 Illustrations. Crown 8vo, cloth. 9s. net.

**ELECTRICAL ENGINEERING.** A First Year's Course for Students. By TYSON SEWELL, A.M.I.E.E. Fifth Edition, revised, with Additions. Large Crown 8vo, cloth. 460 pages, with 278 Illustrations. 5s. net.

**STANDARD ELECTRICAL DICTIONARY.** By T. O'CONNOR SLOANE. 7s. 6d. net.

**ALTERNATING AND DIRECT CURRENT DYNAMOS.** A Text-Book on their Construction for Students, Engineer Constructors and Electricians-in-Charge. By TYSON SEWELL, A.M.I.E.E. 328 pages. 230 Illustrations. Large Crown 8vo, cloth. 7s. 6d. net.

**ELECTRIC MOTORS: Their Action, Control, and Application.** By F. B. CROCKER and M. ARENDT. 10s. 6d. net.

**ELECTRIC POWER CONDUCTORS.** By W. A. DEL MAR. 9s. net.

**WIRELESS TELEPHONY: In Theory and Practice.** By ERNST RUHMER. Translated from the German by J. ERSKINE-MURRAY. Demy 8vo, cloth. 10s. 6d. net.

Complete Catalogue post free on application.

London: Crosby Lockwood & Son  
7, Stationers' Hall Court, E.C., & 5, Broadway, Westminster, S.W.

Automobile Engineers, to which due acknowledgement is made, and this feature, with the author's comments and additions, alone makes the work indispensable to the internal combustion engineer who wishes to keep himself *au fait* with modern practice. The last chapter gives Dr. Clerk's views as to the future of the internal combustion engine, and proves highly interesting reading, and it is instructive to note that he does not hold out much hope of a practical issue in the direction of the internal combustion turbine. The book is excellently printed and illustrated, and we will praise it with faint blame by our only adverse criticism, in suggesting an improvement for a future edition by the insertion of titles under the illustrations as well as the figure numbers, which in most cases are alone given.

**The Design and Construction of Steam Turbines.** By H. M. Martin. 372 pp. 11 in. by 7½ in. 523 figures. (London: Offices of "Engineering," and Longmans, Green & Co.) 25s. net; abroad, 26s. 4d.

Although based on articles which have appeared from time to time on different aspects of the subject in the columns of our contemporary *Engineering*, this work shows no traces of discontinuity or incompleteness, and forms a well-reasoned and at the same time practical study of the steam turbine addressed to the engineer equipped with a moderate mathematical training. The general scheme states in the earlier part of the book some of the more important laws and formulae in a shape convenient for immediate practical application, but proceeds with their demonstrations later "in the belief," as the author says in his preface, "that they will be the more readily followed by the average reader, when he has previously been impressed with the utility of the result." Thus, after setting forth the elementary theory of guide blades and moving buckets, the author describes the functions of the Mollier diagram, explains efficiency ratios, reheat factors, and the use of correction curves, and proceeds at once to outline a method of practical design before completing his theoretical treatment. Mechanical as well as thermodynamic considerations are treated of, and a considerable portion of the latter part of the book is devoted to descriptions of actual examples of the leading types of steam turbine, assisted by a profusion of detail drawings which are a prominent feature of the work. The last chapter, describing the Ljungström turbine, will be read with particular interest in view of the machines of this design that will shortly be tried in this country.

**Foundations and Machinery Fixing.** By F. H. Davies. 152 pp. 6½ in. by 4½ in.; 52 figures. (London: Constable and Co., Ltd.) 2s. net; by post, 2s. 2d.

This little handbook treats in a general yet comprehensive manner of foundations for ordinary electrical plant, and it has been a pleasure to review so well-written a work published at so modest a sum. Generally speaking, foundations are classed into two types—solid and elastic, the former consisting of substantial blocks of concrete carried directly upon either concrete rafts or piling, depending on the sub-surface of the ground, the latter of smaller concrete blocks mounted upon rubber pads, sheets of felt, cork or similar material. The first type of foundation presents usually but little difficulty, only a balancing of dead-weights against the bearing capacity of various kinds of earth, gravel or rock. On very unstable material the earth may require stiffening with piling and an interesting example of such work is given on p. 22 where piles of 150 ft. long were necessary to reach stable ground. Needless to say, very considerable experience is necessary in successfully dealing with such unusual cases. The question of damping down vibrations of high frequency is a very difficult one and generally requires the use of elastic foundations rather than those of a solid type. M. Prache, of Paris, has made a very long study of the problem and his system of rubber pads is briefly described and may become very necessary in the future with the extended use of large high-speed turbines, machines of 5,000 k.v.a. at 3,000 r.p.m. being now proposed as standard types. It is a little difficult to understand why the author has devoted so much space to the description of brick and stonework foundations, as in nearly every case concrete foundations are cheaper, easier to construct, and in every way better.

**The New Steam Tables.** By C. A. M. Smith and A. G. Warren, with an Introduction by Sir J. A. Ewing, F.R.S. 101 pp. 8½ in. by 5½ in. (London: Constable & Co., Ltd.) 4s. net; abroad, 4s. 4d.

Although tables, curves, &c., of the properties of steam at different temperatures have existed for long, the lack of

JUST PUBLISHED. Med. 8vo. 12s. 6d. net (postage 5d.).

## The Design of Alternating Current Machine

By J. R. BARR, A.M.I.E.E.,

Late Lecturer in Electrical Engineering at Heriot-Watt College, Edinburgh, and

R. D. ARCHIBALD, A.M.I.C.E., A.M.I.E.E.,

Head of the Electrical Engineering Department, Dundee Technical College.

With 340 Illustrations and 17 Large Working Drawings.

**PRINCIPLES OF DIRECT CURRENT ELECTRICAL ENGINEERING.** By JAMES R. BARR, A.M.I.E.E. With 294 Illustrations. 10s. net (postage 5d.).

**ARMATURE CONSTRUCTION.** A Practical Handbook for Electrical Engineers. By H. M. HOBART, M.I.C.E., M.I.E.E., and A. G. ELLIS, A.C.G.I. With 420 Illustrations. 15s. net (postage 5d.).

**THE BAUDOT PRINTING TELEGRAPH SYSTEM.** By H. W. PENDRY, Central Telegraph Office. With 72 Illustrations. 2s. 6d. net (postage 3d.).

**THE DYNAMO: Its Theory, Design, and Manufacture.** By C. C. HAWKINS, M.I.E.E., and F. WALLIS, M.I.E.E. With 600 Illustrations. Fifth Edition, entirely re-written and enlarged. In two volumes. Vol. I., with 311 Illustrations, 10s. 6d. net; Vol. II., with 283 Illustrations, 10s. 6d. net (postage 8d.).

**ELECTRIC MOTORS: Continuous, Polyphase and Single-Phase Motors, Their Theory and Construction.** By H. M. HOBART, M.I.C.E., M.I.E.E. Second Edition, entirely re-written and enlarged. With 800 Illustrations. 18s. net (postage 6d.).

**TRANSFORMERS FOR SINGLE AND MULTI-PHASE CURRENTS.** A Treatise on their Theory, Construction, and Use. By GIBBERT KAPP, M.I.C.E., M.I.E.E., Professor of Electrical Engineering at the University of Birmingham. Second Edition, entirely re-written and enlarged. With 219 Illustrations. 10s. 6d. net (postage 5d.).

**PRACTICAL TESTING OF ELECTRICAL MACHINES.** By L. OULTON, A.M.I.E.E., and N. J. WILSON, M.I.E.E. Pocket size, with 90 Illustrations. 4s. 6d. net (postage 3d.).

Catalogue of Books on Electricity, Engineering, etc., Post Free.

**WHITTAKER & CO.,** 2, White Hart St., Paternoster Sq., LONDON, E.C.

In Large 8vo. Handsome Cloth. Fully Illustrated. 10s. 6d. net.

## ELECTRICAL PHOTOMETRY AND ILLUMINATION.

By PROF. HERMANN BOHLE, M.I.E.E.,

Professor of Electrotechnics, S. A. College, Cape Town.

CONTENTS.—Photometric Units and Standards.—Radiation and its Effects.—Photometric Apparatus.—Light Flux and Distribution.—Testing of Electric Lamps.—The Design of Shades and Reflectors.—Illuminating Engineering.—INDEX.

In Large 8vo. Handsome Cloth. Fully Illustrated. 21s. net

## TRANSFORMERS.

By HERMANN BOHLE, M.I.E.E.,

Professor of Electrotechnics, S. A. College, Cape Town,

And PROF. DAVID ROBERTSON, B.Sc., A.I.E.E., OF BRISTOL.

CONTENTS.—General Principles.—Magnetising and No-Load Currents.—Losses in Transformers.—Iron Losses.—Copper Losses.—Temperature Rise.—Magnetic Leakage.—Leakage Inductance.—Vector Diagrams for Transformers.—Systematic Testing of Transformers.—Insulating Materials.—Examples of Construction.—Design of Transformers.—Applications of Transformers.—Regulating and Phase-Changing Transformers.—INDEX.

"This very complete treatise . . . a model of what technical publications should be."—*Nature*.

In Medium 8vo. Pp. i-xx + 313. With 366 Figures and 23 Tables. 25s. net.

## ELECTRIC CRANE CONSTRUCTION.

By CLAUDE W. HILL, A.M.Inst.C.E., M.I.E.E., &c.

CONTENTS.—Overhead Cranes.—Locomotive and Portable Jib Cranes.—Derrick Cranes.—Transporters.—Sheer Legs.—Revolving Cantilever Cranes.—Cableways.—Power required for Crane Driving.—Starting Torque and Acceleration.—Design of Crane Structures.—Design of Machinery.—Brakes.—Toothed Gearing.—Hooks, Lifting Magnets, Ropes and Cranes.—Design of Magnets.—Motors, Controllers and Collectors.—Crane Installations.—INDEX.

"The whole work is straightforward, and may be recommended as being written from a thoroughly engineering point of view."—*Electrical Engineering*.

LONDON: CHARLES GRIFFIN & CO. LTD., EXETER ST., STRAND

complete knowledge of the subject resulted in certain errors and inconsistencies in the older tables. The researches of Prof. H. L. Callendar in this country and Prof. Mollier on the Continent have now linked up theory and experimental results by extending both, and it has now been possible to construct tables of an accuracy heretofore unattainable. The authors' tables are formed on the work of Callendar, and practically agree with the information worked out on the same basis in graphic form by Mollier. Their importance is best expressed by quoting the words of Sir J. Alfred Ewing's introduction:—"It is to be hoped that with the additional assistance these tables supply, English engineers and students will realise that the new method of calculation should be adopted, and the tables and formulæ of the old text-books be abandoned as obsolete." The tables are given in Fahrenheit units as a concession to the old school of English engineers, as well as in the centigrade units that are now so fast taking their place. A brief explanation precedes the tables themselves, and Mollier's chart translated into Fahrenheit units is also included.

**A Handbook of Wireless Telegraphy.** By J. Erskine-Murray. 442 pp. 8½ in. by 5½ in. 195 figures. (London: Crosby Lockwood & Son.) Fourth edition. 10s. 6d. net; abroad, 11s. 4d.

The fact that this is the fourth edition of this work to be reviewed in our columns since 1907 is sufficient evidence that Mr. Erskine-Murray's book is appreciated by the class of reader to whom it is addressed. Since the last edition (see *ELECTRICAL ENGINEERING*, Vol. VII., page 427, July 27th, 1911) there has been considerable general revision, and a new chapter on the telegraphic efficiency of a wireless system has been added. Further additions discuss the theory of abnormal ranges as deduced from actual observations, and new sections deal with the latest developments of the Poulsen, Goldschmidt, and Telefunken systems. Another interesting addition is an appendix containing the specification of the proposed imperial Marconi stations, which have been the subject of so much discussion. The book contains a vast amount of interesting reading of a nature very stimulative of thought, and its merit lies perhaps more in this direction than as a handbook of design for the wireless telegraph engineer.

**Essentials of Electricity—Direct Currents.** By W. H. Timbie. 271 pp. 7 in. by 4½ in.; 224 figures. (London: Chapman and Hall, Ltd.) 5s. 6d. net; abroad, 5s. 9d.

The price of this volume is high for its size, but the quality of the contents is high also. The book is intended to be, and is, suitable for short trade courses for students who wish for advancement. The author has the gift of being able to impart electrical knowledge in a most efficient manner. Well-chosen analogies are often resorted to. The chapter on dynamo troubles is good. Diagrams and simple explanations of a multitude of the commoner applications of electricity to the welfare of mankind are given. Problems are supplied in profusion, but as the book is of American origin, the monetary unit is the dollar, while the B & S wire gauge is of course adopted. The unit wire taken is the mil-foot.

#### THE STANDARD WORK ON THE SUBJECT

*Just Published*

## The Law relating to Electric Lighting, Traction and Power

BY

His Honour the late Judge J. SHIRESS WILL, K.C.

**Fourth Edition, 1912**

Price 27/6; for Cash, post free, 22/7.

"To the station engineer, the expert witness, the Bill promoter, and the parliamentary agent, we confidently recommend Mr. Will's work as a sound, a comprehensive, and an up-to-date guide."—*Electrical Times*.

**BUTTERWORTH & CO.**  
BELL YARD, TEMPLE BAR, LONDON

**A First Book of Electricity and Magnetism.** By W. P. Maycock. 351 pp. 7 in. by 5 in.; 162 figures. (London: Whittaker and Co.) 4th edition. 2s. 6d. net; by post 2s. 10d.

It is now twenty-one years since the first edition of this very elementary text-book was published. During this time four editions have appeared, so that it may be said to have enjoyed considerable popularity. It contains some good matter, the style is easy, and it has been brought fairly up-to-date, but the reasoning in places appears a little loose and it is spoiled by a large number of blocks, apparently from manufacturers' catalogues. Very few calculations are made or given, but there is a long and rather useless list of questions and experiments.

**The Baudôt Printing Telegraph System.** By H. W. Pendry. 147 pp. 7½ in. by 5 in.; 72 figures. (London: Whittaker and Co.) 2s. 6d. net; by post, 2s. 9d.

A comprehensive description of the features of the Baudôt system of machine telegraphy and an excellent account of the construction of the apparatus is contained in this small volume. After a very brief introduction, the author starts on a description of the Baudôt apparatus and by page 15 has got to the quadruple distributor. At page 70 a chapter on the electrical connections starts. This method of division of the subject is quite satisfactory for those conversant with the actual machine. The text is very clear, but the average student who wishes to add particulars of the Baudôt system to his general knowledge will find the matter a little difficult to grasp. That the author was writing for those who have to do with the apparatus is shown by the valuable chapter on adjustments and faults, which terminates the book.

**Die Funkentelegraphie.** By H. Thurn. 128 pp. 7½ in. by 5 in. 58 figures. Leipzig: B. G. Teubner.) M. 1.25; by post, 2s.

This little volume is one of a series of books in German on scientific subjects of a semi-popular nature, and deals with wireless telegraphy and its modern developments in a practical and readable manner, with a considerable degree of detail. As might be expected, the Telefunken system is the example selected for treatment at length, and an interesting illustrated description of the actual apparatus used is given. A short chapter is devoted to wireless telephony, and further sections of the book deal with the field wireless communication is likely to occupy in commercial applications by sea, land, and air. The regulations, both national (German) and international, governing its use are set forth, including the results of the recent conference in London. Statistics of stations in different countries are also given.

**La Télégraphie et la Téléphonie Simultanées et la Téléphonie Multiple.** By K. Berger. Translated into French by P. le Normand. 134 pp. 10 in. by 6½ in. 111 figures. (Paris: Librairie Gauthier-Villars.) 4s. 6d. net; by post, 4s. 9d.

In the first part of this book, which is a French translation of a work by an official of the German telegraph service, the various methods of simultaneous telephony and telegraphy are discussed from both theoretical and practical points of view, including both telephoning over existing telegraph lines and telegraphing over double-wire telephone circuits. The second part of the book is devoted to multiple telephony, including the arrangement of superposed and "phantom" circuits, which are treated in equally thorough manner. The difference between Continental and English and American practice in these respects will interest telegraph engineers in this country.

**Elementary Manual on Applied Mechanics.** By A. Jamieson. 452 pp. 7½ in. by 5 in. About 230 figures. (London: Charles Griffin & Co., Ltd.) 10th edition. 3s. 6d.; abroad, 4s.

Additions and revisions, involving in all an increase of 26 pages, have been made in the tenth edition of this deservedly popular text-book by the late Professor Jamieson. The list of symbols and abbreviations used are given at the beginning of the book, so that one has no difficulty in following the text, which is well illustrated with a number of diagrams, sectional drawings and photographs, the constituent parts of which are conveniently indexed. The elementary principles of practically every type of machine and mechanism are dealt with, as well as hydraulics, the properties of materials, &c. A large number of questions taken from the Ordinary Grade Papers in Mechanical Engineering, set by the City and Guilds of London Institute, and from the examinations conducted by other examining bodies, are included. In many cases the answers are also given.

**The Universal Electrical Directory (G. A. Berly's), 1913.** 1556 pp. 9½ in. by 6½ in. (London: H. Alabaster, Gatehouse & Co.) 21s.; British and Colonial Sections only, 12s.

The 1913 edition of the "Red Book" has been as carefully revised as previous issues. The contents are again divided into four sections, viz., British, Colonial and General, Continental, and U.S.A., and some 35,000 entries are made. In addition to the usual directory entries, however, there are lists of electricity undertakings in the United Kingdom, the British Colonies, and some other countries, whilst a valuable addition to the British Section is a list of trade names, followed by the maker's or agent's name and address.

**Spon's Architects' and Builders' Pocket Price Book and Diary, 1913.** Edited by C. Young and S. M. Brooks. 308 pp. 6½ in. by 3½ in. (London: E. & F. N. Spon, Ltd.) 2s. 6d. net; by post 2s. 8d.

In view of the continually shifting, and, in these days, unfortunately rising prices of all kinds of raw material, and cost of production generally, the keeping of a work of this kind up to date is a difficult task, but the problem has been bravely faced, and in this issue the whole of the prices have been revised to accord with present values. Substantial additions have also been made, including a new section on charges and fees payable. The memoranda section is now issued as a separate volume, entitled, "Spon's Practical Builders' Pocket Book."

**Electric Cranes.**—In response to several inquiries as to the standard book on this subject, we would draw attention to "Electric Crane Construction," by Claude W. Hill, published by Messrs. Charles Griffin & Co., Ltd., and obtainable from the office of ELECTRICAL ENGINEERING, 25s. net; abroad 25s. 10d. It is a very complete handbook on crane design, and most trustworthy. Every description of crane is fully discussed, and

chapters are devoted to power, starting torque, brakes, gearing, hooks, &c., magnet design, motors, controllers, &c., &c. The book is copiously illustrated.

**Finsbury Technical College O.S.A. Magazine.**—The most recent issue of this, now quarterly, publication, contains an abstract of Mr. C. E. Foster's Paper on inexpensive pyrometers, which was read last session before the Sheffield branch of the British Foundrymen's Association, and for which the author was awarded the Wallis-Jones medal. Some notes on the new third year course at Finsbury Technical College are contributed by Mr. J. D. Johns, while the doings of old students, the report of the last annual dinner, and other miscellaneous, but interesting, information, including a portrait of Mr. Foster, completes the issue.

**The National Electric Light Association of America.**—The Proceedings of the 35th Convention of the National Electric Light Association, held at Seattle in June last, fill four good-sized volumes, of which we have been favoured with copies. The first volume, of 458 pages, is devoted to general, executive, public policy, and company "sessions," and a large number of reports, papers, and discussions on very diverse subjects are included. The second volume, of 576 pages, deals with commercial aspects of electricity supply, and the third contains reports of the meetings devoted to power transmission and technical matters generally, and aggregates 688 pages. The last, and smallest, volume contains papers and reports treating of accounting. The utility of the whole series, which touches nearly every branch of electric supply matters in some way or other, is enhanced by the synopses of the papers at the beginning of each volume. A good deal of the matter discussed is of world-wide importance, but naturally there is a large proportion applicable only to American conditions. Much of this, however, is of interest to English engineers as a comparative study, as well as sometimes suggesting methods that might be adopted in modified forms over here.

## Messrs. LONGMANS & CO.'S LIST

**POWER HOUSE DESIGN.** By JOHN F. C. SNELL, M.Inst.C.E., Vice-President of the Institution of Electrical Engineers, &c. With Seventeen Folding Plates and 186 Illustrations. 8vo. 21s. net.

*This book is intended to provide a complete summary of modern practice in the design of power houses for the generation of electricity, and it is divided into sections, dealing respectively with steam, gas, oil, and hydro-electric systems.*

NEW EDITION, 1908. With 389 Illustrations. Crown 8vo. 12s. 6d.

**ELECTRICAL ENGINEERING FOR ELECTRIC LIGHT AND POWER ARTISANS AND STUDENTS** (embracing those branches prescribed in the Syllabus issued by the City and Guilds Technical Institute). By W. SLINGO, Engineer-in-Chief, General Post Office, A. BROOKER, and T. F. WALL, M.Sc.

THIRD EDITION. With 376 Illustrations and Diagrams, 8vo. 10s. 6d. net.

**ELEMENTARY TREATISE ON ELECTRICITY AND MAGNETISM.** By G. CAREY FOSTER, F.R.S., Fellow of and Emeritus Professor of Physics in University College, London; and ALFRED W. PORTER, B.Sc., Fellow of and Assistant-Professor of Physics in University College, London. Founded on Joubert's "Traité Élémentaire d'Électricité."

**PRACTICAL MEASUREMENTS IN RADIO-ACTIVITY.** By W. MAKOWER, M.A., D.Sc., Lecturer and Demonstrator in Physics in the University of Manchester; and H. GEIGER, Ph.D., Lecturer in Physics in the University of Manchester. With 61 Diagrams. Crown 8vo. 5s. net.

"The authors are to be congratulated upon having produced a practical and useful book that will be appreciated by all workers in the intensely interesting field of radio-activity. The illustrations are good, and there is a full index."—*Chemical News*.

**ELECTRICITY AND MAGNETISM.** By S. G. STARLING, B.Sc., A.R.C.Sc., Head of the Physical Department in the West Ham Municipal Technical Institute. With Diagrams. Crown 8vo. 7s. 6d. net.

"Considering its modest proportions and its moderate price, the book must, for its excellence, be afforded a place of honour on the shelf of technical literature."—*The Times*.

**THE PRINCIPLES AND PRACTICE OF ELECTRIC WIRING FOR EVENING STUDENTS.** By ARCHIBALD BURSILL, A.M.I.E.E., Lecturer in Physics and Electrical Engineering, Paddington Technical Institute. With 166 Illustrations. Crown 8vo. 3s. net.

"An excellent example of a modern text-book for technical students, lucid, terse, and well illustrated."—*Ironmonger*.

"This book is thoroughly well done, and should be of great assistance to all practical wiremen and others who have to deal with lighting and power systems."—*Automobile and Carriage Builders' Journal*.

**LONGMANS, GREEN & CO., 39, Paternoster Row, London, E.C.**

## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelopes.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1330.

Rotary converters when running with fixed A.C. input voltage are capable of delivering D.C. variable voltage within small range, without special boosting arrangements.

In the case of a six-phase rotary giving a D.C. voltage of 550-600, how can the power factor and exciting current be calculated for the different voltages, the A.C. input voltage being constant?

How much reactance should the transformer, which is supplying current to the slip rings, have? A. D.  
(Replies must be received not later than first post, March 20th.)

### ANSWERS TO No. 1,328.

A 72 b.h.p. motor, 570 r.p.m., is developing this h.p. and transmitting a proportion through 1:6 ratio spur gear, 92 per cent. efficiency; second reduction, worm-gear triple thread, 1:30 ratio, 70 per cent. efficiency; third reduction, 1:6 ratio spur gear, 90 per cent. efficiency. The efficiencies stated are at full load. What are the losses in the gear when motor is developing 10 b.h.p. at same speed?—W. A. C.

The first award (10s.) is made to "Mu" for the following reply:—

It is difficult to obtain reliable figures for the efficiency of gearing, since these can only be determined by measuring the input to, and the output from, the gear, and the "input-output" method of determining efficiency is notoriously unreliable. It may be taken, however, that the loss in any set of reduction gear consists of two components, one (the fixed loss) which is constant for a given speed, and one (the load loss) which is directly proportional to the power transmitted. This, though not strictly correct, is accurate enough for practical purposes. The proportion of fixed to load losses varies greatly in different gears. In moulded or inaccurately cut gears the fixed loss is high, and the total loss varies comparatively little with varying loads. In the present case, assuming accurately cut gearing designed for a normal load of 72 h.p. on the driving motor, it will probably be somewhere near the truth to take the fixed losses as one-third of the full load losses in the spur gear, and one-sixth in the worm gear. Working on this assumption, the loss in the first spur gear at full load is 5.7 h.p., of which 1.9 is fixed, and 3.8 load loss. The loss at 10 h.p. will therefore be  $1.9 + \frac{10}{72} \times 3.8 = 2.43$  h.p., and the input to the worm gear 7.57 h.p.

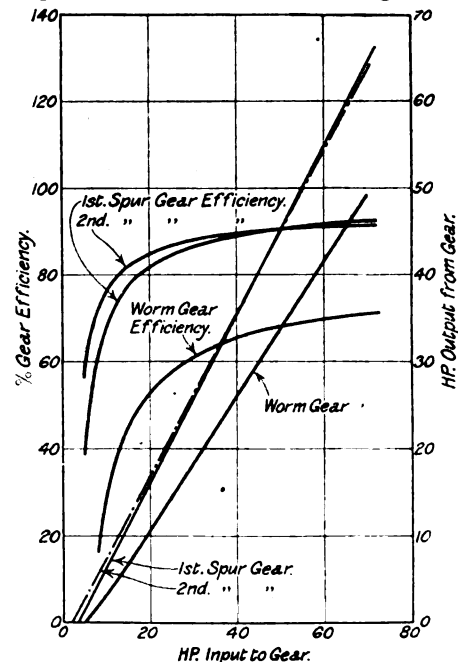
The loss in the worm gear at full load = 19.8 h.p. = 3.3 h.p. fixed, and 16.5 h.p. load loss. The loss at 7.57 h.p. =  $3.3 + \frac{7.57}{66.3} \times 16.5 = 5.19$  h.p., leaving 2.38 h.p. input to the second spur gear. The loss in this at full load = 1.55 h.p. fixed and 3.1 h.p. load loss, and the loss at 2.38 h.p. =  $1.55 + \frac{2.38}{46.5} \times 3.1 = 1.71$  h.p. Thus the total loss in the gearing at a load of 10 h.p. on the motor = 9.33 h.p. and the output available = 0.67 h.p. It will, of course, be understood that the figures quoted above, while probably fairly near the truth, may, on the other hand, be quite misleading, since it is impossible to determine the proportion of fixed to load losses from the particulars given in the question.

I would suggest to "W.A.C." that he should, if possible, take a reading of the input to the motor, in volts and amps., when driving the gearing light, the normal load being entirely disconnected. The makers of the motor should be able to tell him fairly accurately the efficiency, and hence the output of the motor at this input, and no great error will be introduced by assuming that  $L = a + bP$ , where  $L$  = losses in gearing and  $P$  = output of motor.

From the light-running reading and the known efficiencies at 72 h.p. the constants  $a$  and  $b$  can be readily determined, and substituting  $P = 10$  will give the losses in the gearing at 10 h.p. on the motor. It is, of course, quite possible that the power required to drive the gearing light will exceed 10 h.p.

The second award (5s.) is made to W. H. who writes as follows:—

Taking the first spur gear having a 6/1 reduction and a full load efficiency of 92 per cent., the input is 72 h.p. and the output is 66.2 h.p.; therefore, the output of the worm gear is 46.8 h.p. and the output of the second spur gear is 41.6 h.p. The above figures are based on the assumption that the full load of each gear is its actual load when the motor is giving an output of 72 B.H.P. Incidentally, it may be as well to mention that 70 per cent. efficiency for a worm gear is absurdly low, and a figure of 88 per cent. is much nearer the actual efficiency of such a gear. In support of this statement is the fact that at full load the loss in the gear amounts to 19.8 h.p., and as this is converted into heat it will be seen that an excessive temperature is almost certain to result if the gear is of normal dimensions. However, in the accompanying diagram are shown the efficiency curves of the three gears, and from these are plotted the curves showing horsepower output as ordinates against horse-power input as abscissæ. We have a 10-h.p. input to the first spur gear, giving 6.5-h.p. output, i.e., a loss in the first gear of 3.5 h.p.



EFFICIENCY CURVES FOR GEARING.

This gives an input of 6.5 h.p. to the worm gear and a corresponding output of 1 h.p., i.e., a loss in the worm gear of 5.5 h.p. The input to the second spur gear is, therefore, 1 h.p., and it will be seen that this is not sufficient to turn the gear round at full speed. Working backward on the curves it will be seen that 2 h.p. is required to turn the second spur gear round at full speed without any output being taken from its countershaft. Therefore, the output required from the worm gear is 2 h.p., with a corresponding input of 8.2 h.p., and this latter figure, being the output of the first spur gear, requires an input of 11.7 h.p., i.e., the output of the motor will require to be 11.7 h.p. to turn the complete gear idly. The losses under these conditions will be as follows:—

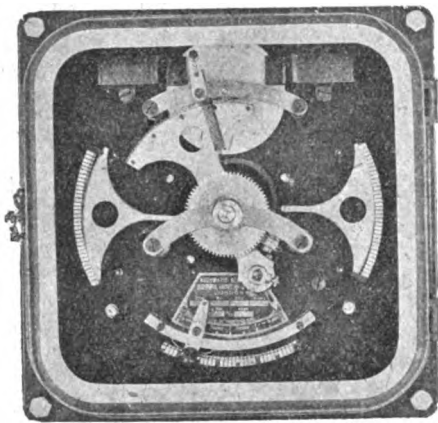
First spur gear (11.7-8.2) h.p. = 3.5 h.p.

Worm gear (8.2-2) h.p. = 6.2 h.p.

Second spur gear (2-0) h.p. = 2.0 h.p.



## BROWN-BOVERI AUTOMATIC PRESSURE REGULATORS

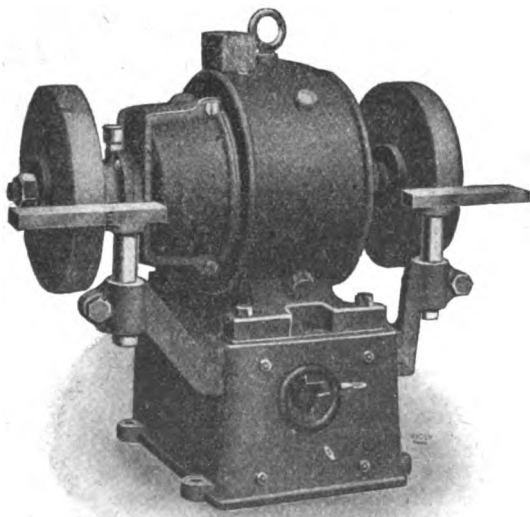


RAPID AND ACCURATE REGULATION.  
NO SPARKING.  
NO "TOUCHING UP" OF CONTACTS.

CAXTON HOUSE  
LONDON S.W.

### A BENCH GRINDER

THE Wilson-Wolf Engineering Co., Ltd. (Thornton Road, Bradford), have sent us particulars of a new pattern of electric bench grinder which they have just put on the market. The machine has been designed for hard and constant work. The motor is shunt-wound, is rated at 1 h.p.



ECONOMIC BENCH GRINDER.

and runs at a speed of about 1,800 r.p.m. It is fitted with Hoffmann ball bearings, and is quite dust-proof. The motor is mounted on a box base of rigid design, which carries two tool rests. These, besides being adjustable to the wear of the wheels, are capable of a vertical and angular adjustment to accommodate work of varying thicknesses and shapes. A starter, with no-volt release attachment, is fitted within the

box base, and is actuated by the hand-wheel seen in front. The standard equipment supplied with each grinder consists of two 8-in. by 1-in. wheels, of any grade to suit the work. The machine can also be supplied as a special heavy-duty grinder, equipped with one 10-in. by 1½-in. wheel.

### NEW INCANDESCENT LAMPS

A NEW lamp, giving a soft, diffused light without glare, and producing a distinctly decorative effect, has been



"GLOBOLITE" LAMPS.

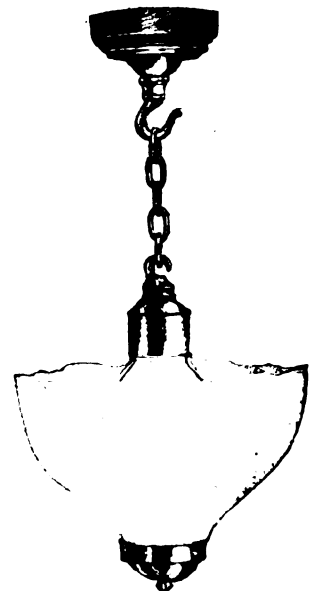
introduced by the Stearn Electric Lamp Co., Ltd. (47 Victoria Street, S.W.), under the name of the "Globolite" Lamp. One form is illustrated here. There is an inner lamp containing the filaments and an outer, slightly obscured, prismatic diffuser, permanently attached to it. They are made with metal filaments in the 28-watt size for 100 to 120 volts, pear-shaped or round, and in the 33-watt size for 200 to 250 volts, as well as for smaller candle powers, with carbon filaments. Other novelties being introduced by the Company are radiator lamps with Edison screw instead of B.C. terminals and 200-250 volt, 25 or 33 watt, "Leuconium" metal filament lamps in tubular form.

### SLOW-BREAK SWITCHES

FOR many purposes a quick-break switch is not necessary, as in equaliser switches and switches for short-circuiting starters on motor generators, switches for cutting out or short-circuiting the series coils of compound-wound machines that are desired to run for the moment as shunt machines. In many such cases quick-break switches are unnecessarily used, because slow-break, the more suitable and cheaper switches, are not available. The General Electric Company, however, by laying in heavy stock, have put themselves in a position to give immediate delivery of their "Witton" slow-break switches which are made in sizes from 100 amperes up to 3,000 amperes and in the single, double and triple-pole patterns. In the design of these switches there are a number of points to which special attention has been paid. Good grinding over the whole area of faces in contact is the first essential, and in "Witton" switches this, coupled with a low-current density at the contacts of 90 amperes per sq. in., is responsible for a very small power loss. In a 1,600-ampere size, for instance, there is only a contact drop of 9 millivolts at the break, and three millivolts at the hinges, a total of 19 watts. In the change-over type, off-stops are provided which prevent the possibility of the switch falling back on the lower contacts should it by any chance work loose.

### A NEW SEMI-INDIRECT FITTING

WE illustrate here a new semi-indirect fitting which has been produced by the British Thomson-Houston Co. (Mazda House, Upper Thames Street). This consists of an inverted "Veluria" reflector suspended by a chain and with a single lamp placed inside so as to be completely hidden. This now well-known form of reflector is particularly suitable for semi-indirect lighting on account of the excellent diffusion obtained.



VELURIA SEMI-INDIRECT FITTING.

## THE THREE-PHASE EXTENSION AT MARYLEBONE

### Mr. Snell's Full Report

IN our issue for January 16th we reported an important decision come to by the St. Marylebone Borough Council to adopt a three-phase 6,600-volt system for all future extensions at the Richmond Street power house of the Council, as the result of a preliminary report by Mr. J. F. C. Snell. The Council then decided to accept the tender of the Maschinenfabrik Oerlikon for two 8,750 k.v.a., 6,600-volt, 50-cycle (two-pole), turbo-alternators running at 3,000 r.p.m. British-made condensers are recommended, one to be worked in conjunction with the canal water and one on the cooling towers. The present equipment of boilers is considered ample for some time to come. The total scheme is estimated to cost £42,000, or only £7 per kw. installed. Mr. Snell's full report, in which he deals with the question of converters, switchgear, &c., came before the Council at their meeting on February 20th, and, after some discussion, Mr. Snell's further recommendations were adopted. He recommends that with regard to converting plant, 1,000-kw. machines should be used and standardised, and that four be installed immediately, namely, one at the generating station, two at Manchester Square sub-station, and one at Rathbone Place sub-station. For the transmission system he recommends three 0.15-sq. in. three-core E.H.T. cables from the generating station to Manchester Square sub-station, and two similar cables from Manchester Square to Rathbone Place sub-station.

Mr. Snell further recommends that the Council should leave the present continuous-current plant unaltered and use it only for peak-load purposes, and as a reserve to the three-phase plant during lighter loads. Although the steam consumptions of the old plant are 35 per cent. above the guaranteed steam consumption of the new plant ordered, yet, having regard to the present high price of copper, the great weight of cables already laid in Marylebone and the present capital commitments of the Council, Mr. Snell has come to the conclusion that an entire change to three-phase generation must be dismissed as impracticable. When the new plant is installed, it is estimated that 80 per cent. of the output can be dealt with by it, under the conditions mentioned above.

With regard to the plant, apart from the turbo-alternators, for which tenders have already been accepted, the following recommendations are made by Mr. Snell: switchgear, Messrs. Ferranti, £2,384. Mr. Snell originally recommended Reyrolle switchgear as being preferable on engineering and other grounds, but in view of the alternative prices since obtained being considerably lower, he, in a later report, withdrew this recommendation on financial grounds; condenser motors and control switchgear, Maschinenfabrik Oerlikon, £1,709; four 1,000-kw. converters, British Westinghouse Company, £8,908; condensers, pumps, &c., Worthington Pump Company, £8,964. The estimated cost of cables is put at £10,600.

At the Council meeting the recommendations were referred back, and a protest was entered against Swiss plant being ordered. Eventually the recommendations of Mr. Snell as embodied in the Committee's Report were carried.

## CATALOGUES, PAMPHLETS, &c., RECEIVED

**STEAM TURBINES.**—A handsome pamphlet from Richardsons, Westgarth & Co., Ltd. (Hartlepool), describes the combined impulse and reaction which they build of the same pattern as the Brown-Boveri-Parsons machines built on the Continent. We understand that they have supplied, and have in hand, a large number of turbines of this type in various sizes. The advantages of combining initial impulse stages with reaction leading for the final expansion are fully explained, and important details of construction, special governing arrangements, &c., are pointed out by the aid of drawings. A large number of photographs are also reproduced of actual installations, ranging up to machines of 28,000 h.p. Curves of steam consumptions are given, and a final section deals with back-pressure and by-pass turbines.

**MEASURING INSTRUMENTS.**—A new list from the Electrical Company, Ltd. (122-124 Charing Cross Road), which forms one of the 30 sections which will make up their complete bound catalogue, is devoted to moving iron, moving coil, and dynamic ammeters and voltmeters, portable instruments,

electrostatic voltmeters, insulation testing sets, and other instruments and accessories.

**CABLES AND WIRES.**—A mailing card calls attention to the cables, flexible cords, &c., supplied by the Metallic Seamless Tube Co., Ltd. (Corporation Street, Birmingham).

**GAS BURNERS AND BLOWPIPES.**—A list of "Bornkessel" burners, of a variety of forms useful to the incandescent lamp-making and other industries, is to hand from the sole agents for these articles, C. Melin & Co. (7 India Street, Crutched Friars, E.C.).

*Readers desiring copies of catalogues or pamphlets should apply to the firms in question, referring to the notice in "Electrical Engineering."*

**SPECIALITIES.**—A folder from Magic Appliances, Ltd. ("H. & O." Dept. 6, Farrington Avenue, E.C.), draws attention to the Hotwynd Blower for hair drying, bed warming, drying photographic plates, &c. The rating is 60 watts. Another apparatus, known as the Oscillus Vibrator for the treatment of various skin affections, is also described.

**INCANDESCENT LAMPS.**—An effective chart in the form either of a blotter or a postcard, has been prepared by the British Thomson-Houston Co., Ltd. (Mazda House, Upper Thames Street, E.C.), showing by representations of lamps of comparative size the various steps in which the cost of lighting by incandescent lamps has gone down from the old carbon lamps of 1885, which (at 1s. per unit), gave 200 candle-hours for 1s., to the modern Mazda lamp, which (at 4d. per unit), gives 2,400 candle-hours for 1s.

**Institution of Electrical Engineers.**—The following is the result of the ballot for new members, and transfers from one class to another, at the meeting on Thursday. *Members:* L. E. Caine, F. G. Clark, H. A. Cox, W. Cross, E. P. Grove, Prof. D. C. Jackson, C. G. Stjernberg. *Associate Members:* A. M. Anderson, A. L. Ballard, L. W. Ballard, F. O. Barralet, J. H. Baxter, T. C. Booth, F. H. Brandreth, W. E. Brandreth, W. J. Branson, R. A. Brown, R. H. Bryans, A. Burnet, J. H. Cardew, H. V. Cornish, J. R. Elliott, W. P. Elliott, H. D. Evans, W. B. Good, T. I. Gordon, J. D. Hathaway, E. Hedley, H. H. Holmes, L. A. Hoyle, W. C. Knight, R. W. Law, W. A. MacKenzie, J. Y. MacKersie, G. A. Madden, D. Martin, P. M. Martin, J. R. Matthews, R. C. Milliken, A. N. Moor, G. Murray, G. Nicolson, A. Regnaud, J. L. Smith, H. A. Stanton, F. V. Stephen, W. Tancred, J. W. Turner. *Associates:* R. L. McCulloch, J. F. Newall. *Graduates:* C. W. Braithwaite, E. C. Channell, E. P. Collett, R. S. Davis, F. S. Dinenage, T. Drummond, T. W. Elsdon, J. W. Leach, T. H. McNaught, O. Melville, R. J. Mitchell, T. F. Stent. *Students:* E. C. Albrecht, S. Baker, B. C. Bayley, C. R. Bicknell, N. B. Bunt, R. L. Castle, A. S. Carr, J. C. Clarke, L. F. Clement, W. T. Crichton, W. G. Cross, T. C. de Moura, A. V. dos Santos, H. Gregson, J. O. Griffiths, B. E. Mittell, B. S. Orme, N. Pemberton, J. H. Salisbury, A. Schamasch, M. Smith, G. O. Tipping. *CANDIDATES TRANSFERRED—Associate Member to Member:* E. Calvert, A. S. Campbell, C. Carew-Gibson, J. H. Carrick, W. L. Carter, A. G. Cooper, H. G. Cotsworth, J. H. Edwards, H. S. Ellis, T. F. Forster, J. Gray, F. S. Grogan, E. P. Gunter, R. J. Kaula, W. F. Long, J. H. Mackail, R. S. McLeod, R. B. Mitchell, F. W. Parkinson, E. Ridley, F. H. Whysall, C. B. Wigg, J. H. Wild, J. H. Williams. *Associate to Associate Member:* A. T. Bartlett, E. A. Reynolds. *Associate to Associate Member:* P. C. Austwick, A. B. Blakey, H. E. Britton, J. C. Johnston, W. Mead, T. Pearson, H. W. Stovold. *Student to Associate Member:* E. V. Buchanan, T. C. Christianson, H. Clark, E. A. Corbin, J. G. Craven, F. Murphy, R. J. O'Brien-Owen, A. C. Towers, E. A. Watson. *Student to Graduate:* G. J. Baldock, J. W. Beck, H. Butler, A. G. Cross, J. K. Hwoo, E. A. Richards, A. Smellie.

**The Batti-Wallahs.**—This Society held its annual general meeting at the Golden Cross Hotel on March 3rd. The president, Mr. F. J. Collis, was in the chair, and his place was afterwards taken by Mr. J. Snow Huddleston, who was unanimously elected president for the ensuing year. Mr. Pooley, the secretary, reported that the finances of the Society were in a healthy condition, and that the progress made during the past year was remarkably good. Four smoking concerts, a dinner, seven informal meetings, a down-river trip, an up-river trip, and a barge trip were held during the year. The vice-presidents are Messrs. J. F. Avila, Hady T. Harrison, W. A. Jones, and C. Newton Russell, and the committee Messrs. Campbell, Carter, Gardner, Greenly, Smith, and Warriolow. Messrs. Collis, Pooley, and Robinson were thanked for their untiring efforts.

**The Electrical Trades Benevolent Institution.**—The annual general meeting of this institution will be held on March 31st, at the Institution of Electrical Engineers, at 2.30 p.m., with Mr. E. Garcke in the chair. The meeting will be composed only of "members" of the institution.

# "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

## Specifications Published March 6, 1913

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

Names in italics indicate communicators of inventions from abroad.

3,105/12. **Train or Car Lighting.** H. F. FOSTER and A. W. S. POCKLINGTON. The variable-speed dynamo to be used in conjunction with accumulators is provided with an automatic cut-in and cut-out switch, actuated by the magnetism of the field, and consisting of a pivotted armature placed behind one of the main poles. The external circuit is closed when the field of the machine rises to a sufficient value, and is opened when a reverse current from the battery passes through a coil carried on the movable armature. The switch is purposely placed in a position where the field is low in order to avoid disturbance by residual magnetism. Two figures.

3,123/12. **Automatic Electric Railway.** J. J. DESCHAMPS. In this system of automatically controlled driverless trains, head-on collisions are prevented by controlling the current in each of the sections into which the track is divided by switches electro-magnetically actuated by the current in the next section ahead, and therefore taking up different positions according to whether a car is on the next section or not, and thereby determining whether the car on the rear section is supplied with current or not. Two figures.

3,325/12. **Heating Resistances.** G. COOPER (British Prometheus Co.). This specification covers a method of coating metal resistance elements with a layer of a precious metal to protect them from the action of the atmosphere at high temperatures. The resistance body is passed through a coating solution and between painting rolls, then through levelling rolls into a drop chamber, and through a drying chamber. Two figures.

3,555/12. **High-frequency Generator.** R. HEYLAND. In this generator the frequency is not determined by the speed and number of poles, but by oscillations of the magnetic field secured by the reaction of a short-circuited polyphase winding unconnected to any source of supply, but having its phases connected in parallel so that oscillations of low frequency are damped out by equalising currents, and only a particular higher harmonic determined by the difference in phase of the separate coils is developed. The oscillations may be strengthened by suitably-tuned inductances and condensers. One figure.

3,590/12 and 30,024/12. **Switches.** H. C. SHELDON (*Sächsische Gruppenwechselshaft*). Systems of obtaining various combinations of control of groups of lamps by two similar switches each containing circuit-closers upon a movable portion insulated from each other, but able to be connected to an outside circuit, and two or four fixed contacts. With only one design of switch, a large number of different schemes of variable connections may be arranged. Nineteen figures.

6,052/12. **Conduit Fittings.** L. G. BYNG and T. TAYLOR (General Electric Co.). This specification covers a method of retaining the clamping screws in one-half of a conduit fitting, of the type that grips the conduit tube by screwing the halves together so that they cannot be lost. The upper part of each screw is formed without a thread, but the hole in the upper half of the fitting is threaded. Thus when the screw has been put in beyond its thread, it cannot fall out, although it is free to rotate as required to draw up the other half of the fitting. In an alternative arrangement the hole in the upper part of the fitting is made to clear the thread for insertion of the screw, and later partly closed by special tools. Four figures.

9,210/12. **Variable-speed A.C. Motors.** BRITISH THOMSON-HOUSTON Co. (*G.E.C., U.S.A.*). Two brushes are provided per pole, and the speed is controlled by varying the distance between them. The arrangement is applicable to forms of repulsion as well as of conduction motor. Two figures.

## Specifications Published To-day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, E.C., at the price of 8d. each, post free.

Summaries of some of the more important of these patents will appear in our next issue.

**Arc Lamps:** B.T.-H. (*G.E.C., U.S.A.*) [Electrodes] 11,792/12; SIRON [For cinematographs and other projections] 26,886/12.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** KEMMERICH [Speed regulation of electrical ring-spinning machines] 4,140/12 and 4,590/12; B.T.-H. and WEDMORE [Protective gear] 10,545/12; SIEMENS BROS. & Co. (*Siemens & Halske*) [Controlling circuits in regular sequence] 20,914/12; BERGMANN [Protective gear] 21,831/12.

**Dynamos and Motors:** B.T.-H. (*Noeggerath*) [Homopolars] 4,187/12; MORGAN CRUCIBLE Co. and GRANT [Brush holders] 4,592/12.

**Heating and Cooking:** PERRY [Cooking] 4,090/12; J. SLATER & Co. and ALLENSBY [Radiator] 6,864/12.

**Ignition:** BRENOT, 10,130/12.

**Switchgear, Fuses, and Fittings:** BEUTTELL [Mounting of and reflectors for incandescent lamps] 1,186/12; WORSNOP [Miners' safety lamps] 4,933/12; REGNART [Holders for candle lamps] 5,560/12; KOVACS [Fuse] 19,218/12; VANDERVELL and MIDGLEY [Switchboards] 27,501/12.

**Telephony and Telegraphy:** BROWN [Telegraphy] 6,275/12; JOHNSON [Telephone exchanges] 8,997/12; SCHIESSLER [Telephone receivers] 27,969/12.

**Traction:** J. STONE & Co. and DARKER [Lighting, heating, and ventilating railway carriages] 4,073/12; MUNRO and R.E.T. CONSTE. Co. [Trolley-pole sockets] 4,264/12; WRIGHTMAN [Locomotive signal] 6,555/12.

**Miscellaneous:** KORYTOWSKI [Electrically-operated doors] 3,736/12; BLOXAM (*Ericsson, Russia*) [Remote indication of movements] 3,742/12; GEB. SIEMENS [Copper coating carbon] 3,917/12; MOLONEY [Fire alarm] 4,777/12; RICHARDS [Clutches] 7,928/12; WOLLISCROFT and H. T. BOOTROYD's [Slow motion gears for starting elec. motors] 10,366/12; MONTGOMERY [Magnetic water-level indicator for steam boilers] 16,483/12; WEINBERG, SCHRIMMER, and BUETZER [Umbrella shock protector] 21,162/12; FRIEDRICH DIEZ [Battery electrodes] 21,739/12; GAMPER [Packing magnetic material] 28,233/12; WEHRLIN [Preventing generation of chlorine by penetration of sea-water into elec.-driven vessels] 28,518/12, [Protecting accumulators from flooding by sea-water] 28,519/12.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Dynamos, Motors, and Transformers:** HILDEBRAND [D.C.-A.C. transformation] 17,346/12.

**Electrochemistry:** ELEKTROZITÄTS WERK LONZA [Recovering alkali metals from fused halogen compounds] 3,575/13.

**Incandescent Lamps:** WESTINGHOUSE METALLFADEN GLÜH-LAMPENFABRIK [Tungsten filaments, &c.] 3,162/13.

**Switchgear, &c.:** GABREAU ET DELAUX [Regulators] 21,813/13.

**Telephony and Telegraphy:** SIGNAL GES. [Wireless] 3,246/13; SIEMENS & HALSKE [Automatic and semi-automatic exchanges] 3,344/13 and 3,431/13, [Telegraph system unaffected by near H.P. lines] 3,432/13.

**Miscellaneous:** PUCEL [Alarm] 3,335/12; STEYNIS [Production of ozone] 3,769/12.

The following Amended Specifications may now be obtained.

**Incandescent Lamps:** B.T.-H. (*G.E.C., U.S.A.*) [Metallic tungsten] 21,513/06 (*ELECTRICAL ENGINEERING*, Feb. 27th, p. 122).

**Telegraphy:** S. G. BROWN [Relays] 20,451/11.

## Expiring and Expired Patents

The following Patents expire during the current week, after a life of fourteen years:—

5,657 of March 15th, 1899. **Wireless Telegraphy.** G. MARCONI and WIRELESS TELEGRAPH & SIGNAL Co. This relates to the construction of and connections for transmitting keys provided with back contacts arranged to cut out the receiving apparatus when sending, and the transmitting apparatus when receiving, without other switches.

5,932 of March 18th, 1899. **Submarine Telegraphy.** A. POLLAK, J. VIRAG, J. EGER and F. SIBERSTEIN. A system of rapid signalling through cables with a receiving instrument constructed on the lines of a telephone receiver, carrying a mirror on the diaphragm which deflects a beam of light.

The following are the more important Patents that have become void through non-payment of renewal fees.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** CROMPTON & Co. and J. R. MACINTOSH [Automatic reversible battery booster system] 25,522/02.

**Dynamos, Motors and Transformers:** B.T.-H. (*G.E.C., U.S.A.*) [Self-exciting alternators] 24,874/04; E. ARNOLD [Single-phase commutator motors] 23,661/05; M. WALKER [Commutation system] 25,624/07.

**Instruments:** E. J. MURPHY and KELVIN & WHITE [Improvements in electrostatic voltmeters] 26,131/06.

**Switchgear, Fuses and Fittings:** W. H. SCOTT [Switches with laminated contacts] 23,751/05; W. HOWLIN [Clock switches] 23,826/05; E. & O.A. Co. [Tubular fuses] 25,478/07; R. F. VENNEN and R. C. GRIESBACH [Time switches] 24,716/07.

**Traction:** H. LEITNER and R. N. LUCAS [Train lighting] 25,216/02; E. TYER and J. H. HAMILTON [Railway signalling] 25,263/03.

**Miscellaneous:** J. JORDAN [Air brakes for electrical winding engines] 23,729/01; W. REUTER [Lifting magnets combined with grabs, &c.] 24,914/02; A. P. and C. H. WARNER [Eddy current tachometers] 25,026/03; G. C. MAAS [Time alarm signals] 26,524/06.

# ADAMS IGRANIC

ELECTRIC MOTOR CONTROL GEAR FOR STEEL MILLS.

ADAMS  
M<sup>FG</sup> C<sup>Y</sup> L<sup>TD</sup>  
BEDFORD  
AND  
LONDON

## ELECTRIC TRACTION NOTES

Serious corrosion of the running rails and the overhead steel construction in the Simplon tunnel having been observed, experiments were made to determine whether there was any electrolytic action from the low frequency alternating current (16 cycles). The chief engineer of the Swiss State Railways, Herr Dänzer-Ischer, in his report, published in the *Schweizerische Bauzeitung*, states that the corrosion has been proved to be due to the chemical action of the water in the tunnel, and not in the slightest degree to electrolytic action. Incidentally, however, the experiments showed that over 60 per cent. of the traction current was returning by the earth as the bonding of the rails was not sufficiently good. This is being remedied, and to prevent further corrosion the rails and other steelwork are being protected from the dripping water.

The Swiss papers state that as soon as the Lötschberg line is open to traffic, which should be during the coming summer, the conversion to electric traction of the Scherzigen-Spiez section will be taken in hand, and eventually the line from Spiez on to Berne. The adoption of electric traction on the Spiez-Zweisimmen narrow-gauge line is also under consideration. This connects up with the Montreux-Oberland-Bernois electric line, and together they will form an electric line about sixty miles in length, connecting the lakes of Thun and Geneva. Another projected scheme in Switzerland is the construction of an electric line from Sierre to Goppenstein, which will shorten the route to Berne.

In a long article in *Elektrische Kraftbetriebe u. Bahnen* (Feb. 14th.), Herr G. Brecht, an engineering official of the Prussian State Railways, discusses the decision of the Victorian Government to adopt high-tension direct-current traction for the Melbourne system. He agrees that, in the case of the suburban system of Melbourne, the direct-current is the correct and most economical proposition, but complains of the comparison with the single-phase system in respect of the low trolley pressure (11,000 volts as compared with the German standard of 15,000 volts), the high frequency (25 cycles as compared with the German standard of 16½), and the adoption of four-motor coaches instead of one or two large motors in a locomotive. In particular, however, he rejects as wholly incorrect the ratio of approximately two to one in the first cost and maintenance of equipments (founded, it is stated, upon actual quotations and guarantees), but offers no figures to substantiate his argument. In respect of the comparison of the two systems for the long-distance lines, he considers that the direct-current, and not the single-phase overhead, equipment would have the larger maintenance figure, and that this and the high figure again taken for locomotive maintenance invalidate the comparison which, he considers, should show largely to the advantage of the single-phase system for these longer lines.

The trolley omnibus routes at Stockport, which have been equipped on the Bremen system, patents for which in this country are held by the Brush Electrical Engineering Co., were finally inspected by the Board of Trade officers last week.

### EVERY INSTALLATION ENGINEER

Should join his Trade Protection Organisation,

THE

**ELECTRICAL CONTRACTORS' ASSOCIATION**

(Incorporated).

Inquiries cordially invited by the Secretary,

L. G. TATE,

20, Bucklersbury, LONDON, E.C.

The Manchester Corporation Tramways Committee decided on Tuesday that the Committee's contribution in relief of the rates for the year ending the 31st inst. should be £100,000, which is the highest sum ever paid by any tramway undertaking in the United Kingdom in one year toward the relief of the rates. Last year £85,000 was contributed, and in ten years the total amount paid by this Committee reaches £700,000.

## TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

On 6th March last the cable between Odessa and Constantinople was working normally, and on the following day the routes via Fao and El Arich were repaired but encumbered.—On the 8th March the Lemnos-Salonika cable was restored and traffic for the latter place could be again accepted "via Eastern."—The Ottoman Government announced on the 10th inst. that private correspondence between Turkey and offices opened by the coalition Governments in European Turkey—other than diplomatic messages—are stopped, and the office of origin will not be notified.—On the 10th inst., also, traffic via Fao and El Arich was passing normally.

## LOCAL NOTES

**Accrington: Gas Engine Plant.**—The Engineer has presented a report with regard to the gas engine plant. A three months' trial on one set started on February 4th and no stoppage has occurred since. The gas-making plant was started on a three months' trial on March 1st.

**Barking: Electricity Undertaking.**—The position of the electricity undertaking and the possibility of a supply in bulk being taken from neighbouring authorities, has been under general discussion recently, but the Electricity and Tramways Committee now report that so far as the possible transfer of the undertaking is concerned, no further steps should be taken. For the present, the question of a supply in bulk from West Ham is to remain in abeyance, but negotiations with East Ham for a bulk supply are to be continued.

**Belfast: Electricity Profits.**—The sum of £5,000 is to be transferred from electricity profits to relief of rates.

**Bognor: Electricity Supply.**—The Bognor Gas Co. have lost no time in putting into operation their electric lighting powers, and under the direction of Mr. A. H. Dykes, their consulting engineer, it is hoped that a supply will be available in July of this year.

**Cheltenham: Street Lighting.**—A scheme for substituting thirty-four electric lamps for thirty-three gas lamps has been approved.

**Darlington: Slot Meters.**—It has been decided to fit "penny-in-the-slot" meters, as a demand is springing up for these in a certain class of house. The charge will be calculated on the basis of 4½d. per unit, which will include the supply of metal filament lamps.

**Dorsetshire: Electricity Supply.**—It is anticipated that the County of Dorset Electric Supply Co. will have their electricity works in Swanage, Dorchester, and Blandford in operation this spring.

**Felixstowe: Proposed Purchase of Electricity Undertaking.**—The proposal to purchase the undertaking of the Suffolk Electricity Co., which is leased by the Council, has been referred to a Special Committee of Inquiry. At present the Council are responsible for the finance for the Works, but it is stated that under the proposed scheme it would be relieved of this responsibility.

**Hull: Electricity v. Gas.**—A proposal to light the new Saner Street schools by gas was discussed at the last meeting



## PHENIX ASSURANCE COMPANY, LIMITED.

ESTABLISHED 1782.

Head Offices: 19 & 70, LOMBARD STREET, LONDON, E.C.

TOTAL FUNDS EXCEED  
£15,000,000

CLAIMS PAID EXCEED  
£90,000,000

CHAIRMAN: RT. HON. LORD GEORGE HAMILTON, P.C., G.C.S.I.

### FIRE - LIFE - ACCIDENT - MARINE

Loss of Profits following Fire, Workmen's Compensation,  
Fidelity Guarantee, Burglary, Trustee and Executor, &c.

#### ELECTRIC LIGHTING.

The Company has always encouraged the development of Electricity, and the well-known "Phoenix Fire Office" Rules for Electrical Installations are in use throughout the world. Copies will be supplied free on application to Head Offices.

General Manager: SIR GERALD H. RYAN.

## DON'T MACHINE!—CAST!

The scientific accuracy and perfection of finish that can be secured by

"PRANA"

### DIE FINISHED CASTINGS

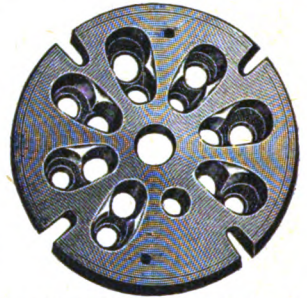
renders unnecessary all expensive and costly machining, and will

#### CUT DOWN COST ON COMPLICATED PARTS

Holes, Slots, Teeth, Notches, Screw Threads accurately cast and finished by the "Prana" process.

Send for booklet E.A., illustrating and describing this money-saving process to:—

AERATORS LIMITED, EDMONTON, LONDON, N.



### ELECTRICAL PORCELAIN

OF

HIGHEST QUALITY

APPLY TO

JAMES MACINTYRE & CO., LTD.,  
BURSLEM.

MICA MICANITE FIBRE.  
OILED FABRICS LEATHEROID

## INSULATION

The Micanite & Insulators Co., Ltd.  
Walthamstow, London, E.

## COMSTICK.

The Unrivalled Commutator Compound. Has a Thirteen Years' Successful Record, and is in constant use for both Carbon and Copper Brushes.

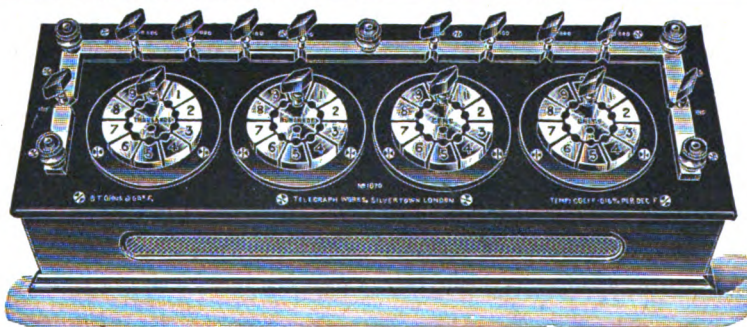
PRICE: ONE SHILLING PER STICK.

Inventor & Sole Manufacturer—S. W. CUTTRISS, Prudential Buildings, LEEDS.

**STEATITE  
INSULATORS**  
SUPPLIED  
FOR ALL KINDS OF  
ELECTRICAL WORK  
WILLIAM SUGG & CO. LTD.  
WESTMINSTER.

# SILVERTOWN INSTRUMENTS

Bridges with  
Sliding-Contact  
Dials also  
supplied.



Please write  
for List  
No. 33.

**FOUR-DIAL BRIDGE, A 424**, with circular dial plug commutators having resistances of thousands, hundreds, tens, and units, mounted with ratio arms, containing pairs of coils of 10, 100, 1,000, and 10,000 ohms. The coils wound with platinoid or manganin wire, and adjusted either in British Association or Board of Trade units.

**The India Rubber, Gutta Percha  
and  
Telegraph Works Co., Ltd.**

Head Offices:  
106, Cannon Street, London, E.C.

Works:  
Silvertown, London, E.

WHEN CORRESPONDING WITH ADVERTISERS, PLEASE MENTION "ELECTRICAL ENGINEERING."



of the Corporation, and an amendment that electricity be adopted was eventually passed.

**Sidmouth: Arbitration Award.**—Arbitration proceedings took place a short time ago to determine the price which the District Council should pay for the undertaking of the Sidmouth Gas and Electricity Co. As a matter of fact, the electric lighting powers have not yet been put into force. The arbitrator's award has just been issued, and fixes the price at £34,683 for the combined undertaking.

**Stoke-on-Trent: Electricity Works Assessments.**—Strong complaints are being made against the recent assessments of the various electricity works owned by the Council. In one case the assessment has been doubled, and the increases are so large generally, that Alderman Coates, who was at one time Chairman of the Hanley Electricity Committee, is convinced that a mistake has been made. Notice of motion has been given with a view to securing instructions being given to the Town Clerk to appeal.

**Swansea: Electric Lighting Profits.**—Alderman Sinclair, Chairman of the Electric Light Committee, has protested against a proposal to allocate £1,200 from electricity profits to relief of rates. He points out that the reserve fund should be added to until it is one-tenth of the capital expenditure, and it has not yet reached this sum; hence his opposition.

**Truro: Electric Lighting.**—At the Board of Trade offices last week an inquiry was held by Mr. Garnham Roper, Secretary to the Harbour Department, into applications by the Truro Corporation and the Truro Gas Co. for electric lighting provisional orders for that town. Dr. J. W. Purves is advising the Corporation, and he estimated that a plant costing £8,000 would meet the requirements of Truro for a few years. He proposes putting in two 100-h.p. suction gas engines, and two 65-kw. generators, and calculated that at the end of the first year there will be a net profit of £92. He also calculated that there would be 3,500 30-watt lamps in use at the end of the first year, and had worked out his estimates on the basis of each lamp consuming 10 units per annum. The Gas Co. strongly contested these figures, and argued that the estimated consumption per lamp per annum was much too high, four units being nearer the average. The Gas Co. argued, in support of their own Order, that an electrical undertaking in a small town like Truro could not be made to pay unless associated with a gas undertaking, which already had practically all the staff, lands and buildings. The success of the combined electricity and gas undertaking at Ascot was referred to, and Mr. A. E. Brooks, Engineer and Manager of that undertaking, was called in support of the Gas Co.'s case. The estimates of the Gas Co. were that, in spite of having the land and buildings, a capital expenditure of £7,535 will be necessary for the plant, and the figures showed that after a five years' working there would be a profit of £494. At the conclusion of the inquiry, Mr. Garnham Roper asked the Corporation whether, assuming the Board of Trade granted the Council an Order, the insertion of the "Winchester" Clause would be agreed to, and the reply was in the affirmative.

**Walsall: Position of Electricity Undertaking.**—As already noted in these columns, the position of the electricity undertaking is causing grave concern. The accounts now show an adverse balance of £3,853 on the past year's working. Already a recommendation has been made to call in an expert, and, apparently, with the idea of increasing the revenue, it is now proposed that the price of current for lighting purposes be increased from 4d. to 5d. per unit, at the same time abolishing meter rents.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

[Notes of Contracts Open are not repeated under this heading week by week until the last date for receiving tenders, but are only inserted once.]

### Generating Stations, Sub-Stations, Mains, &c.

**Bristol.**—A loan of £25,000 is to be applied for, to cover the estimated requirements of the Electricity Department during the next three years.

**Buxton.**—The Local Government Board have sanctioned loans for electrical extensions.

**Cheltenham.**—Mains extensions at an estimated cost of £338 are contemplated.

**Colchester.**—A loan of £7,660 for electrical extensions has been applied for.

**Darlington.**—A loan of £8,052 for mains and services has been sanctioned.

**Halifax.**—Additional cables are to be laid at an approximate cost of £1,700.

**Hereford.**—A loan of £500 is to be taken up for mains extensions.

**Leeds.**—Two new transformer chambers are to be constructed. Chief Electrical Engineer.

**London: L.C.C.**—Reconstruction and rewinding of seventeen 300-kw. synchronous motor-generators, and three 500-kw. induction motor-generators. Clerk. April 3rd. (See advertisement on another page.)

**Hackney.**—A number of mains extensions are contemplated.

**Manchester.**—The contract for the electric lighting of the Crumpsall Workhouse at a cost of £4,755 has been let to a Salford firm of electrical engineers.

**Newcastle-under-Lyme.**—A new feeder cable is to be laid.

**Peterborough.**—A loan of £7,000 is to be applied for to provide an additional 500-kw. turbo-generator.

**Southampton.**—An important report has been prepared by the Borough Electrical Engineer, in which the installation of additional generating plant is recommended at an estimated cost of £8,200. Mr. Street impresses upon the Committee the necessity for having this plant by next winter.

**Southend-on-Sea.**—A loan of £3,700 for electrical extensions has been inquired into. It is intended to instal a new 500-kw. steam generator.

**Stoke-on-Trent.**—Extensions of mains and also to the switchboard are contemplated at the Hanley Electricity Works at an estimated cost of £4,570.

**Stroud.**—Terms have been arranged between the Council and a company for the erection of an electricity works.

**Walsall.**—A loan of £4,840 is to be applied for to instal additional boilers.

**West Africa.**—The Loanda Municipality require an electric lighting installation. Particulars, 78 Basinghall Street, E.C.

**Wigan.**—A loan of £3,000 for electrical extensions is to be applied for.

### Wiring

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Armagh.**—Cinematograph theatre. Architect, T. Houston, Kingscourt, Wellington Place, Belfast.

**Chesterfield.**—Drill hall. Architect, W. H. Wagstaff.

**Croydon.**—126 houses, J. Weller, Dalmaley Road.—Twelve houses, Norbury Court Estate Office.—Twenty-eight houses, Ashburton Avenue, W. Nottle, 250 Albert Road.

**Dukinfield.**—New cinematograph theatre.

**Dundee.**—New hospital in Seafeld Road.

**Hawick.**—New swimming baths.

**Hull.**—Lighting of Saner Street schools.

**London.**—Considerable extensions to Tooting Bec Asylum. Metropolitan Asylums Board.

New hotel, 88 Marylebone Road.

**Nottingham.**—New swimming baths in the Meadows District.

**St. Andrews.**—Cinematograph theatre, North Street.

**Southend-on-Sea.**—Swimming baths. Borough Engineer.

**South Shields.**—Electric lighting of new wing, Nurses' Home at Union. Architect, J. K. Morton, 57 Westgate Road, Newcastle-on-Tyne.

**Swansea.**—Electric lighting of County Police Station. March 20th. Wilts County Surveyor.

### Miscellaneous

**Chichester.**—Twelve months' supply of electric lighting stores for County Asylum. Clerk. March 26th.

**Coventry.**—Two double-deck top-covered and three double-deck non-top-covered cars. General Manager. March 27th.

**Portishead.**—Now that the local electric lighting company has got into working order, the Council have decided to substitute electricity for the existing gas lamps in the streets.

FOR  
**STEAM JOINTS**  
USE



JOHN HUDSON & CO.'S SUCCESSORS, Mansell St., London, E.

**Wallasey.**—General stores for Electricity Department. Borough Electrical Engineer. April 12th. (See advertisement on another page.)

**Windsor.**—The Board of Guardians are considering the question of lighting and power at the Old Windsor Workhouse, and in this connection their attention may be usefully drawn to the experience at Eton, referred to in our "Local Notes" column last week. Local opinion is that it is quite time the antiquated system of lighting and power at the Windsor Workhouse is improved. For several years the Windsor Electric Lighting Co. have offered to go into the matter and to supply current on advantageous terms, but hitherto the proposal has always been out-voted.

## TENDERS RECEIVED AND ACCEPTED

**Birkenhead.**—Messrs. Chamberlain and Hookham have received an order for D.C. meters.

**Bolton.**—Ten tenders have been received for two 4,000-kw. turbo-alternators for the new power station, and that of Messrs. J. Musgrave and Son, Ltd., has been accepted. Five tenders have been received for four water-tube boilers including superheaters and mechanical stokers, and Messrs. Babcock and Wilcox have been given the order. The order for economisers has been given to Messrs. E. Green and Sons. Tenders for switchgear are still under consideration.

**London: Islington.**—The following tenders have been accepted: meters, British Westinghouse Co.; cables, British Insulated and Helsby Cables, Ltd.; lamps, arc-lamp parts, &c., Maxim Lamp Co., Pope's Electric Lamp Co., and General Electric Co., Heap and Johnson; service and network boxes, cable terminals, &c., British Insulated and Helsby Cables, Ltd., Callender's Cable and Construction Co., Lucy and Co., Sykes and Sugden, Dussek Bitumen Co., Indiarubber, Gutta Percha and Telegraph Works Co.

**West Ham.**—Messrs. Chamberlain and Hookham have received an order for A.C. meters of 25-ampere capacity and upwards.

**Manchester.**—The following tenders have been accepted by the Corporation: 300 kw. rotary-converter, General Electric Co.; 500 kw. motor-converter, Bruce Peebles and Co.; auto-transformers, British Electric Transformer Co.; H.T. switchgear and E.H.T. panels, Ferranti, Ltd.

**Nelson.**—The tender of the Tudor Accumulator Co. has been accepted for a traction battery, and that of Messrs. Newton Bros. for a motor-generator and booster.

**South Africa.**—Messrs. Siemens Bros. Dynamo Works have received a contract for the supply of 31,800 "Wotan" lamps for use on the South African railways.

**Staffordshire.**—The Electric Construction have received an order at £335 for electrical plant at the County Mining Institute, Burntwood.

**Worcester.**—A three years' contract for cable has been placed with the British Insulated and Helsby Cables, Ltd., in spite of some opposition at the last Council meeting.

## APPOINTMENTS AND PERSONAL NOTES

Sir Oliver Lodge, F.R.S., has been elected President of the British Association for the meeting at Birmingham this year, in consequence of the death of Sir William White. The Sectional Presidents for the Birmingham meeting have now been appointed, and Mr. J. A. F. Aspinall, General Manager of the Yorkshire and Lancashire Railway Co., is Chairman of the Engineering Section.

Owing to the forthcoming departure of Mr. H. H. Couzens to take up an appointment abroad, applications are invited for the office of Chief Electrical Engineer and Manager to the Hampstead Electricity Department. The salary is £700 a year with a bonus on the profits of the undertaking. A "consumers'" engineer is also required at a salary of £300 a year. (See an advertisement.)

Mr. S. T. Allen, at present Chief Electrical Engineer to the Carlisle Corporation, is recommended for the post of Chief Electrical Engineer at Wolverhampton, at a commencing salary of £600 per annum.

Mr. Charles Mittelhausen, who has recently resigned his

position as Engineer and Manager to the Bexley Council Tramways and Electricity Undertaking, was entertained to dinner, on the 28th February, at Whitehall Court, by the tramways managers of the Greater Metropolitan area.

Mr. F. Clough has been appointed Chief Assistant Electrical Engineer at the new Essex County Asylum, Colchester.

A Chief Electrical Engineer is wanted by the Heywood Corporation at a salary of £200 per annum. Applications to Town Clerk by March 21st.

The Hackney Electricity Committee make the following recommendations: that Mr. T. Dalby be designated Works and Sub-stations Superintendent, at a salary of £200 rising to £300 per annum; that the salary of Mr. E. Mathews, Testing Engineer, be increased from £130 to £140 per annum, and that the salary of Mr. E. Wilkinson, Generating Engineer, be increased from £117 to £127 10s., rising to a maximum of £150 per annum.

Mr. L. E. F. Bellamy has been appointed Borough Electrical and Tramway Engineer at Ilkeston at a salary of £200 rising to £260 per annum.

Mr. W. H. Woods has been appointed Shift Engineer at the Stuart Street generating station, Manchester, at a salary of £175 rising to £190 per annum.

Mr. James Stott, Borough Electrical Engineer and Tramways Manager at Heywood, is resigning on account of ill-health.

Mr. H. Wolfenden has resigned his position as Director and Chairman of the Edison and Swan United Electric Light Co., Ltd. Mr. C. J. Ford succeeds him.

Mr. A. Prentice, of the Central London Railway Power House, has been recommended for the post of Station Superintendent at Walsall, at a salary of £200 per annum, after a trial.

The recommendation to increase the salary of Mr. W. Fennell, Borough Electrical Engineer at Wednesbury, by £25 per annum, has been passed after a good deal of opposition.

## COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &c.

**Electrical Distribution of Yorkshire.**—The capital is to be increased by £25,000.

**British Insulated and Helsby Cables.**—The profit for last year amounted to £218,395, in addition to £63,651 brought forward. This represents an addition of £30,136 over the previous twelve months. A final dividend, making 10 per cent. for the year, is recommended, carrying forward £74,231.

**British L. M. Ericsson Manufacturing Co.**—A dividend of 8 per cent. is recommended on the ordinary shares, carrying forward £5,940.

**Metropolitan Electric Supply Co.**—A final dividend, making 4½ per cent. for the year, is recommended for 1912, carrying forward £4,262.

**Vickers.**—It is proposed to increase the ordinary share capital by 740,000 shares. They are to be offered to the existing shareholders at 30s., viz., a premium of 10s.

**Price of Copper.**—Messrs. George Smith and Son, 5 Philpot Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night, was £69 to £69 10. (Last week the same.)

**Metal Filament Lamp Patents.**—In the Chancery Division last week, Mr. Justice Sargant had a motion before him in the action of Osram Lamp Works, Ltd., v. Freeman. It appears that the defendant is selling the Gabrielle lamp, and Sir Alfred Cripps, K.C., protested against an interim injunction being granted restraining the sale of these lamps in the country, on the ground that there was a substantial defence to the main action now pending. No motion was made on the order, and the question of costs was reserved.

Mr. Justice Swinfen Eady in the Chancery Division last week granted an injunction against Louis Schloss & Co. restraining them from selling lamps infringing Osram Lamp patents. It was stated that the lamps were purchased from a Belgian company, who in turn had received them from Turin.

On Feb. 21st, in the High Court of Justice, Chancery Division, Mr. Justice Parker granted an interim injunction to the Osram Lamp Works, Ltd., restraining L. Apple, 13 Brewer Street, Regent Street, W. (Brewer Lamps), trading as the West-End Gas Appliances and Ironmongery Stores, his servants, agents, and workmen, from selling lamps infringing Osram Patents Nos. 25,839 of 1904 and 18,622 of 1906. The lamps in question were supplied by Louis Schloss & Co., Rangoon Street, Crutched Friars, E.C.

# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 325 [VOL. IX., No. 12]

*All rights reserved.*

THURSDAY, MARCH 20, 1913.

[PRICE ONE PENNY.

*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES and TECHNICAL COLLEGE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

*Other Advertisement Rates on Application.*

*Latest Time for Receiving*

Letters for Insertion, Tuesday first post.

Small Advertisements and Official Announcements, Wednesday first post.

Displayed Advertisements, Tuesday first post.

Corrections in Standing Advertisements, Monday first post.

All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 208-206, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Circling, Fleet, London."

Telephone No.: 5509 Holborn.

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## CONTENTS

	PAGE
SUMMARY	157
A Big Birthday Party	158
Power Supply on the Rand	159
Breakdown on the L.C.C. Trams	160
Electric Cooking and Heating	161
Recent Developments in the Street Lighting of Manchester	162
Questions and Answers by Practical Men	163
A New Multiblade Exhaust Fan	164
The Manufacture of Wotan and Tantalum Lamps	164
Catalogues and Pamphlets Received	164
Electric Traction Notes	165
Telephony and Telegraphy (including Wireless)	165
PATENT RECORD	166
Local Notes	167
Tenders Invited and Prospective Business	167
Tenders Received and Accepted	168
Miscellaneous Business Notes	168
Companies' Meetings, Dividends, Reports, &c.	168

## SUMMARY

AN "At Home" was given at the Royal Opera House, Covent Garden, last Saturday, to celebrate the twenty-fifth anniversary of the inception of the General Electric Co. (Page 158.)

A FULL description of the system of electrical power supply on the Rand was given in a Paper by Mr. A. E. Hadley at last Thursday's meeting of the Institution of Electrical Engineers. The scheme involves some 176,000 kw., and transmission is carried out at pressures up to 80,000 volts. There is also an extensive scheme of compressed air distribution. (Page 159.)

THE short-circuiting of the temporary connections to a testing meter at the Greenwich power house of the L.C.C. tramways, last week, caused a serious arc

on the switchboard, and the breaking down of two generators. (Page 160.)

A PAPER by Mr. T. P. Wilmshurst, read before the Birmingham Local Section of the Institution of Electrical Engineers, reviewed the present position of electric cooking, and provoked an interesting discussion. (Page 161.)

THERE were useful discussions on Mr. Pearce's and Mr. Ratcliff's street-lighting Paper in Manchester and Birmingham. (Page 162.)

A PROBLEM concerning the accuracy of two phase meters is discussed in our Questions and Answers columns. (Page 163.)

A NEW design of multiblade fan is described on p. 164.

SOME interesting cinematograph films showing various processes in the manufacture of Wotan and Tantalum lamps were exhibited on Monday. (Page 164.)

A FEATURE of the electrical equipment of the East London Railway is the signalling arrangements, there being red and green lamps which light alternately. We also give some general particulars of the scheme.—Petrol-electric motor omnibuses are being tried in Hastings where, it is stated, the Dolter system is to be condemned by the Board of Trade. (Page 165.)

THE National Telephone Co. is appealing against the award for the value of their undertaking.—A scheme for maintaining communication between Aberdeen and Dundee by wireless telegraphy has been put before the Postmaster-General.—We also give figures relating to telephony and telegraphy in Canada. (Page 165.)

APPLICATION for the restoration of a lapsed patent for pull chain lamp-holders has been made by H. Hubbell, of America. A patent for an alternating current column printing telegraph, by W. Higgins, expires during the current week, after a life of 14 years. The specifications published by the Patent Office on Thursday last include two dealing with distribution protective gear, two dealing with heating and cooking, and one by S. G. Brown for a compensating arrangement for use with the patentee's thermo-electric relays. (Page 166.)

THE staff of the Barrow Electricity Department is assisting the Gas Department, owing to a strike.—An electrically-driven breakdown van has been purchased by the Glasgow Electricity Committee.—Increases in the lighting and power tariffs are announced at Lowestoft and Pembroke. (Page 167.)

SWITCHGEAR is required at Shanghai; cable at Blackpool and Stalybridge; an electrically-driven pump at Taunton; electric pumping machinery at Hereford; and sub-station at Holmfirth.—Generating plant is also required in Canada and New Zealand, and electrical stores in Wigan, Bolton and Islington. (Page 167.)

THE Chelsea Electric Supply Co. are installing Diesel-engine plant, and the Clyde Valley Electrical Power Co. are issuing £300,000 new capital. (Page 167.)



### The London Electrical Engineers.

(TO-DAY) THURSDAY, MARCH 20TH. *Easter Camp*.—Parade at Headquarters at 12.45 p.m. C. Company.—Recruit Training, 7 to 10 p.m.; Company Training, 7 to 10 p.m.

FRIDAY, MARCH 21ST (GOOD FRIDAY).—Headquarters closed.

SATURDAY, MARCH 22ND. Headquarters open for Regimental business from 10 a.m. till 12 noon.

MONDAY, MARCH 24TH (BANK HOLIDAY).—Headquarters closed.

TUESDAY, MARCH 25TH. B. Company.—Company Training, 7 to 10 p.m.

THURSDAY, MARCH 27TH. C. Company.—Recruit Training, 7 to 10 p.m.; Company Training, 7 to 10 p.m.

FRIDAY, MARCH 28TH. D. Company.—Company Training, 7 to 10 p.m.

SATURDAY, MARCH 29TH. Headquarters open from 10 a.m. till 12 noon.

### A BIG BIRTHDAY PARTY

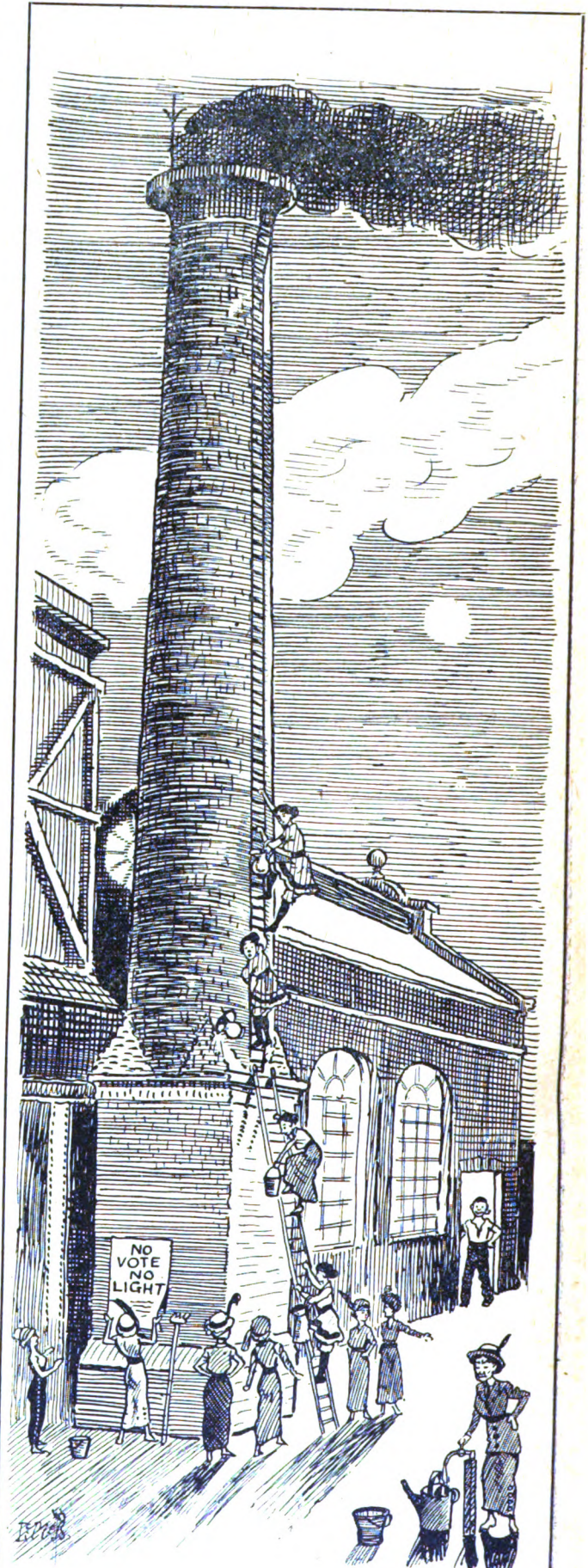
LAST Saturday evening the General Electric Co., Ltd., celebrated the twenty-fifth anniversary of its inception by giving an "At Home" at the Royal Opera House, Covent Garden, at which their staff and a large number of the Company's friends and distinguished guests were present. The house was as full as it could be, and an excellent "star" variety programme was provided. The artistes included Lydia Kyasht, who gave a selection of her artistic and graceful dances; Edmund Payne and George Grossmith, who raised storms of laughter and applause by their modernised version of "The Two Obadiahs" and their make-up as Balfour and Lloyd George; Harry Tate and Co. in "Motoring," Ruth Vincent, Wish Wynne, the Hudson family, Harry Dearth, Barclay Gammon, Clarice Mayne, and the "Sunshine Girls." Some excellent cinematograph pictures showed the manufacture of Osram lamps, scenes at the Witton works, views of the G.E.Co.'s branches in various parts of the world and of their headquarters. The moving pictures of lamp manufacture were excellent, and considerable amusement was elicited by the view of the wrapping department working at express speed, and heralded by the motto, "Who said strength?" Another picture of even quicker motion showed how the works could be emptied of employees in two-and-a-half minutes at fire-drill. Among the films relating to the works at Witton a tinted one, showing a crucible being filled with molten iron in the foundry, and a series of pictures taken in the carbon works, were very fine indeed, in spite of the extreme difficulty that must have been experienced in taking them. Some moving pictures also gave an idea of the facilities for recreation enjoyed by the employees—cricket, football, tennis, pool, &c. It is, we believe, the first time that industrial cinematograph pictures such as these have been exhibited in public, and they impressed one both with the magnitude and diversity of the G.E.Co.'s operations and the care in providing for the comfort and recreation of their workpeople. It may be mentioned, in passing, that the gallery of the theatre was filled with workpeople selected on the basis of seniority. The series of pictures of the G.E.Co.'s branches all over the world were interesting in showing a more or less familiar building in different surroundings each time.

We must compliment the Company, and particularly Mr. H. Clifford Palmer, who acted as Organising Manager, on the excellent arrangements and organisation. Each guest was personally looked after, and all the 2,500 members of the audience, both ladies and gentlemen, felt "At Home" in every sense of the word, enjoying the very finest variety programme under the most comfortable and hospitable conditions.

Last, but not least, we must congratulate the Company on its twenty-fifth birthday. During the twenty-five years of the G.E.Co.'s existence it has, with its branches and affiliated companies, risen to be the largest electrical manufacturing company in the country, with a capital of over £1,000,000, and employing nearly 10,000 hands.

**How to Read a Meter.**—Judgment was formally entered on Tuesday in this action (ELECTRICAL ENGINEERING, March 6th, p. 128) for the County of London Electric Supply Co., on the claim and the counterclaim, with costs in both cases. The Company's meter readers had wrongly read a consumer's meter for 3½ years, with the result that only one-tenth the actual amount of current used was charged for. The Company's claim amounted to £1,880, but an agreement was come to by which this was reduced to £1,730.

**Institution Journal.**—At the meeting of the Institution of Electrical Engineers last Thursday, the President, Mr. Duddell, announced that the Council had decided to publish the *Journal* at fortnightly intervals during the session (from November to July). The shape is to be altered, and the size of the page is to be what is known as "quarto," viz., 10 in. by 7 in., or thereabouts; it is also announced that there will be no advertisements in it. A similar announcement was made at the dinner of the Birmingham Local Section last Friday.



The above depicts a deeply thought-out scheme of the Suffragettes for depriving the community of electric light by pouring water down the chimney to extinguish the fires.



## POWER SUPPLY ON THE RAND

A PAPER describing the undertaking of the Victoria Falls and Transvaal Power Co. and the Rand Mines Power Supply Co., by Mr. A. E. Hadley, was read at last Thursday's meeting of the Institution of Electrical Engineers. The author first outlined the history of the undertaking from the foundation of the former company in 1906, which, abandoning its original proposal of transmitting power from Victoria Falls, subsequently took over the undertakings of the Rand Central Electric Works and the General Electric Power Co., and acquired from Messrs. Lewis and Marks rights to establish a power station at Vereeniging. On the largest group of mines, controlled by the Rand Mines, Ltd., and Eckstein and Co., deciding to adopt electric driving, the Rand Mines Power Supply Co. was founded, but the entire capital was provided by the Victoria Falls Co., and the whole undertaking is run practically as one concern, with a combined peak load of 88,000 kw. and sales averaging 1,350,000 units per day (including a certain amount of power supplied in the form of compressed air through pipe lines). The price of supply to the mines is in most cases 0.525d. per unit, and it is stated that the introduction of the scheme has reduced the cost of production of gold by an amount varying from 6d. to 1s. per ton of ore milled. Motors aggregating 400,000 h.p. are installed, and supply is given to the town of Germiston, but not to Johannesburg itself.

The generating stations now at work are as follows, in the order in which they were built. Brakpan (two 3,000-kw. sets), Simmerpan (six 3,000-kw. sets), Rosherville (five 10,000-kw. sets and six 3,500-kw. steam-driven air compressors), and Vereeniging (four 10,000-kw. sets). Three

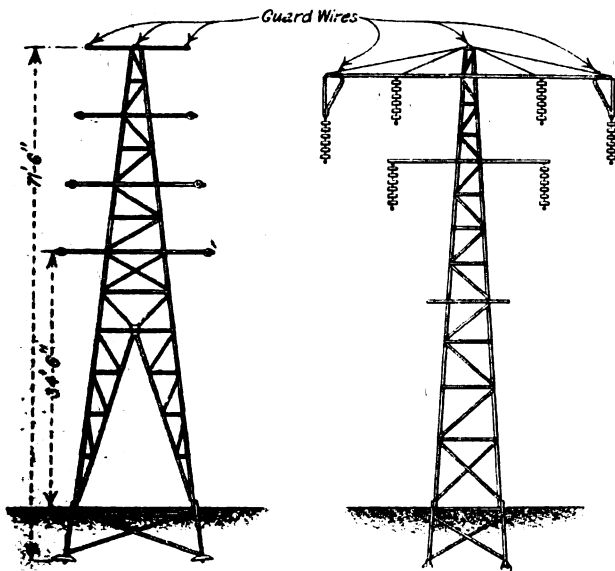


FIG. 1.—ANCHOR MAST.

FIG. 2.—INTERMEDIATE MAST.

7,000-kw. air compressors are also being installed at Rosherville and two more 10,000 sets are to be added to the Vereeniging equipment this year. At Robinson central station there are six electrically-driven 3,500-kw. air compressors. All the electrical generating sets are three-phase 50-cycle steam turbo-alternators, generating at such voltages as enable the stators to be constructed with one bar per slot and feeding the 40,000, 20,000 or 10,000 volt transmission lines through step-up transformers. The main transmission system consists of a 40,000-volt line stretching practically the whole length of the reef, and fed at four points, viz., Brakpan, Simmerpan, Rosherville and at Robinson Central, where the supply from Vereeniging joins the reef. At present, however, the extreme western end is worked at 20,000 volts. The main transmission line passes through two further distributing centres at Hercules to the east and Bantjes to the west. From these six points distribution networks, laid out as ring mains, supply the various sub-stations on the mines. The three eastern distributing stations supply the system through 10,000-volt overhead lines. The central portion of the area is served by an underground 20,000-volt cable system, and the western distribution network, as previously mentioned, is working at 20,000 volts by overhead lines. The

Vereeniging station is connected to the Rand by an 80,000-volt line approximately thirty-five miles long, terminating at the Robinson Central distributing station, where the pressure is transformed to either 40,000 or 20,000 volts, these pressures being also coupled together through transformers aggregating 16,000 k.v.a. The 80,000-volt line is carried on two rows of steel towers spaced 500 ft. apart on 10-in. suspension insulators, five in series. The conductors are 6-sq. mm. stranded copper with three earthed guard wires above them. Pin-type insulators are employed for the 40,000-volt lines. The 20,000-volt cables have three circular 100-sq. mm. conductors and are paper insulated, lead covered and armoured. All the circuits except the 80,000-volt line are protected on the Merz-Price system, without which a reliable supply on the ring main system could not have been given, and the more expensive radial type of network would have been necessitated. The control of the switching on the entire system is in the hands of a central "load dispatcher," who is in telephonic communication with every point.

The lightning conditions are particularly severe in the district and in the earlier stages considerable trouble was experienced, and the means now adopted to prevent disturbance are the employment of earthed overhead guard wires; earthing the neutral of each separate section of the system; and careful selection and adjustment of lightning arresters to deal with the different conditions arising. Most of the arresters are of the horn type, as at the time of the initial installation the aluminium arrester was not on the market. Some aluminium arresters have been installed since.

The generating stations are in general designed on the same plan, and a description is given in the paper of the equipment at Rosherville dam as being typical. Among its features is the completeness of the coal storage arrangements, and the use of the Pratt ejector system of induced draught to all the forty Babcock and Wilcox marine-type boilers with no less than twenty-four separate short steel chimneys. There are five A.E.G. turbo-alternators of 12,000 k.v.a., six steam turbo-compressors of 3,500 kw. and two more 7,030 compressors are being installed. The alternators run at 1,000 r.p.m. and generate at 5,000 volts. The switch-gear is in a separate building at one end of the station and is all of the remote-control type. Considerable trouble has been experienced by the effect of short-circuits on the switches, owing to the low internal reactance of the generators and transformers. The momentary rush of energy on short-circuit can reach 500,000–700,000 kw. No oil switch as at present designed could interrupt this rush of power unassisted. The intensely hot gases formed by the arc after rising through the oil come into contact with the air and cause an explosion, which more often than not is productive of a switch failure. Of the methods tried to obviate this difficulty the earthing of the neutral through a resistance has proved most valuable, as more than 90 per cent. of the faults start as faults to earth. On the first two Vereeniging machines two switches are employed in series, one introducing a non-inductive resistance; while on the last two machines, both of which have not yet been put into service, a two-movement reactance switch is being installed, constructed on the lines of an oil-break switch, but is provided with a second pair of contacts for the final break. The separation of the first pair of contacts introduces two reactances placed centrally, one on each terminal bushing inside the oil tank, and the second pair of contacts finally breaks the circuit. At some early date the system will also be sectionalised in order to reduce the rush of power on short-circuit, and in doing so reactances of relatively large value can be inserted between sections in those cases where it is not economical to separate adjacent sections permanently.

The electrically-driven compressors at Robinson Deep are each divided into two units on the same shaft and are driven by synchronous motors of 2,000 k.v.a.-capacity, running at 3,000 r.p.m. and designed to give a leading power-factor of 85 per cent., thus greatly improving the general power-factor of the system. Special motor-generators are provided for starting them up. Regulation is effected by throttling the intake.

The latter part of the paper is mainly devoted to the arrangements for the compressed-air transmission system, including interesting details of the methods of charging for and of metering the air, together with a few notes on the



# BROWN-BOVERI

## AUTOMATIC

## PRESSURE REGULATORS



RAPID AND ACCURATE REGULATION.  
NO SPARKING.  
NO "TOUCHING UP" OF CONTACTS.

CAXTON HOUSE  
LONDON S.W.

transformer sub-stations on consumers' premises, of which there are sixty, varying in capacity from 2,000 to 10,000 k.v.a.

### DISCUSSION.

Mr. J. A. ROSENTHAL (Babcock and Wilcox), in the course of his remarks, pointed out there was in the station described in the Paper 1.19 kw. produced per square foot of space, which he believed was a record. The nearest to this was at Dunston-on-Tyne, where the figure was 1.12 kw., and the next was Lots Road, 0.72 kw. Boilers arranged in bays at right angles to the engine-room were first adopted at Carville, and had since been repeated in a large number of stations all over the world.

Mr. H. BRAZIL (Charing Cross, West End and City Electricity Supply Co.) asked whether it was a fact that in the original line near Johannesburg ordinary barbed wire was used for guard-wire purposes, and wanted some further information regarding the lightning-protection equipment. The effectiveness of earthing the neutral largely depended upon whether the disturbances were unidirectional or oscillatory, in view of the inductance of the generators.

Mr. A. P. TROTTER (Electrical Adviser to the Board of Trade) said that what we suffered most from in this country was the necessity for putting up transmission lines on such a small scale that stringent economy became necessary, and introduced difficulties which were not dreamed of on a large scheme such as that described in the paper. It did one's heart good to see a job which could afford two rows of poles side by side and protective gear throughout the whole system, as well as a ring main to keep up the supply in case of a shut-down on any part. He had always advocated the use of earthed guard wires. He asked whether there was any special reason for the 24 ft. 6 in. clearance from the ground for the wires. He should have thought that 20 ft. was sufficient.

Mr. J. S. HIGHFIELD (Metropolitan Electric Supply Co.) referred to the co-operative method of fixing the charge, and said that the action of the Rand mine owners in substituting for their individual power plants supply from the public mains showed that the case for electric-power generation and distribution on a large scale had been proved up to the hilt. At the same time, the figure of 0.525d. given in the paper did not seem low. His opinion was that the guard wires should be of similar material to the line wires.

Mr. A. JACOB (British Aluminium Co.) reckoned that the factor of safety allowed for on the overhead system came out at about 2, which was very much less than it was in this country. The towers seemed to have extremely long arms at the top, and in the event of any mishap to the conductors there

would seem to be great torsional stress on them. He had worked out for comparison that a line of copper conductors, using rigid towers at 80,000 volts, would be £956 per mile, and a similar aluminium line £926 per mile, showing a saving of £30 per mile. This would be still more increased if towers of similar construction to those in use in South Africa were adopted. He asked the Author if there had been any trouble from corona losses, because he had heard of cases with 80,000 volts transmission where there had been serious trouble from this cause, and where it had been necessary either to increase the diameter of the conductor by the insertion of a hemp core or to employ aluminium, which had a greater diameter by some 20 per cent. than the copper equivalent.

Mr. V. O. DAVIS dealt mainly with the compressed-air system, and expressed his agreement with the adoption of synchronous motors for driving the compressors.

Mr. E. V. PANNELL (British Aluminium Co.) contrasted the type of tower that was now practically standard in America with that described in the Paper, and thought the former would come out the cheaper. In America, he said, they have abandoned the equilateral arrangement of conductors, and he wished to know whether in South Africa this method was considered vital in connection with the balancing of the circuits. The use of concrete for foundations represented 50 per cent. of the cost of the tower, and if this could be done away with it would be a great advantage from an economic point of view. A guard wire was as essential from the mechanical as from the electrical point of view. He deprecated the use of a cheap material for the guard wires, and instanced a case on the Central Colorado transmission lines where a serious short had occurred from the breaking of the guard wire.

Mr. ARTHUR WRIGHT looked forward to the time when the whole of the transmission lines in South Africa would be underground, as this was the only way of avoiding troubles due to atmospheric conditions.

Mr. A. E. HADLEY, in reply, said that a 24 ft. 6 in. height was necessary to comply with the regulations. There was a time when they thought they would have had serious legislative difficulties, but the final Act which had been passed was as fair as could have been expected. He would have liked to have seen the price of 0.525d. five or six per cent. higher for the next two years, and then to be reduced to 0.525d. In criticising this price, they must remember the difference in the purchasing power of money in South Africa and in this country. The contracts provided that after 6 or 6½ per cent. was paid upon the Company's capital, any surplus was divided between the consumer and Power Company as to ¼ and ¾ respectively. There were other clauses in the contract providing for variation in price according to the cost of railway freights, &c. They used galvanised steel for guard wires. The factor of safety was not 2, but 5; and in further answer to Mr. Jacob he said that experiments had been made on each class of pole line, so that all the wires on one side of the pole were broken simultaneously, and on none of them was there any twisting of the arms. There had been no corona loss. He did not agree with Mr. Pannell that pole lines in America were becoming standardised, and he had seen most of the systems recently, including the Central Colorado. He did not agree with Mr. Wright as to placing the lines underground, as each year there was less and less disturbance by lightning.

## BREAKDOWN ON THE L.C.C. TRAMWAYS

AN unfortunate chain of accidents resulted in the interruption of the London County Council tramway service for an hour at the time of heaviest traffic on Monday, last week, and a diminution in the service a few days later. The primary cause of the breakdown on the Monday afternoon was a short-circuit on the temporary connections to a checking meter for testing the meters in the Greenwich power house. These leads were connected at one of the isolating plugs on the main switchboard, and the arc flashed across on to two adjoining generator cells. The serious arc on the switchboard fused a considerable amount of copper on to the insulators, and, in addition, some of the stator coils of one of the large 3,500-kw. generators driven by the reciprocating engines broke down. It took about an hour to get things in running order again, and the service was then renewed.

Two days later, however, it was found that the strain had damaged the insulation on the stator connections of one of the 5,000-kw. turbo-generators as well, and this went to earth. The capacity of the station was thus reduced by 8,500 kw., and at present there is practically no reserve, so that, although a limited amount of current could be obtained on a few overhead sections which adjoined lines run by neighbouring local authorities, it was necessary to diminish the car service, and over 100 cars had to be taken off on various parts of the system to lighten the load.

It is anticipated that the necessary repairs will have been completed and normal service resumed early next week.

## ELECTRIC COOKING AND HEATING

A PAPER entitled, "The Commercial Aspect of Electric Cooking and Heating," by Mr. T. P. Wilmshurst (Borough Electrical Engineer, Derby), was discussed on Feb. 26th by the Birmingham Local Section of the Institution of Electrical Engineers. The author referred to the great progress which had been made by gas cooking, which was first in the field, and said that until recently electric cooking was to all intents and purposes non-existent. Much of the early apparatus was designed without due regard to the conditions under which it was to be used. He thought that much of the recent progress was due to the foresight of Mr. A. F. Berry, who originated the "Tricity" apparatus, and to the excellent demonstrations made with it round the country by Mr. F. S. Grogan. At Derby, for example, only two cookers were on the mains before Mr. Grogan's visit, but over thirty consumers adopted electric cooking within two months. Mr. Wilmshurst summed up the main advantages of electric cooking as follows:—Absolute cleanliness. Absolute certainty of results, owing to the voltage limit restrictions laid down by the Board of Trade. This is in marked contrast with the results obtained with gas cookers, owing to the wide fluctuations of gas pressure in practice, or with the results with coal ovens. With the "Tricity" system absolute evenness of temperature is attained by a simple arrangement of deflectors fixed under the top heater and over the bottom heater. With an electric cooker it is only necessary to weigh the joint and allow

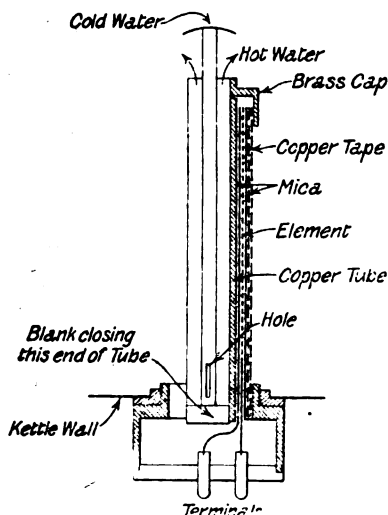


FIG. 1.—HEATING ELEMENT FOR RAPID BOILING KETTLE.

fifteen to twenty minutes per pound, according to taste, and at the predetermined time the joint is taken out with the certainty that the meat will be cooked perfectly and without the door of the oven having once been opened. A saving owing to the diminished loss of weight as compared with other methods was another important point.

He particularly dwelt on the last advantage, giving some striking figures, and mentioning one case where the saving in meat as against coal-fire cooking was so great as to far outweigh the cost of current at 1d. per unit. In some electric cooking outfits there is no provision for boiling small quantities of water with rapidity. To meet this difficulty a neat arrangement has recently been devised by Mr. Berry. A specially-shaped kettle is used, into which can be inserted a cartridge element (Fig. 1). The resistance strip is wound on a copper tube covered with a layer of pure mica, the connecting leads consisting of four strands of the element laid along the tubes in longitudinal grooves so as to prevent lumps. Over this strip is wound two layers of thin copper tape insulated from the winding by pure mica. A brass cap, fitting tightly on the tube and then opened out to slip over the tape, finishes one end; and at the other end is a brass terminal box, which carries the contact pins. When all the parts are assembled the whole apparatus is soldered up solid and watertight. A smaller tube is fixed down the centre of the main one into the plug closing the end carrying the terminal box, and has holes at the bottom end: the other end carries a small "umbrella." This arrangement allows the water to circulate inside, the "umbrella" preventing the outflowing stream interfering with the cold water entering. The loading is 1,200 watts, and this can be

assisted by standing the kettle on the hot-plate. With an initial temperature of 40° F. three pints of water can be boiled in six minutes with 2,000 watts, at an efficiency of over 98 per cent.

In Derby the rents charged for hired cookers are as follows: For an outfit including "duplex" extension heater and oven, 4s. per quarter; including griller and grease pan, 4s. 3d. per quarter; additional extension heater, 1s. 4d. per quarter. The small utensils used in conjunction with the hot-plates are sold outright at prices approximately 10 per cent. above net cost. The consumption of energy with the "bright" oven usually amounts to 1 to 1½ units per person per day, and at 1d. per unit the author believes this will compete with gas at 2s. 6d. per thousand cubic feet. With electricity at ½d. or ¾d. per unit there was no question of the economy of electric cooking.

After a few words on radiators, the author passed on to electric water heating, which financially was the most difficult problem to deal with. He pointed out the much higher efficiency of electric heaters over coal or gas, and proceeded to describe the "Therol" heater in which an even load factor is obtained by the provision of considerable heat storage capacity; the Belenus boiler, which can be fitted to existing hot-water systems, and the Belling geyser (see ELECTRICAL ENGINEERING, Vol. VIII., p. 324, June 13th, 1912), in which the water-supply and electrical control are interlocked. These appliances brought the hot-water problem within the range of practical engineering, but the cheapest solution was to discard the coal fire altogether, to use a coke stove for water heating and to cook by electricity. In conclusion the author considered briefly some of the various systems of charging, of which he considered that the two best were the "Norwich" system and the "Telephone" system. Once a satisfactory price could be obtained, he said, the load would follow as a matter of course.

Mr. F. S. GROGAN (British Electric Transformer Co.), in opening the discussion, deplored the practice of small supply authorities of experimenting with cooking apparatus rather than accepting manufacturers' wares. He was a strong advocate of cooking demonstrations of such a nature as to teach the public to apply their existing knowledge to electric cooking, besides giving definite costs. Referring to the saving effected by diminished loss in weight, Mr. Grogan emphasised the fact that a joint of meat, once seared, is better cooked at a lower temperature, and it is for this reason that far less shrinkage occurs. He guaranteed to lose only 10 per cent. in weight in the cooking of a joint, as against 25 per cent. to 35 per cent. loss by gas-cooking, a great point against the ordinary gas-cooker being the difficulty of rapidly lowering the temperature owing to the large amount of heat stored. An interesting instance of electric cooking was given of a school where the energy required to cook for 100 boys worked out at ½ unit per day per head. He had been informed that at Southampton 75 per cent. of the cookers let out on hire had been thereby sold.

Mr. ELLIOTT, referring to water-heating, stated that 3 units were necessary to raise an ordinary water bath (25 gallons) from 60° to 100° F., and mentioned an interesting device whereby the temperature was kept constant by a thermometer automatically operating a relay which regulated the current for the heater.

Mr. PHILLIPS thought that the explanation of the reduced shrinkage in meat cooked electrically lay in the fact that, as there were no noxious fumes, no ventilation was necessary.

Mr. FENNEL (Borough Electrical Engineer, Wednesbury) was favourably impressed with both the "Tricity" and "black" types of cooker after two years' experience with both, very even results in cooking being obtainable; he thought that the saving in weight, being only water, was of little account, and considered that there was much in favour of auxiliary cooking apparatus, such as toasters, grillers, &c., but was convinced that there was a great future for an electric oven which could be purchased for £4.

Mr. MORRISON (Electric & Ordnance Accessories) stated that the demand for electric cooking apparatus was far greater in the Colonies than at home. He thought "black" a poor term, since many cookers so called were vitreous enamelled inside and outside; he gave some figures obtained from a cooker of this type showing the "shrinkages" to be approximately the same as those given by Mr. Wilmshurst. He considered that, in view of the 100 per cent. load-factor, supply companies should afford a special low rate for water-heaters.

Among other speakers, Mr. N. B. ROSHER (Messrs. Moffett & Rosher) expressed unfavourable views as to electric cooking. Dr. C. C. GARRARD (General Electric Co.) thought that the "black" lagged oven must certainly be more efficient than the so-called "bright" type. He considered that the water driven off was not in a "free" state, and therefore represented a real loss. Mr. DEWSBURY found that electricity at 0.75d. was equal

to gas at 1s. 11d. per 1,000 cubic feet. Mr. W. E. Milns advocated the necessity of a cheap and durable oven with heating elements easy of replacement, and advocated metallic braided flexible cord. He gave, as his own experience, the figure of 82 units per week for five people, which included all household cooking and heating for November except baths; he found the cost to be about 15 per cent. more than gas for electric cooking. In any type of electric oven the wastage in meat was 10 per cent.

## RECENT DEVELOPMENTS IN THE STREET LIGHTING OF MANCHESTER

(Discussion in London, continued from p. 142 of last issue.)

Professor J. T. MORRIS (East London Technical College) said that some years ago he had made a series of tests in his laboratory on high-pressure gas lamps, and the figures he got were almost exactly corroborated by the tests mentioned in the paper. As a rule, high-pressure gas lamps did not give their guaranteed candle-power. He had worked out from the figures in the Paper that, in the case of electricity, 60 to 65 per cent. of the cost was for current, whilst in the case of gas 80 per cent. was for the cost of gas used. Trimming and maintenance for the arc lamps came to 7 to 8 per cent., against 13 per cent. for gas, and, finally, carbons in the case of the arc lamp accounted for 28 to 30 per cent. of the cost, whilst in the gas only 7 per cent. could be attributed to mantles; but it must be borne in mind that this 7 per cent. referred to lamps which gave half the proper candle-power, and it was very obvious that as the candle-power was brought up, the life of the mantles would be shortened very largely.

Mr. J. S. DOW (Assistant Hon. Sec. Illuminating Engineering Society) said that the rays which caused the most glare were those at the small angles from the horizontal, which were also the ones required for a uniform illumination. He, however, was an advocate of even illumination. He supported the metre as the standard height for measurements of illumination, both because it was recommended by an International Committee on nomenclature, and because it was the height always used for indoor measurements.

Mr. S. L. PEARCE, in reply, dealt briefly with a few of the points raised. As to lowering gear, Portland Street was adjacent to the Dickinson Street Works, and consequently it was an easy matter to run out a tower wagon. Further, they had no compulsory powers for making fixtures to the house fronts, and there might be difficulty in getting permission to fix winches, &c. With regard to the question of cost raised by Mr. Seabrook, the figures given simply showed the actual cost to the department; they included allowance for a contribution to reserve and rate aid. Replying to Mr. Harrison, he said that the pressure of gas in Manchester was 55 to 60 inches water gauge, which was substantially lower than the pressure used in London, but even with this reduced pressure there was a very considerable amount of leakage from the high-pressure mains. He thought the time had gone by when the gas people claimed anything like 50 or 60 candles per c. ft. He believed that quite recently Mr. Goodenough himself had dropped the figure down to 40, and even that was on the high side. The calorific value of the Manchester gas was 550 B.Th.U. gross and 500 net. In reply to Mr. Bailey, the graded frosting on the globes did not diminish their life.

Mr. RATCLIFF also replied to some of the points raised. He disposed of Mr. Dow's remark as to glare by pointing out that at the smaller angles one did not see the naked arc at all.

Mr. A. P. TROTTER, in a written communication, said that the difference between the illumination by electricity and gas in the two trials in Manchester was imperceptible without a photometer, and the price was in favour of electricity. Where an illumination (on a horizontal plane 3 ft. 3 in. from the ground) of half a foot-candle with a ratio of maximum to minimum of  $3\frac{1}{2}$  is wanted, this was an excellent way of doing it, but it must not be assumed that so high an illumination was always required, or that a capital expenditure of £1,500 per mile of street and £250 per mile per annum was necessary. For the measuring of illumination, a direct-reading illumination photometer would have been less cumbersome and fatiguing than the one used by the Authors. To say that a dioptric shade has a strongly defined optical centre was to admit that it was intelligently designed; but he had seen dioptric shades offered for street lighting in which no intelligence had been used in the design, and had seen well-designed shades so unintelligently used as to defeat the intended effect altogether. With a fixed focus arc there should be no difficulty in setting the shade as the inventor or designer intended. He had long ago changed his opinion about the value of uniform illumination for street work, and considered a street to be more usefully lighted when the ratio of maximum to minimum is 15, or even greater. The graded frosting was simple and effective, but was like regulating the speed of a steam engine by a brake instead of by the steam admission.

## DISCUSSION IN MANCHESTER, FEBRUARY 25TH.

Dr. E. ROSENBERG (British Westinghouse Co.) thought the lighting in Mosley Street and Portland Street bore evidence of competition, for the degree of illumination was too great; the glare in Portland Street and Mosley Street was equally bad.

Alderman WALKER said that Manchester had actually been losing money on street lighting since 1904, because the Gas Committee was the illuminating authority. They used at present 0.23 unit per head of population for street lighting in Manchester, compared with 6 units per head in Edinburgh. To the list of advantages of electric lighting over gas, should be added the great point of reliability. The report of the gas expert claimed for the gas lamps, "freedom from involuntary extinction," but the report showed that while out of 16 arcs, only two were out for about one hour each during the period of the tests, out of the gas lamps, two were out all night, and others for half an hour or one hour.

Mr. H. R. BURNETT (Barrow) considered the figure of 3.25d. per trim altogether too low. Adding capital charges, the cost of the electric lighting system described worked out at £500 per street mile, which was much more than most towns could afford. A 0.5 foot candle standard adopted was too high, and quite unnecessary. Its use would entail the raising of the standard for the side streets, and would be thus still more expensive. There was a critical point where metallic filament lighting became cheaper than arc lighting.

Mr. A. E. ANGOLD (G.E. Co.), on the question of globes, said that the glass should be so shaped that the reflection of the arc could be seen in it when looked at from a constant angle. Glare should not be so very noticeable. Frosting the inside of the globes spoilt the reflecting qualities.

Some questions were then asked on various other points by Dr. Zettell (G.E. Co.) and Mr. E. M. Hollingsworth (St. Helens), and Mr. H. T. Wilkinson (Wardle Engineering Co.), spoke in favour of overhead suspension of the lamps over the centre of the road. Mr. R. G. Cunliffe (Manchester Tramways) was also in favour of this, and said that from the point of view of street users the glare from the centre lighting did not strike into the drivers' eyes, and the result was that the speed was very much increased.

Dr. E. W. MARCHANT (Liverpool University) thought from the results of some tests, that the frosted globes absorbed much more light than was commonly supposed.

Mr. S. L. PEARCE, in reply to some questions, said that to the gas costs, the bye-passes were not included, and all leakage was eliminated. The maintenance costs were borne out by their experience, and were perhaps accounted for by the proximity to the station. There was always a great loss to tramways through the slowing up of the cars owing to traffic congestion, and it appeared to him that better illumination might do something to reduce this at night. Mr. H. A. Ratcliff also replied.

## DISCUSSION IN BIRMINGHAM, MARCH 12TH.

Mr. R. A. CHATTOCK (City Electrical Engineer, Birmingham) said that the figures of candle-power given corroborated the general impression among electrical engineers as to the inaccuracy of the claims made by gas people. It was well known that electric lamps gave their full rated candle-power. The results obtained with street arc lighting in Handsworth (Birmingham) agreed generally with those given in the Paper. The absence of candle-power between 80° and 90° in Fig. 4 could be remedied by using lamps with two carbons, one vertically over the other, instead of the converging type usually employed. In this case the bottom carbon was positive.

Mr. E. CROCKER (Birmingham Electricity Department) commented on the extremely low variation factor (3.75) obtained with the frosted globes used. He had taken some measurements in a road lighted with incandescent gas lamps, and found the variation factor as high as 18.

Mr. M. SOLOMON (G.E. Co.) pointed out that the curves in Figs. 1 and 2 agreed extremely closely with those given in his Paper on flame arcs, which were deduced from laboratory experiments. He considered that the shape of the inner globe finally adopted had as much effect in improving the distribution as the alterations in the shape of the spinings and the outer globes.

Mr. A. M. TAYLOR (Chairman) suggested that there was need for a further factor in addition to the variation factor in order to indicate the rate of change of the illumination.

**I.E.E. Students' Section.**—The unique informal dinner held on Friday evening last at the 'Tricity House' was a most enjoyable function. Both the dinner itself, the musical items provided by the Students of the Institution, and the speeches, were apparently thoroughly enjoyed by everyone present. Among the toasts may be mentioned those of "Electric Cooking" and "Point Five Juice," which were proposed in short, humorous speeches, the former by Mr. S. M. Hills and the latter by Mr. G. W. P. Page, who was the originator of this all-electric dinner. The former toast was responded to by Mr. C. H. Smyth (Mains Engineer, Marylebone Electricity Supply) in a more technical vein, and the latter by Mr. J. Mould, who made some jocular remarks. The Chairman of the Students' Section, Mr. J. C. Rennie, presided, and the active Hon. Secretary, Mr. E. T. Driver, was also present.

## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelopes.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,331.

What formulæ are generally used in the design of fans for cooling the windings of alternating-current motors? Have any recent papers or articles been published upon this subject?—"INQUISITIVE."

(Replies must be received not later than first post, March 27th.)

### ANSWERS TO No. 1,329.

In a workshop with 2-phase, 4-wire installation, two single-phase meters are provided by the Supply Co. for purpose of charging. A two-phase meter is also connected for checking purposes. The load is mixed, and consists of: (a) lights; (b) some two-phase induction motors; and also (c) a single-phase motor. It has been found that the meters agree when (a) and (b) are running, but when (c) is switched in the single-phase meters register less than the two-phase meter. The meters have been tested separately and found correct.—S. C. R.

The first award (10s.) is made to "OHM" for the following reply:—

As the actual discrepancy between the readings of the two single-phase meters and the reading of the two-phase meter under case (c) is not specified, it is only possible to suggest a probable explanation of the observed difference in the registrations. Obviously the meters have been correctly connected in circuit, for otherwise the readings would not agree under cases (a) and (b). In view of the fact that all three meters when tested separately were found to be reading correctly, it certainly does seem remarkable, on the face of it, that the consistency of the readings should be destroyed by simply altering the load conditions as under (c). The trouble, I think, rests with the two-phase meter. No particulars regarding its construction are given, but presumably it comprises two single-phase meter elements in accordance with standard practice. It would be interesting to know whether the two elements operate both on one disc, or if each element acts on its own disc, the two discs being connected to the same spindle. Both constructions are adopted in practice, and whilst there is theoretically no difference between them, there is actually a considerable difference, due to the fact in the former case it is practically impossible to entirely eliminate the interaction between the two driving elements. There is, as a matter of fact, a slight interaction in an ordinary two-disc meter, but with a good design this would be very small on balanced loads. The two-phase meter was probably tested on a single-phase circuit by coupling the two meter elements in series. On this assumption, "S.C.R." would most likely find, if the meter was tested on a two-phase circuit so as to reproduce exactly the operating conditions, that it was reading considerably in error as a result of the interaction effect referred to above. Under working conditions this error would not be serious so long as the two circuits were fairly balanced. This condition of affairs, I take it, exists under cases (a) and (b). As soon, however, as the single-phase motor is switched

on, the load on one phase will be much greater than on the other, and the error in the reading of the two-phase meter, as a result of interaction, will manifest itself. Hence the discrepancy in the readings observed.

The second award (5s.) is made to "J. E. R. R." who writes as follows:—

One thing that will account for the speeding-up of the two-phase meter is magnetic interaction between the two integrating elements. Magnetic flux strays from the current coil of one element to that of the other and affects the speed of the discs. This interaction may be very slight, probably nil, when each element is equally loaded and each current lags its voltage equally. This will occur when the lights and two-phase motors are in use. When one element is given a larger and lower power-factor current, the interchange of flux may be appreciable and affect the accuracy of the instrument, which will happen when the single-phase motor is switched on, but, under the same conditions, no such interaction can occur with the single-phase meters, and they should still read correctly. In a paper read before the Institution of Electrical Engineers on March 23, 1911, on the subject of Meters (see ELECTRICAL ENGINEERING, Vol. VII., page 163, March 30th, 1911), the results of tests

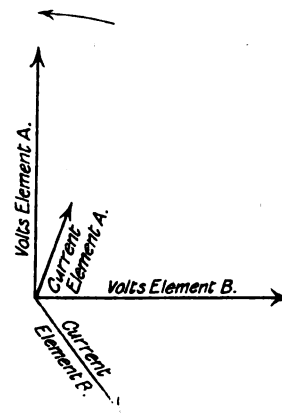


FIG. 1.—1-PHASE MOTOR ON PHASE B.

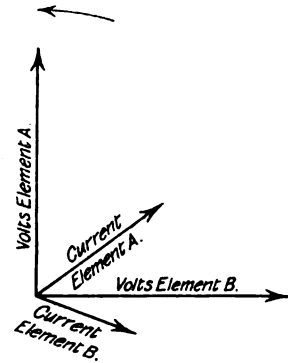


FIG. 2.—1-PHASE MOTOR ON PHASE A.

on various meters for this interaction were given. It was found that when one element had a different power-factor to the other the meters read incorrectly, and that varying this difference of power-factor varied the percentage error. No matter which phase we switch the single-phase motor on, the meter would read fast, for it would alter the power-factor of one current somewhat, as shown in Figs. 1 and 2, from which it will be seen that the phase difference between the currents may be approximately  $120^\circ$  or  $55^\circ$ , either of which conditions will speed up the meter and make it read more than the sum of the two single-phase meters. The question states that each meter has been tested and found correct. No doubt the test has been carried out on the two-phase meter with the P.F. of each element equal, or possibly on unity P.F.; in either case this interaction would be exceedingly small. It has been found that this interaction does not exist to the same extent in all makes of instruments. It depends a great deal on the construction of the magnetic circuits and the nearness of one element to the other. In some makes of instruments its effect is negligible for all practical purposes, whilst in others it may amount to 5 per cent. The percentage error will also vary with the load, being greatest on the lower loads. The fact remains that very few meters are free from this interchange of flux when the power-factor of the current in one element differs from that of the other, and it is always advisable before using polyphase meters on inductive or mixed loads to first check them with two reliable single-phase instruments on the kind of load they are to work on. In this instance it will be more reliable to take the sum of the two single-phase meters as being the more correct reading of the power.

## A NEW MULTIBLADE EXHAUST FAN

THE General Electric Co. (67 Queen Victoria Street) have put on the market an improved type of electric fan which is a combination of the "Freezor" exhaust fan motor and Pitters Patent blades. The multiblade principle calls for a proper arrangement of a number of narrow blades, one behind the other, in position according to pitch and curve of the blades. The effect is that the total volume of air displaced by each group of blades is far larger than that by a single blade of the ordinary type, the resistance is much less and no eddy currents are formed. A considerable increased efficiency is thus produced.

A comparative test has been recently taken with an ordinary 18-in. box blade and with an 18-in. three-way Pitters blade fan; both have been run with the same motor and under the same conditions, at speeds of 656 r.p.m. and 671 r.p.m. respectively (the speeds on the multiblade fan going up slightly, as the resistance is less), with an energy consumption of 84 watts in both cases. The former displaced 1,455 cub. ft. of air per minute and the latter displaced 2,210 cub. ft. of air per minute. The air measurements were taken 2 ft. away from the fan on the input side, and not in close proximity to the blades on the outside, as is usually the practice, and under which condition naturally higher figures can be obtained. The Company point out that as far as economy is concerned the introduction of this fan is doing to the electric fan industry what the Osram lamp did to the electric light industry—it effects a saving in the same manner, for, with the same amount of current, a greater volume of air can be circulated, or, to put it another way, the same volume of air as is now being circulated with an ordinary box-blade fan can be circulated at a far lower current consumption.

## THE MANUFACTURE OF WOTAN AND TANTALUM LAMPS

AT the invitation of Siemens Brothers Dynamo Works, Ltd. (Lamp and Fittings Department, Tyssen Street, Dalston, N.E.), we had the pleasure on Tuesday of being present at a most interesting private exhibition of the new "industrial" cinematograph films, that have been prepared to show the processes of manufacture of Wotan and Tantalum drawn-wire lamps. The demonstration was given at the studio of Messrs. Pathé Freres, Ltd., where we were most hospitably received by Mr. H. A. Pryor and other Siemens friends. Considerable difficulties were encountered in the taking of these photographs, involving as they do representations both of very small articles and rapidly moving machinery near to the camera, but these have been well surmounted, and an excellent series of films has resulted, which is bound to be popular when exhibited throughout the country. The films are confined to the operations actually carried out at the works at Dalston. We are first given an idea of the scale on which all this is being done by exterior views of the works, some showing the army of employees leaving at the dinner hour and some streams of railway vans laden with lamps. We then follow the various operations forming the building up of the lamps themselves. Expert glass workers are seen making the necks, the supporting spiders, &c., preparing the bulbs for their reception, and adding a tube on the "pip" end for exhaustion. It was also shown how some of these operations can be carried out at higher speed by ingenious machines. Other employees are shown winding the wire on to the spiders and sealing the completed neck, support and filament into the bulb, an operation which is also carried out by machinery as well as by hand. The sealing off of the lamp after exhaustion was next shown, and the subsequent cap-mounting, stamping, testing, inspecting and packing operations. These films should open the eyes of the public as to the number and complexity of the processes employed in lamp making. They are indeed a revelation as regards both the skill and speed of the workers and the ingenuity exhibited in the machines, and they reflect great credit on the department and its energetic manager, Mr. E. P. Barfield.

**Electrical Trades Benevolent Institution.**—We have received a copy of the annual book of reports and list of members, subscribers, &c., from this institution, which reflects very satisfactory progress during 1912. A special letter of appeal signed by Sir William Preece is being issued in connection with the forthcoming festival dinner.

## CATALOGUES, PAMPHLETS, &c., RECEIVED

**VARIOUS INSTRUMENTS.**—A new list issued by The India Rubber, Gutta Percha & Telegraph Works, Co., Ltd. (100-106 Cannon Street, E.C.) gives particulars of some of the company's well-known instruments. Included are telegraphic apparatus—Wheatstone, Morse, tapper keys, pole-changers, &c., as well as the Raymond-Barker multi-tone vibrating transmitter, lightning protectors, testing apparatus of all kinds, and various accessories. Water-level indicators and Walker's train describers, semaphore repeaters, and bells for railway, mining, and other purposes are also listed.

**TELEPHONES.**—A leaflet from the Sterling Telephone & Electric Co. (200 Upper Thames Street, E.C.) gives particulars of watertight magneto-ringing mining telephones in flameproof cast-iron cases.

**RISE AND FALL PENDANTS.**—A new list illustrating a number of rise and fall pendants suitable for dressing-rooms, &c., has just been issued by Siemens Bros. Dynamo Works, Ltd. (Tyssen Street, Dalston, N.E.). All the fittings are of artistic design, and some are very handsome. The prices also are quite moderate.

*Readers desiring copies of catalogues or pamphlets should apply to the firms in question, referring to the notice in "Electrical Engineering."*

**MERCURY VAPOUR LAMPS FOR CINEMATOGRAPHS.**—The advantages of Mercury vapour lamps for use in connection with the production of cinematograph films are set forth in a leaflet from the Westinghouse, Cooper, Hewitt Co., Ltd. (80 York Road, King's Cross, N.), who will be pleased to supply additional information on this subject.

**WIRES AND CABLES.**—A sectional catalogue from Simplex Conduits, Ltd. (116 Charing Cross Road, W.C.), gives prices and particulars of wires and cables of English manufacture, including the usual grades of vulcanised indiarubber insulated wires and cables for electric lighting, flexible cords, and bell wires.

**REFLECTORS.**—The new catalogue of "Sunlite" and "Sunline" reflectors of the Sun Electrical Co., Ltd. (118 and 120 Charing Cross Road, W.C.), is one of the most complete that has been issued. In addition to the well-known standard lines of these reflectors, a large variety of special patterns for facia lighting, concealed lighting, picture lighting, &c., are included. For the last-mentioned purpose, a new reflector, particularly unobtrusive in appearance, has been introduced which gives very even illumination without glare from the top of the picture only. A variety of small window fittings are listed. Outside lanterns and reflectors are also dealt with, and a few pages are devoted to suitable incandescent lamps.

**ELECTRIC HEATERS.**—A leaflet from H. S. Martin (74 Great Ancoats Street, Manchester) depicts by the aid of vivid colour-printing one of their "Redglo" electric fires, with its glowing hemispherical centre.

**Alternating Current Magnets.**—A Paper by Prof. E. Wilson on this subject was read at a meeting of the Physical Society on February 28th. The pull of an alternating electromagnet is unidirectional and intermittent, and means should be provided to reduce the consequent chattering and vibration. In the present experiments a phase-splitting device has been adopted, and consists in surrounding a portion of the pole-piece of the magnet with a short-circuited "shading" coil. The effect of this is to alter, not only the relative amplitudes, but the phase of the magnetic fields passing through the shaded and unshaded portions of the pole-face. The magnet used in the experiments varies the length of its gap when in action, and the influence of the gap length upon this phase-displacement has been studied. When the resistance of the shading coil is such that the magnetic induction over the whole face is substantially uniform and the gap closed, the phase-displacement is 72 electrical degrees. A gap length of 0.15 cm. reduces the phase-displacement to 18 deg., and consequently the minimum or "hold on" pull drops. The arrangement of the shading coil above described is very effective in preventing vibration and chattering. With constant alternating voltage impressed upon the magnetising coils of the magnet the net pull exerted diminishes rapidly at first as the gap length increases and tends to become more nearly constant. The R.M.S. amperes, on the other hand, steadily increase as the pull diminishes owing to the increase in the gap length. The observed net pull in the case of the magnet experimented upon is less than the calculated average pull, varying from 83 to 59 per cent. as the gap length varies from 0 to 1 cm.



# ADAMS IGRANIC

ELECTRIC-MOTOR CONTROL GEAR FOR STEEL MILLS.

ADAMS  
MFG CO LTD  
BEDFORD  
AND  
LONDON

## ELECTRIC TRACTION NOTES

The electric traction equipment of the East London Railway, which is hoped to be ready for use at the end of this month, follows in general the lines of that of the District and Metropolitan Railways, in conjunction with which it will be worked. There are, however, some points of novelty in the automatic signalling arrangements, which were installed by the McKenzie, Holland and Westinghouse Co. According to the *Railway Gazette*, the track circuits are worked by alternating currents, eliminating the possibility of the system being adversely affected by extraneous currents. Lamp signals are employed in the tunnels, and semaphores in the open. The former are provided with red and green Fresnel lenses, behind each of which incandescent lamps are placed. These lamps light up alternately in accordance with the desired control. It is not possible for both sets of lamps to burn at the same time, as the voltage of the lamps giving the danger indication is considerably lower than the voltage of the lamps for the "clear" indication. Train stops are provided at each stop signal, and both these and the semaphores are worked by small A.C. series motors. The electrical supply for the signals and track circuits is obtained from the sub-stations at Whitechapel and Surrey Docks. The transmission voltage is 440, and transformers are provided for effecting the necessary reduction for tracks and signals. The voltage for the track is about 1.5, for semaphore signals 50, and for lamp signals 50 for green and 5 for red.

Petrol-electric motor omnibuses are being tried in Hastings with a view to their adoption on the front, where the dolter surface-contact system has given so much trouble. It is stated that the Board of Trade has intimated its intention to condemn the dolter system in six months' time.

Before the Budget Committee of the German Parliament, the Minister of Public Works stated that the lighting of railway coaches with accumulators and metal filament lamps was now as cheap as lighting with gas mantles, and would shortly be much more largely employed on the State railways.

**Lighting of the Institution Lecture Theatre.**—Many of our readers who attend the meetings at the Institution of Electrical Engineers in London will be glad to hear that a Committee was appointed about two months ago to consider the lighting of the lecture theatre, with a view to its possible improvement, and that some experiments are being made.

**Heating and Cooking Apparatus.**—An interesting and instructive Paper on this important branch of the electrical industry was read by Mr. S. M. Hills on March 5th, before the Students' Section of the Institution of Electrical Engineers. The temperature of a room five feet from the floor should be 60° F., when heating is arranged by convection, said the author, but 55° F. was sufficient if radiant heat was used. It was pointed out that a  $\frac{1}{2}$  kw. radiator in each of the four corners of a room would produce the same heating effect as a 2 kw. radiator in the fireplace, while the air would be more uniformly heated. Convectors were usually perforated at the top to assist ventilation. This allowed dust to collect in the resistances, which on the temperature reaching a certain point was decomposed, thereby emitting a disagreeable odour. The ideal system of heating would be to make the floor a uniform heat radiator. The hot panel or border system would appear to offer advantages to electrical heating, as the loading would be low, and the heat evenly distributed. The hot borders are made of iron from 6 in. to 18 in. wide, and run along the floor close to the walls. The author then discoursed on cooking apparatus. A cooker to be useful must, he said, consist of a top plate containing three boiling plates and a grill; a hot cupboard between the top plate and the oven; an oven; a rapid water boiler; a control board. The switchboard should be on the wall on the same level as the oven, not above it, so as to be unaffected by steam, &c. The loading of the boiling plate should be between 20 and 25 watts per sq. in., the limiting factor being that mica insulation will not stand a prolonged temperature above 600° F. For the grill 12 to 15 watts per sq. in. would be sufficient. A loading of 1 kw. per cub. ft. capacity was sufficient for the oven. The disposition of the elements, and other problems, were then considered. The Paper provoked a good discussion.

## TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

Both the National Telephone Co. and the Post Office are appealing against the award of the Railway and Canal Commissioners as to the value of the former's undertaking taken over by the Post Office. The Post Office are appealing against the cost of obtaining subscribers' agreements and the cost of raising capital being allowed. The National Co. are appealing against the whole award, and in particular against the method adopted in the award of calculating depreciation. Tuesday, April 15th, has been fixed for the hearing of the appeal.

The first statistical report on the commercial telegraph interests of Canada has just been issued. According to the *Electrical News* (Toronto) the pole mileage for the year ending June 30th, 1912, was 40,785, and the total length of wire 167,939. These figures are made up as follows: Nova Scotia, 2,828 and 9,878; New Brunswick, 1,867 and 8,376; Prince Edward Island, 14 and 14; Quebec, 7,515 and 24,249; Saskatchewan, 5,382 and 21,257; Alberta, 2,895 and 14,491; British Columbia, 3,467 and 10,571; Yukon, 2,498 and 2,713. The total number of employees is given as 4,828, and 9,252,540 telegrams and 768,559 cablegrams were sent. It appears that the first telegraph was constructed in Canada in 1846, between Toronto and Niagara, one year later than the first commercial line in the United States.

The telephone statistics for the same period show that 212,732 common battery telephones and 158,152 magneto telephones were in use. The increases during the year were 37,738 common battery and 30,387 magneto. The wire mileage is given as: galvanised, 271,911; copper, 20,096; overhead cable, 232,893; underground cable, 364,875; submarine cable, 1,015. There was one telephone for every 19.3 of the total population and one telephone for every 2.3 miles of wire. The number of employees was 12,783, compared with 10,425 for the previous year.

The Postmaster-General has stated that no license has been granted Marconi's Wireless Telegraph Co. for the Transatlantic station which they are now building in North Wales, and that the Company is proceeding at its own risk in the matter. The question of granting a license for this station will be considered when the House of Commons Committee now sitting has presented its final report.

It is stated that a scheme by which communication might be maintained by wireless between Aberdeen and Dundee in the event of a breakdown of the telegraph wires has been submitted to the Postmaster-General.

The Select Committee of the House of Commons which last session inquired into the Imperial wireless scheme has been re-appointed and will shortly resume its meetings.

The Atlantic Companies, on the 11th inst., stated that the new regulations for the acceptance of traffic to Mexico were as follows:—Communication is cut off with Coahuila, Durango, Chihuahua, Morelos, Sonora, and Caxaca, as well as with Puerto Morelos and Tepepand Galeana. Telegrams to places in the interior are only accepted at sender's risk and with delay.—Code and cipher are accepted for all places.—The line between Bagdad and Bassorah was down on 11th inst., and the cable between Madagascar and Réunion and between Réunion and Mauritius failed on the same day. The latter cable was repaired on the 15th inst., thus putting an end to the risk senders had to incur while the cables were down.—The Bagdad-Bassorah line was working again on the 12th inst., and the Zante-Crete cable was restored.—The Greek Administration opened an office at Janina on the 13th inst., and telegrams for this place will be routed *via* Corfu, and are subject to delay.—On the 15th inst. lines were down to Morelos, Guerrero, Coahuila, Durango, and Chihuahua in Mexico.

**Royal Institution.**—Among the lecture arrangements after Easter is a Friday evening discourse on May 23rd, by Prof. Silvanus P. Thompson, on "The Secret of the Permanent Magnet."

## "ELECTRICAL ENGINEERING" PATENT RECORD

*(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)*

### Specifications Published March 13, 1913

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

4,090/12. **Heating Element for Cooking Utensils.** W. F. PERRY. In combination with a flat or conical top plate is a recessed underplate coated on its upper surface with insulating enamel. An asbestos-covered resistance is placed in this recess. Heat is conducted from the under to the top plate by an annular flange. The interstices of the element are filled with cement. A central bolt secures the element to the base of the utensil. Two figures.

6,275/12. **Telegraph Relays.** S. G. BROWN. To avoid the bad effects of slowly varying currents on the working of relays, such as those described in specifications Nos. 19,779/11 and 20,451/11 (ELECTRICAL ENGINEERING, Vol. VIII., pp. 550 and 564). There is interposed between the first relay and the sending-on relay an apparatus to shut off steady or slowly varying currents from the second relay. To prevent a weakening of signals of long duration, provision is made in the local circuit of the sending-on relay to compensate for this. A condenser or an "air-gap" transformer may be used for this purpose, and the compensation may consist of a coil in the local circuit and a combination of resistance and inductance, or resistance and capacity. Two figures.

6,864/12. **Radiator.** JAMES SLATER & Co. and C. R. ALLENSBY. To prevent currents of cold air entering rooms through open spaces between window frames, &c. An angle base plate with suitable feet is erected with its horizontal flange uppermost. This flange is slotted, and carries the heater elements, which are protected by a wire guard. The other flange acts as a baffle for preventing air passing between the horizontal flange and the under frame into the room. Five figures.

10,545/12. **Protective Gear.** B.T.-H. and E. B. WEDMORE. To obtain discriminative action of relays controlling a distribution network, impedance is inserted, not between distributing centres, but at the distributing point between the two switches.

11,394/12. **Manufacture of Aluminium Carbides.** S. PEACOCK. The higher carbides of aluminium are obtained by feeding a finely divided mixture of alumina and carbon into a combined arc and resistance furnace, and at the same time maintaining a pressure below that of the atmosphere and a temperature low enough to prevent the dissociation of the higher carbides. One figure.

21,831/12. **Automatically Cutting Out Faulty Cables.** BERGMANN. At the ends of each section of the conductor artificial neutral points are formed. They are connected by an auxiliary insulated conductor, which is connected to the main conductors through relays. The difference in P.D. between the main and auxiliary conductors produced by a fault causes the relays to operate disconnecting switches. Five figures.

27,969/12. **Telephone Receivers.** J. SCHISSLER. To prevent cracking of the diaphragms due to atmospheric disturbances and condenser discharges, a non-magnetic diaphragm is connected through bell-crank levers to a system of magnets in the longitudinal axis. The magnets also provide the necessary damping. Three figures.

### Specifications Published To-day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, E.C., at the price of 8d. each, post free.

Names in italics indicate communicators of inventions from abroad. Summaries of some of the more important of these patents will appear in our next issue.

**Arc Lamps:** B.T.-H. (*G.E.C., U.S.A.*) [Electrodes] 15,483/12; G. SCHANZENBACH & Co., Ges. [Suspension] 22,549/12.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** MARTIN, JACKSON, and CAMPBELL [Controlling guns, steering-gear, bridges, capstans, &c.] 1,901/12; BACON and SHEPHERD [Leading electric power into revolving structures] 5,336/12; B.T.-H. and WEDMORE [Protective gear for distributing systems] 8,569/12; BETTELL and MANNERS-SMITH [Stage lighting reflectors and screens] 14,722/12.

**Dynamos, Motors, and Transformers:** BROWN, BOVERI [A.C. generators] 4,460/12; PRICE [Dynamos] 5,981/12; SIEMENS SCHUCKERT [Transformers] 15,647/12; GOLODEIZ [Rectifiers] 18,741/12; SIEMENS SCHUCKERT [Polyphase A.C. commutator motors] 21,471/12; BREDDEN and MOORE [Dynamos] 25,556/12.

**Electrometallurgy and Electrochemistry:** SHELMEIDINE [Milk sterilisation] 17,554/11; BALLY [Retort furnaces] 16,041/12; CHAUMAT [Manufacture of chrome-alum by electrolysis] 1,636/13.

**Ignition:** WILKS, 3,404/12; BOSCH [Driving mechanism of oscillating armature magnetos] 23,046/12; MASCOV [Reducing duration of sparks from magneto] 27,094/12.

**Switchgear, Fuses, and Fittings:** LONGBOTTOM and FARRAR [Conduits] 4,426/12; HAWKES and COCKERILL [Lamps for illuminating music] 4,816/12; PEYTON and BOND [Electroliers] 5,467/12; INSTAN and HOLT [Securing shades on lamp-holders] 9,302/12; BIJUR [Circuit interrupters] 9,426/12; DAUM [Refillable fuse] 21,240/12; VOIGT & HAEFFNER [Cut-outs] 23,514/12.

**Telephony and Telegraphy:** MELLINGER [Telephone systems] 4,179/12; GOTT [Working submarine cables] 10,534/12.

**Miscellaneous:** SCHISSLER [Reproducing undulating currents] 4,407/12; TURNBULL [Windmills] 11,240/12; GAIFFE [Light baths] 17,778/12; CAMPICHE [Striking gear] 17,779/12; GRAHAM [Water-tight bells] 19,587/12; WALKER [Clock mechanism] 20,366/12; KELVIN & JAMES WHITE and BOTTOMLEY [Compasses] 26,358/12; WEHRLIN [Protecting storage batteries from flooding by sea-water] 28,520/12.

The following Specifications are open to Inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Dynamos and Motors:** SIEMENS SCHUCKERT [Field Magnets] 3,627/13.

**Switchgear, Fittings, &c.:** CHUBB [Terminals for aluminium conductors] 2,146/13.

**Telephony and Telegraphy:** SIGNAL GES. [Submarine] 3,853/13.

**Miscellaneous:** SMITH [Electrocuting animals] 2,199/13; HELM [Coil winding] 4,091/13.

The following Amended Specification may now be obtained.

**Incandescent Lamps:** A. C. HYDE, 6,487/12.

### Application for Restoration of Lapsed Patent

15,801/01. **Pull Chain Switch Lamp Holders.** H. HUBBELL. This patent expired on August 6th, 1912, owing to non-payment of the renewal fee. Application for restoration is now made under Section 20.

### Opposition to Grant of Patent

28,260/12. **Moving Targets.** J. B. LE MAITRE. This specification deals with an electro-magnetic clutch and several details of the mechanism for controlling the motion of the screen and the picture projector for the purpose of viewing the shot hole. The relay for stopping the target when a shot is fired is that described in specifications Nos. 25,851/10 and 27,521/11.

### Expiring and Expired Patents

The following Patent expires during the current week, after a life of fourteen years:—

6,229 of March 22nd, 1899. **Column Printing Telegraphs.** F. H. W. HIGGINS. The transmitter consists of a magneto supplying A.C. to a Wheatstone type transmitter. The receiver consists of a polarised relay energised by the signalling currents. The currents also pass through an unpolarised relay. When the current is interrupted by the arrival of the type wheel at the letter to be printed the second armature leaves its magnet and operates the escapement, which allows a spring or weight to impress the letter on the paper. The type wheel is advanced along the column by a fast motion screw.

The following are the more important Patents that have become void through non-payment of renewal fees.

**Arc Lamps:** A. BLONDEL [Leading gas from mineralised electrodes from the arc] 24,562/05.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** B.T.-H. and J. E. WOODBRIDGE [Composite cable for A.C. distribution to railways whereby the return pressure drop is reduced] 27,302/06.

**Electrochemistry:** G. BREWER (*E. R. Taylor*) [Furnace for production of carbon disulphide] 26,130/07.

**Incandescent Lamps:** WESTINGHOUSE METAL FILAMENT LAMP Co. [Production of tungsten dioxide] 18,922/07; [Connecting metal filaments to leading-in wires by alloys] 18,923/07; F. LE TALL (*A. Lederer*) [Hollow tungsten filaments] 26,179/07.

**Instruments and Meters:** W. HAMILTON and FERRANTI's [Pre-payment] 25,966a/05; W. MEYERLING [Oscillating armature D.C. meter] 26,031/07.

**Switchgear:** G. FINZI [Switch for adjustable pressure transformers to avoid breaking circuit during the change] 26,051/05.

**Telephony and Telegraphy:** I. KITSEE [Submarine telegraphy: impulses of equal duration but of alternate sign] 26,043/04; A. F. PETCH, F. DUNCAN, and O. C. F. KING [Harmonic electro-magnetic order telegraphs] 26,195/07.

**Traction:** E. TYER [Automatic tablet-changing mechanism at passing places on single-line railways] 23,897/01; SIEMENS BROS. & Co. and L. M. G. FERREIRA [Point detector] 26,983/06; [Motor-operated points] 26,984/06.

**Miscellaneous:** S. LAKE [Submarines] 25,924/99; A. J. B. LÉCÉ [Moving targets: aim recording] 26,215/05.

## LOCAL NOTES

**Barrow-in-Furness: Strike of Employees.**—Although most of the Corporation's workmen are out on strike, the employees of the Electricity Department, with the exception of two or three casual labourers, have remained loyal, and as a result there has been no interference with the electricity supply. Fortunately most of the main thoroughfares are lighted by electricity, otherwise a considerable public inconvenience would have been caused owing to the men of the Gas Department being out. As a matter of fact, a number of the staff of the Electricity Department have been assisting in the Gas Department.

**Belfast: Large Power Demand.**—Messrs. Workman, Clark and Co. have applied to the Corporation for a supply of electrical energy which may amount to 1,000,000 units per annum for one yard alone, together with a similar demand for the firm's south yard. Negotiations are being conducted.

**Bingley: Bulk Supply.**—When the agreement referred to in our issue of Feb. 27th for the supply of electrical energy in bulk to this district by Keighley came before the latter Council last week, complaints were made that the price was too low, having regard to the charges now in force in Keighley itself. It was contended that the price was lower than that at which the Tramways Department is being supplied at the present time, and eventually an amendment to refer the agreement back was carried. The terms are for a supply of three-phase current at 6,600 volts 50 periods, the Bingley Council to pay a fixed annual charge of £400 if the consumption does not exceed 300,000 units; £500 if it exceeds 300,000 but does not exceed 400,000; and £600 if it exceeds 400,000, in addition in each case to 3d. per unit, registered by a meter fixed at the Bingley end of the high-tension cable.

**Bispham: Electrical Extensions.**—The Local Ratepayers' Association have protested against the proposed expenditure of £8,000 for electric lighting purposes in view of a possibility of the district being absorbed into Blackpool.

**Dundee: Arc Lighting.**—The Harbour Board have installed arc lighting at the Camperdown Docks.

**Edinburgh: Lighting of Redford.**—A dispute has arisen between the Colinton Tramway Co. and the Corporation on account of the desire of the former to resell for lighting purposes electric current taken from the Corporation for the tramway undertaking. The Corporation claim the right to supply in Redford themselves.

**Glasgow: Electric Motor Van.**—The Electricity Committee have purchased an electrically-driven motor van for the purpose of conveying breakdown squads. It is equipped with a battery of thirty cells and is said to be able to run a distance of forty miles on a single charge.

**Hove: Purchase of Electric Supply Co.**—Arrangements have been made between the Corporation and the Company for the latter to carry on their undertaking as usual, pending the passing of the Corporation's Bill to purchase. In the event of this latter passing, the purchase money will become due on December 8th.

**Lowestoft: Lighting and Power Tariff.**—The charge for private lighting is to be increased to 5d. per unit, and that for power will in future be 2d. per unit up to 2,000 units per quarter, and 1½d. per unit for all consumption above. The charge for hire for outside shop incandescent lighting has been increased to 2s. per quarter per fitting.

**Lytham: Electric Lighting.**—A Board of Trade inquiry was held here last week into applications by the Lytham Council and the St. Anne's-on-Sea Council for electric lighting orders.

**Pembroke: Electric Lighting Tariff.**—Owing to the decrease in the profits last year of £1,000 in consequence of the price of coal, it has been decided to increase the present charges for supply by 5 per cent. all round. An amended scale for the use of energy for industrial purposes is under consideration.

**Sunderland: Obsolete Plant.**—In connection with the sale of the superseded steam plant at Dunning Street, the Corporation has undertaken to pay off the outstanding debt within a period of five years from April 1st. It is estimated that in addition to the amount received from the sale of the plant, a sum of £520 yearly for five years will be necessary.

**Waterford: Electric Supply.**—For a long time there have been protests against the inaction of the Corporation with regard to the question of electric supply, there being obviously a demand in the town. In the circumstances it is not surprising that the Gas Company have now decided to

go into the question, and, in fact, Mr. C. H. Wordingham has visited Waterford on their behalf and has made a report.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

## Generating Stations, Sub-Stations, Mains, &amp;c.

**Ayr.**—The Corporation are being urged to extend their mains to Prestwick.

**Blackpool.**—High and low-tension cables, transformer switch pillars and accessories. Borough Electrical Engineer.

**Burton-on-Trent.**—Mains are to be extended to Stretton.

**Canada.**—One 200-kw. and one 400-kw. A.C. turbo-generating sets are required by the Swift Current Council, Saskatchewan. March 31st. This information is only of use to those firms whose agents can be instructed by cable.

**Hereford.**—A Local Government Board inquiry was held last week concerning an application for a loan by the Corporation of £1,600 for the installation of electric pumping machinery at the Waterworks.

**Holmfirth.**—The Council have decided to take a supply in bulk from the Yorkshire Electric Power Co., and a consulting engineer is to be engaged.

**New Zealand.**—An expenditure of £12,000 is contemplated by the Whangarei Municipality.

**Shanghai.**—Extra high and low tension three-phase switch-gear for sub-stations. Preece, Cardew & Snell, 8 Queen Anne's Gate, Westminster. April 3rd.

**Stalybridge.**—4,500 yards extra high tension three-core lead-covered paper-insulated cable. Chief Engineer, Electricity Board.

## Wiring

The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.

**Cardiff.**—Block of offices in Mount Stuart Square. Architect, Henry Budgen, 96 St. Mary Street.

**Dublin.**—Additions to Military Hospital. War Office, Whitehall.

**Edinburgh.**—Royal (Dick) Veterinary College. Architect, D. M'Arthy, 25 Frederick Street.

**London:** L.C.C.—620 points at Avery Hill Hostels, Eltham. Clerk. April 2nd. (See an advertisement on another page.)

**Lewisham.**—One of the staff engineers of the South Metropolitan Electric Light and Power Co. has been engaged as consulting engineer for the electric lighting of the infirmary and workhouse.

**St. George's-in-the-East.**—Gymnasium and swimming bath at schools, Green Street, Upton Park. Guardians' Offices, Raine Street, Old Gravel Lane, E.C.

**Manchester.**—Mr. H. C. Crews, of Clarence Chambers, has been appointed consulting electrical engineer to Denstone College, which is to be fitted for electric lighting.

School, Old Hall Drive, Gorton. Education Offices.

**Paisley.**—Extensions to Art Gallery.

**Sal.**—Higher elementary school. Architects, F. Hewitt and Son, 33 Brazenose Street.

## Miscellaneous

**Bolton.**—A supply of general stores for Electricity Department. Borough Electrical Engineer, March 27th.

**Brazil.**—Two wireless stations are to be erected at Fortaleza and Porto Murinho.

**Canada.**—Large quantities of electrical supplies are required by the City Commissioners of Regina, Saskatchewan. March 29th. This information is only of use to firms whose agents can be instructed by cable.

**Chile.**—Fresh tenders are to be invited for the electrification of the 117-mile section of line from Valparaiso to Santiago, and for the branch line from Las Vegas to Los Andes, a distance of twenty-eight miles.

## THE RECORD ELECTRICAL Co., Ltd.

LONDON OFFICE:  
CAXTON HOUSE,  
WESTMINSTER, S.W.

Telephone  
3057 Victoria.  
Telegrams & Cablegrams:  
"Infusion,"  
London.

MEASURING  
INSTRUMENTS.

RECORD'S PATENT.

WORKS:  
BROADHEATH,  
MANCHESTER.

Telephone  
164 Altrincham.  
Telegrams & Cablegrams:  
"Infusion,"  
Altrincham.

Write for Prices & Particulars.

**London: Islington.**—A twelve months' supply of electrical fittings and sundries for the Guardians. Clerk, St. John's Road, Upper Holloway.

**Russia.**—According to the *Board of Trade Journal*, various schemes of electric railways for the Warsaw district are under consideration by the Russian Committee of New Railways.

**Taunton.**—Electrically-driven boiler feed pump. Borough Electrical Engineer.

**Wigan.**—Electrical stores for Electricity and Tramways Departments. Borough Electrical Engineer. March 31st. (See an advertisement on another page.)

## TENDERS RECEIVED AND ACCEPTED

**Ashton-under-Lyne.**—The tender of Switchgear and Cowans, Ltd., has been accepted for high-tension switchgear.

**Bridlington.**—Fourteen tenders have been received for a 600-kw. generating set, and it is recommended that a Willans disc-and-drum turbine coupled to tandem D.C. Brown Boveri generators shall be purchased at a cost of £2,867, subject to the necessary sanction by the Local Government Board.

**London: Hammersmith.**—The tender of Messrs. Chamberlain and Hookham is recommended for a supply of prepayment meters at £2 6s. each, less 2½ per cent., for 3, 5, and 10-ampere sizes for 110 and 220 volts. There were ten tenders in all, ranging from a total for the three sizes of £6 17s. to £8.

The Electrical Engineering and Equipment Co. have received an order for arc-lamp carbons at £137 10s., less 2½ per cent. There were nine tenders, ranging from the accepted one to £206 14s.

**Metropolitan Asylums Board.**—An order for a twelve months' supply of "Wotan" drawn-wire and carbon filament lamps has been placed with Messrs. Siemens Bros. Dynamo Works.

**Whitehaven.**—The Bastian Meter Co. have received an order for a supply of 5-ampere meters.

## APPOINTMENTS AND PERSONAL NOTES

The Rt. Hon. Viscount Chilston has been elected president of the Tramways and Light Railways Association. Viscount Chilston, as the Rt. Hon. A. Akers Douglas, was Home Secretary for 1902-6, in addition to having been previously Parliamentary Secretary to the Treasury and First Commissioner of Works.

Mr. Arthur Wright has been retained by the Edison Electric Illuminating Co. of Boston as general adviser. According to the *Electrical World* (New York) Mr. Wright will spend a considerable time in Boston in the early spring.

Dr. J. Erskine-Murray has joined the firm of Clark, Forde and Taylor (H. A. Taylor, A. L. Dearlove and R. M. Sayers), Consulting Engineers to the Pacific Cable Board and many other cable owners. The style of the firm after March 25th will be Clark, Forde, Taylor and Erskine-Murray, 4 Great Winchester Street, E.C. By this combination the firm will be in a position to advise upon, and act as consultants in, all branches of telegraphic engineering.

The salary of Mr. E. H. Wright, Borough Electrical Engineer at Rhyl, has been increased to £200 per annum.

Mr. G. A. Bruce, Borough Electrical Engineer and Tramways Manager at Lowestoft, has resigned.

Fitters, turners, and instrument-makers are required in the Royal Navy. (See an advertisement on another page.)

An electric mechanic is required for the East African Postal Telegraph Department. (See an advertisement on another page.)

**Electrical Exhibition at Glasgow.**—The Corporation has decided to hold an Electrical Exhibition incorporating engineering and machinery from October 23rd to November 15th next. The scope will embrace lighting, heating, and power, and a special section will be devoted to appliances for domestic purposes. There will also be sections illustrating applications of electricity to light railways, mining, textile, and other industries.

**Manchester Electro-Harmonic Society.**—The last concert of the season is to be held in the Marble Hall, Albion Hotel, Piccadilly, Manchester, on March 28th.

## MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. George Smith & Son, 5 Philpot Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night was £69 to £69 10s. (Last week the same.)

**Companies Struck off Register.**—The names of the following companies have been struck off the register of joint stock companies: Dynamo Electric Car Transmission Syndicate; Electrical Fittings Co.; Electrocarb Development Co.; London Electrocarb Co.; Norfolk Electrical Co.

**Dissolution of Partnership.**—J. H. Pybus and T. Pybus, Electrical Engineers, 29 Brown Street, Manchester, have dissolved partnership. Debts by J. H. Pybus.

**Bankruptcy.**—J. Mitchell and F. Mitchell, trading as F. Mitchell and Co., Electrical Engineers, 97 Stockport Road, Ardwick, Manchester, have filed their petition. The public examination will be on April 23rd at the Court House, Quay Street, Manchester.

**Change of Address.**—Messrs. G. Harland Bowden and Co. have moved from the City to 1 Victoria Street, Westminster, S.W. Telegraphic address, Harbowdeco, Vic., London. Telephone number, Regent 1009.

## COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &c.

**City of London Electric Lighting Co.**—The Directors' Report for 1912 calls attention to the fact that on August 18th, 1914, the City Corporation may give notice of its desire to purchase the Company's undertaking in the City of London, but no indication is given as to whether the directors have any information regarding the intentions of the City Corporation.

**Newcastle-on-Tyne Electric Supply Co.**—There was a net profit of £90,518 last year, and after transferring £15,000 to depreciation, a 5 per cent. dividend is paid on the ordinary shares, carrying forward £6,768.

**County of Durham Electrical Power Distributing Co.**—The net profit for the past year was £20,363. The preference dividend is met, but no dividend is paid on the ordinary shares.

**Chelsea Electric Supply Co.**—At the meeting last week it was mentioned that an agreement has been entered into with the Central Electric Supply Co. for a supply in bulk to the most northern of the Chelsea Company's sub-stations. This assures the Chelsea Co. of a standby for an important part of their area, and also supplies a point which is the least economical for them to supply from their own generating station. Another departure is the decision to order Diesel engine plant for the generation of a considerable portion of the Company's own current.

**Clyde Valley Electrical Power Co.**—Subscriptions are being invited for £300,000 6 per cent. cumulative preference shares.

## NEW COMPANIES

**C. A. PARSONS & CO.** Heaton Works, Heaton, Newcastle-on-Tyne.—Capital, £450,000 in £100 shares. The Hon. Sir Charles A. Parsons, K.C.B., and six others will form the Board.

**STRODE & CO.**, 48 Osnaburgh Street, N.W.—Capital, £20,000. To take over the existing business of electrical and general engineers.

**MOSCOW ELECTRICITY CO.**—This company has been formed with a capital of 12,000,000 francs. The promotion is being financed by Belgian capitalists.

**Insulated Aluminium Cables.**—We are informed that the Paris Omnibus Co. have just placed an important contract for aluminium armoured cables for tramway feeder networks. The cables will have cross-sections up to 1,000mm<sup>2</sup>. (1.55 sq. ins.), and are for a pressure of 500 volts. The order comprises some 300 tons of metal, and is expected to show an economy of 8 to 10 per cent. as compared with the cost of copper cables. Including cables already installed of a net weight in aluminium of about 300 tons, this Company's system now has in service or on order insulated cables employing a total of 600 tons of aluminium.

# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

NO. 326 [VOL. IX., No. 13]  
*All rights reserved.*

THURSDAY, MARCH 27, 1913.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES and TECHNICAL COLLEGE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

Other Advertisement Rates on Application.

Latest Time for Receiving

Letters for Insertion, Tuesday first post.

Small Advertisements and Official Announcements, Wednesday first post.

Displayed Advertisements, Tuesday first post.

Corrections in Standing Advertisements, Monday first post.

All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 208-210, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Circling, Fleet, London." Telephone No.: 5509 Holborn.

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## CONTENTS

	PAGE
SUMMARY	169
Arrangements for the Week	170
Control of A.-C. Motors	170
Electricity in Construction Work	171
Electric Power on Warships	172
Metal Filament Lamps	173
Testing of Ebonite	173
Electric Driving at a Brick-Making Works	174
Good Illumination	174
A Combined Switch Fuse and Plug	174
Questions and Answers by Practical Men	175
PATENT RECORD	176
The "Electric Arc"	177
Some Uses of the Stroboscope	177
Catalogues and Pamphlets Received	177
Answers to Correspondents	177
A Plug for Fixing Wiring	178
Electric Traction Notes	178
Telephony and Telegraphy (Including Wireless)	179
Local Notes	179
Tenders Invited and Prospective Business	179
Tenders Received and Accepted	180
Companies Meetings, Dividends, Reports	180
Miscellaneous Business Notes	180

## SUMMARY

HAND and automatic starting and speed control of alternating-current motors was the subject of a paper by Mr. J. T. Mould, read before the Association of Engineers-in-Charge recently. Some interesting applications of automatic gear were given. (Page 170.)

An example of the way in which electrical working can be of use to contractors for constructional work is presented by the extensions now being completed at the Glenquey reservoir in Perthshire. (Page 171.)

SOME points in connection with the uses of electric power on warships were dealt with in a paper read by Mr. A. P. Hyne, read before the Newcastle Local Section of the Institution of Electrical Engineers. (Page 172.)

A PAPER by Mr. Alexander Siemens at the recent meeting of the Institute of Metals traced the progress of metal filament lamp manufacture. (Page 173.)

THE results of some researches regarding the properties of ebonite have been published, with a proposed specification of suitable tests for ensuring its high quality. (Page 173.)

THE conversion of a brickmaking works to electric drive is referred to in a short article. (Page 174.)

THE value of good illumination was dealt with in a recent Paper by Mr. Leon Gaster before the Royal Society of Arts. In the discussion the history of the lighting of the Society's building was given. (Page 174.)

A NEW design of combined switch fuse and plug is described and illustrated. (Page 174.)

THE question of obtaining variable D.C. voltage from rotary-converters without special boosting arrangements is discussed in our "Questions and Answers" columns. (Page 175.)

AMONG the specifications published by the Patent Office on Thursday last was one for submarine telegraphy by reverse currents by J. Gott. Patents in connection with A.C. commutator motors have also been taken out by Brown, Boveri et Cie and Siemens Schuckertwerke Ges. There are a number of patents expiring during the current week after a life of fourteen years. These include one for improvements in H-type cells by R. O. A. Heinrich, and one for induction coils for wireless by G. Marconi and the Marconi Co. (Page 176.)

At a recent meeting of the Scottish Local Section of the Institution of Electrical Engineers in Edinburgh Mr. W. B. Hird initiated a discussion on electric propulsion of ships by giving a lecture on the experimental "Electric Arc." (Page 177.)

At a recent meeting of the Western Local Section of the Institution of Electrical Engineers, in Bristol, Professor D. Robertson gave an exhibition of some applications of the stroboscope. (Page 177.)

A CORRESPONDENT asks a question about the various regulations prescribed by different bodies for the installation of electrical apparatus. (Page 177.)

A new plug for fixing wiring is described. (Page 178.)

LONDON local authorities are resisting a proposal in the Metropolitan Electric Tramways (Railless Traction) Bill to give the Board of Trade power to sanction additional trolley-omnibus routes. "Pay-as-you-enter" cars are now in use in Leicester. (Page 178.)



THE Australian Government has granted the Marconi Co. permission to inspect its wireless plant in connection with the patent action which is pending. The circumstances of how the Attorney-General purchased 10,000 shares of the American Marconi Co. are being explained to the House of Commons Committee. (Page 179.)

STREET electric lighting is to be extended in Belfast.—The rateable value system of charging has been adopted at Gloucester.—The Electricity Committees at Dublin and Hornsey are averse from handing over large sums from profits to relief of rates. (Page 179.)

EXTRA high-tension switchgear is required at Dundee; cable at Peterborough; additional feeder panel at Grimsby; electrical installations are required by the Waterford Guardians and for the Queen Street Wharf, Auckland, N.Z.—The Bloemfontein Council has decided to instal a trolley-omnibus system. (Page 179.)

A DIVIDEND of 5 per cent. and a bonus of  $2\frac{1}{2}$  per cent. is declared on the ordinary shares of Messrs. W. T. Glover and Co.—The year's working of the Automatic Telephone Co. has been so successful that the British Insulated and Helsby Cables, Ltd., will not be called upon, under their guarantee, to provide a sum for the preference dividend.—The last year's working of the South Wales Electrical Power Distribution Co., the British L.M. Ericsson Manufacturing Co., and the British Aluminium Co. has also been satisfactory. (Page 180.)

### ARRANGEMENTS FOR THE WEEK

#### FRIDAY, MARCH 28TH.

*Manchester Electro Harmonic Society.*

7.30 p.m. Concert, Albion Hotel, Piccadilly.

#### SATURDAY, MARCH 29TH.

*Association of Mining Electrical Engineers.*

5.30 p.m. Warwick and S. Staffs Branch. At Imperial Hotel, Temple Street, Birmingham. "Cable Jointing and Junction Boxes, &c.," by C. Jones.

5 p.m. S. Wales Branch, Eastern Section. At Carlton Café, Cardiff. "The Speed-Control of Three-Phase Motors," by S. Simons.

7.30 p.m. Western Section. At Swansea Grammar School. "Turbine Engines: their Construction, Installation, and Maintenance," by A. L. Ohlson.

#### MONDAY, MARCH 31ST.

*Institution of Electrical Engineers: Newcastle Section.*

7.30 p.m. At Armstrong College. "Telephonic Development," by J. R. Andrews.

#### TUESDAY, APRIL 1ST.

*Institution of Electrical Engineers: Manchester Section.*

7.30 p.m. At the University. "Self-Synchronising Machines," by Dr. E. Rosenberg.

#### WEDNESDAY, APRIL 2ND.

*"DYNAMICABLES."*

7.30 p.m. Anniversary Dinner at Trocadero.

#### FRIDAY, APRIL 4TH.

*Electro Harmonic Society.*

8 p.m. Smoking Concert at Holborn Restaurant.

*Faraday Society.*

8 p.m. Joint meeting with Manchester Section of Society of Chemical Industry to discuss "The Corrosion of Iron and Steel."

### The London Electrical Engineers.

(To-Day) THURSDAY, MARCH 27TH. C. Company.—Recruit Training, 7 to 10 p.m.; Company Training, 7 to 10 p.m.

FRIDAY, MARCH 28TH. D. Company.—Company Training, 7 to 10 p.m.

SATURDAY, MARCH 29TH. Headquarters open from 10 a.m. till 12 noon.

MONDAY, MARCH 31ST. A. Company.—Recruit and Company Training, 7 to 10 p.m.

TUESDAY, APRIL 1ST. B. Company.—Company Training, 7 to 10 p.m.

THURSDAY, APRIL 3RD. C. Company.—Recruit and Company Training, 7 to 10 p.m.

FRIDAY, APRIL 4TH. D. Company.—Company Training, 7 to 10 p.m.

SATURDAY, APRIL 5TH. Headquarters open from 10 a.m. till noon.

**The Strength of Metal Filaments.**—The General Electric Co. inform us of yet another case where the ability of Osram lamps to withstand rough treatment is proved. At Blackpool the other day a 16-c.p., 250-volt Osram lamp in its carton had been thrown away by mistake, and was only discovered when on the point of being tipped into the destructor. The lamp was found to be intact, and is now in use.

### CONTROL OF A.C. MOTORS

THE control of alternating-current motors was the title of a recent Paper read before the Association of Engineers-in-Charge by Mr. J. T. Mould (Adams Manufacturing Co., Ltd.). After briefly reviewing the characteristics of the many types of A.C. motors, the author describes the usual methods of speed control. The star-delta method of starting is only applicable to motors starting light or driving loads which develop after partial acceleration, as, for example, fans and centrifugal pumps. The switches for this operation should be of the drum type, since the contacts are independent and may therefore be self-aligning and self-adjusting. The rotary movement should be in the same direction from the "off" position, right through the "star" to the "delta" position. To meet the objection to this method that the starting torque cannot be varied, an auto-transformer may be used. For motors up to, say, 20 h.p., taps are usually provided to give about 50, 65, and 80 per cent. of line voltage, with respective line currents about equal to 25, 42, and 65 per cent. of what would be taken by switching straight on to the mains. For larger motors it is common to provide taps giving about 40, 58, 70, and 85 per cent. of line voltage with respective line currents of about 16, 34, 50, and 72 per cent. of what would be taken if no auto-transformer were used. The only method of starting slip-ring motors is to gradually take out resistance from the rotor circuit. It is common to limit the current on the first step to about 150 per cent. of its normal full-load value, and except for large motors to allow a 15-seconds starting rating. For motors larger than 100 h.p. at 200 volts, or 200 h.p. at 500 volts, a multiple lever toggle-joint starter is recommended in preference to a sliding-contact starter.

Automatic no-volt release, although more popular than formerly, is not so often fitted to A.C. as to D.C. switchgear. Although not essential to the safety of the motors, it protects the line against violent disturbances. A series overload trip applied to two phases of a three-phase motor prevents it running single-phase.

Automatic control is advocated for air compressors, which convenience demands should be started and stopped by variation of air pressure; centrifugal and ram pumps, which require to be controlled by variation of water level; hydraulic pumps, to be started and stopped by the rise and fall of an accumulator; fire pumps, calling for control from numerous and remote positions; lifts and hoists, swing and rolling bridges, conveyors, transporter bridges, and all kinds of automatic machinery. The author then referred to some examples of this type of gear made by the Adams Manufacturing Co., Ltd. Many of these have already been described in ELECTRICAL ENGINEERING. An interesting auto-transformer starter for large squirrel-cage motors consists of magnetically-operated clapper switches mounted on a panel and so connected that the closing of the master switch causes two of them to close and connect the auto-transformers to the lines and the motors to suitable taps. After a sufficient pause these first switches open, and the remaining ones close, thereby entirely disconnecting the auto-transformers and connecting the motor terminals to the line. The pause in starting is secured by series relays, and its duration depends entirely upon the starting performance of the motor. If the motor accelerates quickly at the low voltage the pause is a short one, but if it accelerates slowly a longer period elapses before the auto-transformers are cut out. A case is also quoted of the system being applied to cascade motors fixed in the middle of a rotating machine where the controller has to be some distance from the motor. In another case, by the use of series relays controlling clapper switches, the controller of a rolling mill motor automatically increases the slip by introducing resistance in the rotor circuit on each recurrence of the peak, and cuts it out when the peak is passed.

**Association of Electrical Station Engineers.**—A Liverpool branch of this Association has been formed. We gave particulars of the objects of the Association on p. 90 of our issue of February 13th. It is stated that the membership is now nearly 5,000.

**Mercury Vapour Apparatus in U.S.**—The patent litigation which has been pending for many years between the Cooper Hewitt Electric, the General Electric, and the Westinghouse Electric & Manufacturing Companies, of America, has, says the *Electrical World* (New York), been settled by an exchange of licenses under the patents of P. Cooper Hewitt, E. Weintraub, P. H. Thomas, C. P. Steinmetz, and others. Both the Westinghouse and General Electric Companies have been licensed to manufacture rectifiers, while the General Electric and the Cooper Hewitt Companies have exchanged licenses for mercury vapour lamps.

## ELECTRICITY IN CONSTRUCTION WORK

THE supply of labour is of vital importance in the carrying out of construction work and will often decide whether a contract may prove profitable to the contractor or not, and whether he will be enabled to adhere to the specified time of completion. In many cases mechanical power has advantageously superseded manual labour to a considerable extent by the use of comparatively small and inefficient steam units, but as a general rule the application of electricity obtained from a central source of power in the neighbourhood, or by the equipment of a power station to suit requirements, is preferable both for convenient and economical working. No better results in this connection have been obtained than with the working of pumps, results, indeed, unattained by any other method of transmission because of the steady load on the motor. A further recommendation for this duty is the mobility of the pumps and motors, as, the energy being transmitted by cables, it is obvious that very little work is involved in removing the pumps to other areas as found necessary.

A recent instance of the use of electricity in contracting is to be found in the work now being completed at Glenquey Reservoir in Perthshire. This undertaking was constructed three or four years since to provide storage for the water-supply to the Southern District of Fife and particularly in anticipation of the expected increased demand created by the naval base at Rosyth. About eighteen months ago it was found necessary to extend the puddle trench of the retaining

is accommodated at the end of the power-house building which is driven by belting from the engine flywheel. Electric energy is transmitted to the bank workings by overhead bare conductors supported on insulators fixed to poles and entering buildings through porcelain tubes. Separate cables radiate from distributing boards in store cabin adjoining excavations for the supply of pump, crane and lighting.

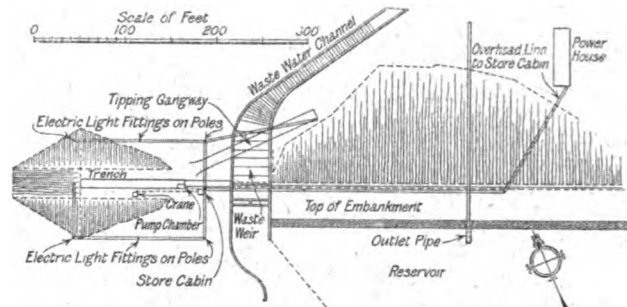


FIG. 2.—GENERAL PLAN OF INSTALLATION.

As the growth of water was uncertain one pump was supplied in the first instance, which has proved sufficient to deal with the amount of water in the trench. The centrifugal pump and motor combination, manufactured by Weise and Monski, will deliver 300 gallons of water per minute against a total varying head of from 50 to 190 ft. The pump delivery to 6 in.-rising main pipe column, fitted with retaining valve, is throttled at the sluice valve as required to keep the quantity of water normal during sinking operations at reduced head. The 25-h.p. motor running at 1,700 r.p.m. is of shunt wound protected type for 250/300 volts and suitable to drive the pump at full load without undue heating. Although the pump was used intermittently, spare impeller parts and a motor armature were available to ensure continuity of service, but it is gratifying to know that neither have so far been necessary.

A three-ton electric derrick crane by Butters Bros., lifting at the rate of 80 to 120 ft. per minute, is fitted with a 60-ft. steel lattice jib, made in two portions for convenient delivery and erection. A 12-b.h.p. motor of enclosed reversing type, series wound for 250/300 volts at 700 r.p.m., is fitted to this crane and a tramway-type controller with magnetic blow-out and suitable resistance is mounted alongside. The crane has handled fully 10,000 cub. ft. of earth and rock excavations, besides the necessary timbering, &c.

Aerial conductors are supported on porcelain insulators fixed to cross arms on poles spaced about 20 yards apart, the connections being taken from these conductors to twenty-

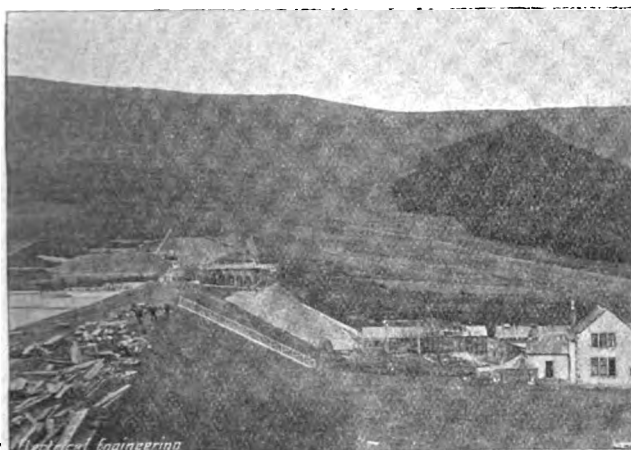


FIG. 1.—CONSTRUCTION WORKS, GLENQUEY RESERVOIR.

bank into the hill at the east side with a view to increasing the capacity of the reservoir, which has been planned to provide double storage at any future time by raising the existing bank by 11ft. The contractors, Wilson, Kinmond and Marr, Ltd., of Glasgow, were entrusted with the extension, and on the advice of their consulting engineers, James E. Sayers and Caldwell, of Glasgow (who kindly supplied us with these particulars), decided to provide generating plant in a position accessible for the easy delivery of fuel, the power being supplied to pump, crane, &c., by means of an overhead transmission line. A general view of the works is shown in Fig. 1.

The position of the power house in relation to the work can be seen in Fig. 2, while the plan in Fig 3 shows the general arrangement of generating plant. The gas-engine and suction-producer plant manufactured by the National Gas Engine Co. is capable of giving 75 b.h.p. maximum and 68 b.h.p. constant working load on suction gas of 135 B.Th.U. at 210 r.p.m. The engine is provided with magneto ignition and compressed-air starter. Owing to the continuance of operations night and day during the execution of the contract double producers and scrubbers were provided which are connected together, but, as each is capable of taking three-quarter duty, they are so arranged that either plant could be disconnected to allow the other producer being re-lined with fire-bricks at intervals. A motor-driven fan is fitted to one producer for starting. The dynamo, of 40-kw. capacity, manufactured by the Edison and Swan Co., is compound wound to develop 135 amperes 300 volts at 800 r.p.m. and connected by belting to the engine pulley. A circular saw

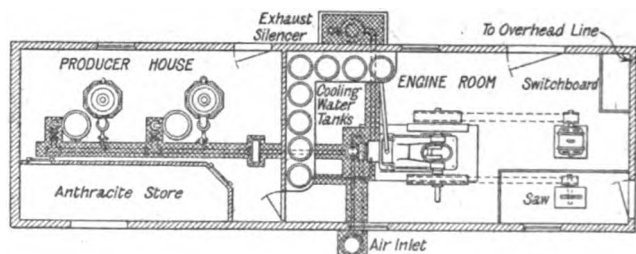


FIG. 3.—ARRANGEMENT OF PLANT IN POWER-HOUSE.

four electric lamp fittings fixed to poles by clamping rings underneath. The erection of plant and wiring was carried out by The Harland Engineering Co. and Telford Grier and MacKay.

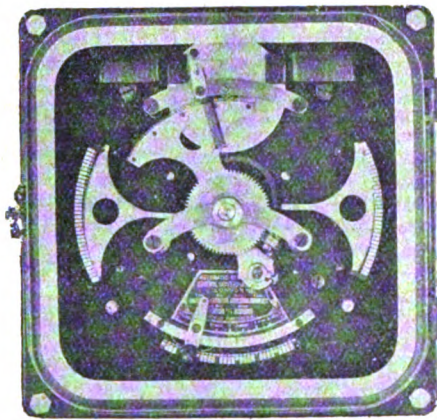
During the eighteen months the plant has been in operation only 55 tons of Polmaise Anthracite (washed singles), costing £56 12s., including delivery charges, was consumed by the producer plant. The above instance of the application of electricity to contracting work is sufficient to warrant the special consideration of its further development by firms who carry out the erection of large buildings, driving of tunnels, excavating of sewers and all the large public work in connection with the operating of lifts and hoists, concrete mixers, derricks and other contracting appliances.



# BROWN-BOVERI

## AUTOMATIC

### PRESSURE REGULATORS



RAPID AND ACCURATE REGULATION.  
NO SPARKING.  
NO "TOUCHING UP" OF CONTACTS.

CAXTON HOUSE  
LONDON S.W.

### ELECTRIC POWER ON WARSHIPS

A PAPER entitled "Some Special Applications of Electricity on Warships," by Mr. A. P. Hyne, was read before the Newcastle Local Section of the Institution of Electrical Engineers on February 10th. The author remarked that the conditions governing the application of electricity to warships were, on the whole, more favourable than in the case of merchant ships. Very little progress had, however, been made in this direction in our own navy, although electrically-worked gun-turrets had been in use in competition with hydraulic gear in other navies for many years.

Many of the disadvantages commonly attributed to electrical working can largely be avoided by designing the turret specially for electrical gear, and designing the electrical equipment with a full consideration of the very exacting nature of the work entailing rapid acceleration of heavy masses, stopping without shock or jar, frequent reversal, wide speed range, and complicated interlocking of the control. Difficulties are also introduced by the long periods of rest. Careful attention must be given to accessibility, simplicity, and suitability of the particular type of apparatus to its particular work. Accessibility is favoured by the use of contactor control, and switches should be standardised as far as possible to minimise replacement parts. Among a number of other points, the author insisted that both motors and switchgear should be robust as regards overload, and electromagnetic switches should be certain in action with considerably reduced voltages. Fuses and double-pole isolating switches must be provided in all control circuits. All contacts should be self-cleaning, and mica and micanite alone should be used for insulation wherever possible. The conditions of operation of winches, lifts, turret-turning gear, hoists, &c., are so varied that the type of motor must be selected to suit each particular case. For boat and coaling winches, lifts, &c., series or compound-wound motors can be used with advantage; but for ammunition hoists and most of the auxiliary gear of gun-turrets the variable speed of such motors under varying loads gives rise to serious difficulties. A shunt winding providing a very strong field is quite the most suitable for such cases.

With regard to cables, the system now adopted by the German and one or two other navies, or using lead-covered

cables protected by a jute braiding and having an armouring of fine steel wires, has, in the author's opinion, much to recommend it, and might with advantage be adopted on our own ships.

The paper then proceeds to a consideration of the requirements of certain special cases. In the central trunk hoist of a heavy gun-turret, the shell and powder cages of the central trunk hoist are frequently independent, the powder cage stopping at the magazine level when descending, and the shell cage continuing to the shell-room flat. With such an arrangement when raising the cages, the shell cage starts first, rapidly accelerates to full speed, then slows down, picks up the powder cage, and the two moving as one accelerate to full speed, and must slow down again just before reaching the top in order not to strike the stops too violently. Conversely, when lowering, the combined cages must slow down just before dropping the powder cage; the shell cage then accelerates to full speed, slowing down again just before reaching the bottom. These conditions are not easy to satisfy, and elaborate interlocking arrangements are necessary. Gun-loading hoist introduce equally arduous conditions, and another difficult case is that of a gun-loading rammer which has to make in less than 12 seconds some three double-strokes of varying length to accommodate the shell, the first two quarter-charges of powder, and the last two quarter-charges of powder. The shell must be pressed well home until there is no doubt that it has been properly rammed. The motor can then be reversed. In the case of the powder strokes, however, the powder must on no account be crushed up by the rammer, which must therefore be stopped automatically at the correct distance. The motor should be shunt-wound, since short-circuiting the armature is almost essential for pulling the motor up quickly at the limits, particularly at the end of the powder stroke. If partial charges are being fired, and the rammer tends to run on after current is cut off, then the powder will be rammed unnecessarily far into the breech. This case is eminently suitable for push-button control. A problem of quite a different nature is that of training, owing to the wide speed-range called for, necessitating a motor of, say, 750 revs. per minute maximum speed being capable of running at less than 3 revs. per minute. Even with the Ward-Leonard system there are difficulties in obtaining so wide a variation satisfactorily, and better results are being obtained with a two-motor system similar to that employed for printing presses.

In conclusion, the author writes:—"Given, however, situations designed for the reception of electrical apparatus, thoroughly reliable switchgear and motors, and the simplicity—from the operator's point of view—of push-button control, electricity should not fear competition from hydraulic power. But although these conditions can now be complied with, the electrical engineer still has the difficult task before him of overcoming the prejudice which exists in certain quarters against the more extended use of electricity for shipwork."

Mr. W. Routledge (Blaydon Iron Works), in the discussion, mentioned some large controllers for steering gear, which were exceedingly complicated but gave little or no trouble simply because all the parts were accessible for cleaning. Mr. T. G. Nyborg (Armstrong, Whitworth & Co.) referred to the case of a ship in South American waters in which the hydraulic cup leathers had to be renewed every fortnight. Mr. J. H. Holmes remarked that in the old days, on cargo ships with hull return, the usual practice was to drive a wood screw through the wood lining of the ship until it made good contact with the iron. Mr. F. O. Hunt said that in hoists the greatest proportion of the momentum was stored in the rotating armature and brake drum, but this was not appreciated by many makers. The difficulty with ordinary brakes was that they absorbed energy at a rate proportional to the peripheral speed, whereas for smooth stopping they should absorb at a rate proportional to the square of the speed. Mr. W. Baxter (A. Reyrolle & Co.) said that unfortunately the electrical plant had to give way to everything else, with the result that motors were often stuck in inaccessible places. He considered that electricity had been pushed too far in battleships, and that well-designed clutches were superior to controllers for many purposes. For two-stage loading he suggested a modified Barlow gear controlled by a simple reversing motor. He thought that it would be a mistake to open the firing circuits automatically, and that it was better to depend upon the turret danger signals. Mr. Pyne briefly replied to the various points raised.

**Boycott of German Goods in Prague.**—According to the *Elektrotechnische Zeitschrift*, one of the oldest electrical firms of Berlin, has successfully petitioned that the German Ambassador in Vienna should approach the Austro-Hungarian Government with the object of annulling the recent restrictions of the Prague Electricity Supply Authorities so far as electric motors of German manufacture are concerned.



## METAL FILAMENT LAMPS

AMONG the papers read during the meeting of the Institute of Metals, on March 12th, was one by Mr. Alexander Siemens on metal filament lamps. The earliest attempt to improve on the economy of the carbon lamp resulted in the osmium lamp, which, only using half the watts per candle power, was inferior to the carbon lamp in many respects. Its further development was interrupted by the appearance of the Nernst lamp, but the next step forward was the introduction of the Tantalum lamp in 1905, with its wire-drawn filament. This, he said, had all the good qualities of the carbon lamp, but consumed only half the current, and as many as 103 million have been sold in the last five years. Experiments were, however, being carried on meanwhile with metals of higher melting points, notably tungsten, which melts at about  $3,000^{\circ}\text{C}$ ., and the Osram lamp was produced by Auer by mixing metallic tungsten powder with organic materials to form a paste which could be squirted into threads, the additions being removed by heating in hydrogen. The colloid method of Kuzel was also mentioned, and that tried by Siemens and Halske, who mixed tungsten powder with a small percentage of nickel and pressed the mixture into rods which were heated in an atmosphere of hydrogen up to near the melting point of nickel. These rods were malleable, they could be drawn to serve as lamp filaments and their strength exceeded that of the tantalum. The filaments had to be heated afterwards in special containers to expel the nickel which would have blackened the bulbs. It was found, however, that their life was uncertain.

The next decisive step forward was made by the General Electric Co. of America, who patented in 1909 a process for making ductile tungsten, which is described in the British Patents 23,499/09 and 8,031/10, and of which the following is the fundamental fact on which the change in the properties of tungsten is based, viz., that "by repeated mechanical working, the tungsten being heated during the earlier stage of the operations, a condition is reached where the metal acquires such physical or molecular characteristics that further working may, if desired, be continued at room temperatures." The pure metallic tungsten powder is pressed into rods 13 cm. long and 4 sq. mm. in section by a pressure of about 32 tons per sq. in. In order to consolidate these rods, they are at first heated in an atmosphere of hydrogen to about  $1,300^{\circ}\text{C}$ ., and afterwards, by passing an electric current through them, to a white heat until the rod is firm enough to be hammered in a swaging machine. The treatment of heating the rod and passing it through a swaging machine is repeated until the dimensions are sufficiently reduced to commence rolling and drawing through diamond dies in the same manner as other metal wires are treated. The finished tungsten wire is silver-white and possesses a breaking strain up to 266-292 tons per sq. in. Wotan lamps with pure drawn tungsten filaments are now made in sizes varying from a 5-c.p. 110-volt lamp with a filament 0.01 mm. in diameter and 3.30 mm. long to the 2,000-c.p. 220-volt lamp with a filament 0.275 mm. in diameter and 2.6 metres long. The efficiencies vary, it is stated, from 1.1 watt per c.p. in the smaller sizes to 0.85 watt per c.p. in the largest, but it is not made clear in the paper whether British or Hefner c.p. are referred to.

The President (Prof. W. Gowland), in opening the discussion, referred to experiments which he made in conjunction with Sir William Siemens 30 years ago in the production of solid tungsten by the electric furnace. He asked how the tensile strength of tungsten compared with that of steel wire of the same diameter, and whether the ultimate malleability of the tungsten was really the result of alternate heatings and hammerings, or was due to the withdrawal of the carbon by the presence of hydrogen.

Mr. A. Philip asked for further information on the physical properties of tungsten. The tensile strength of tungsten must be considerably higher than that of steel, as he did not know of any steel for ordinary purposes which went higher than 130 tons, and it was improbable that a steel wire had ever been drawn so fine as half a thousandth of an inch. Mr. W. H. Johnson, however, remembered seeing some experiments on the breaking strain of a very fine steel wire which gave over 200 tons per square inch. Mr. G. A. Boeddicker said that tungsten appeared to be the only metal that could be made homogeneous simply by pressure. An interesting point was the annealing of the metal during the process of drawing it down. He had drawn constantan wire down to 0.0015, but it was extraordinarily difficult. Mr. E. L. Rhead gave some information about the malleability of other alloys, and Mr. J. D. Bedson spoke of the addition of tungsten to steel.

Mr. F. W. Willcox (British Thomson-Houston Co.) pointed

out that the candle-powers in the Paper were hefner and not British candle-power, which latter would be about 10 per cent. less. He considered that the development of the drawn wire filament had been one of the most revolutionary which had ever taken place in any industry. Mr. T. Boulton was not quite clear how it was possible to swage a bar of tungsten small enough to draw it through a diamond die without any intermediate rolling.

Mr. A. Siemens, in reply, said that rolling did take place, although he had not mentioned it. The strength of tungsten only reached high values when drawn very fine. In the larger sizes it was no stronger than ordinary steel wire. With regard to the President's remark as to the withdrawal of carbon, he said that the powder was prepared from a dioxide, which must be absolutely pure, and, as a matter of fact, great care was taken to eliminate the carbon.

## THE TESTING OF EBONITE

AN original communication by Messrs. C. C. Paterson, E. H. Rayner, and A. Kinnes, entitled, "Notes on the Testing of Ebonite for Electrical Purposes," has been published in the Journal of the Institution of Electrical Engineers. The authors describe an extensive series of tests on ebonite of various qualities at the National Physical Laboratory. The points to which attention was specially directed were immunity from the action of light in deteriorating the surface of the material, resulting in bad surface insulation; high electric strength; mechanical toughness, and the absence of any tendency to yield under pressure or at temperatures above that of the air.

The first was found to be present in all the samples, and none could be said to be superior to any other. The tests finally recommended for ascertaining the quality of ebonite are those of electric strength, yield, temperature, and specific gravity, and the following specification is suggested for tests on sheet ebonite purporting to be made from best Para rubber without adulteration:—

*Specific Gravity.*—To be not more than 1.21.

*Yield Test.*—A cantilever of the ebonite 25 mm. (1 in.) wide and 10 mm. ( $\frac{3}{8}$  in.) thick, supporting a 1-lb. weight 152 mm. (6 in.) from the support, shall be placed in an oven maintained at a temperature of  $70^{\circ}\text{C}$ . The ebonite shall not yield so that the point of support of the weight drops through a greater distance than 15 mm. (approximately  $\frac{5}{8}$  in.) during two hours at this temperature. The distance dropped shall be measured before and after the test with the weight removed.

*Electric Strength.*—The sheet ebonite shall be tested for electric strength by embedding metal spheres, 51 mm. (2 in.) diameter, into opposite sides of the material so that the thickness of ebonite between them is about 0.5 mm. An alternating potential difference with an approximately sine wave distribution shall then be put across the spheres, and the voltage gradually raised over a period of about 1 minute until breakdown occurs. The test specimens and spheres may be placed under oil during this test, in which case a specimen 100 mm. (4 in.) diameter will suffice to prevent sparking round the edges. Under these conditions of test the ebonite shall show an electric strength of not less than 125,000 volts per millimetre (R.M.S.).

*Switch Connections.*—The abridged waistcoat pocket edition of Mr. W. Perren Maycock's "Lighting Connections," which was published by Messrs. A. P. Lundberg & Sons (477-487 Liverpool Road, N.) less than a year ago, has just been reprinted as a second edition, similar in all respects to the first except that the colour of the cover is brighter. This shows that our prediction that it should prove very useful to wiremen and contractors (ELECTRICAL ENGINEERING, Vol. VIII., p. 308, June 6th, 1912) has been fulfilled. The price of the volume is 6d. net, by post 7d., from Messrs. A. P. Lundberg.

*School for Electricity Supply Canvassers.*—A school, supported by public electric supply companies, has just been opened in Chicago to give instruction in the commercial side of electricity supply. The course extends over 11 months. Half of this time outside work is done, for which the student receives remuneration.

*Large Canadian Hydro-Electric Generating Station.*—According to the *Electrical News* (Toronto) orders have recently been placed for 12 10,000-kw. vertical hydro-electric sets. The overall diameter of the generators is approximately 36 ft., and the speed 56 r.p.m. The head of water is only 30 ft. The company owning this station is the Cedars Rapids Manufacturing & Power Co. (Montreal), and the station is said to be the largest single installation ever contracted for at one time in Canada, and with the exception of the plant at present under construction at Keokuk on the Mississippi River, probably the largest in the world.



## ELECTRIC DRIVING AT A BRICKMAKING WORKS

A RECENT example of electric driving ousting the steam engine is the power installation carried out by the Northern Counties Electricity Supply Co., Ltd., at the Pelaw Terra Cotta Brick Works of Messrs. Jones Brothers, Newcastle-on-Tyne. This firm have recently replaced their 300-h.p. steam engine and two Lancashire boilers by electric motors. Current is brought from a switch-house near by by overhead cables to a sub-station in the works at 5,000 to 6,000 volts, three-phase, 40 cycles, and is there transformed down to 440 volts by a Westinghouse transformer, for supply to the motors.

The main brickmaking plant is driven by three 75-h.p. enclosed ventilated motors running at 460-480 r.p.m., and controlled by oil-immersed auto-starters, made, as well as the motors, by the British Westinghouse Co. These three complete brickmaking equipments (by Messrs. Bradley and Craven, of Wakefield) each consist of a grinding mill, mixing mill, brickmaking machine, and two represses. These sets are worked independently of each other, and are quite self-contained. The haulage from the shale pit to the works is on the endless chain system, and is operated by a 15-h.p. back-gear induction motor running at 600 r.p.m. at the works' end of the haulage. The water employed in the brick-making process is pumped from an adjacent pond by a 300-r.p.m. Daniels' single-crank vertical ram pump with a capacity of 900 gallons per hour, driven by a 5-h.p. squirrel-cage motor running at 750 r.p.m. There is a well-equipped engineering shop, and the various machines contained therein are driven by a 5-h.p. 800-r.p.m. back-gear motor. The advantages which have been realised by the conversion from steam to electrical driving are reduced labour, maintenance, and power charges, and avoidance of the complete shut-downs of the whole works, which were unavoidable when trouble occurred with the steam power plant. Standing losses are avoided and the shafting and transmission friction is considerably reduced. The consulting engineers to Messrs. Jones Brothers are Messrs. Merz and McLellan.

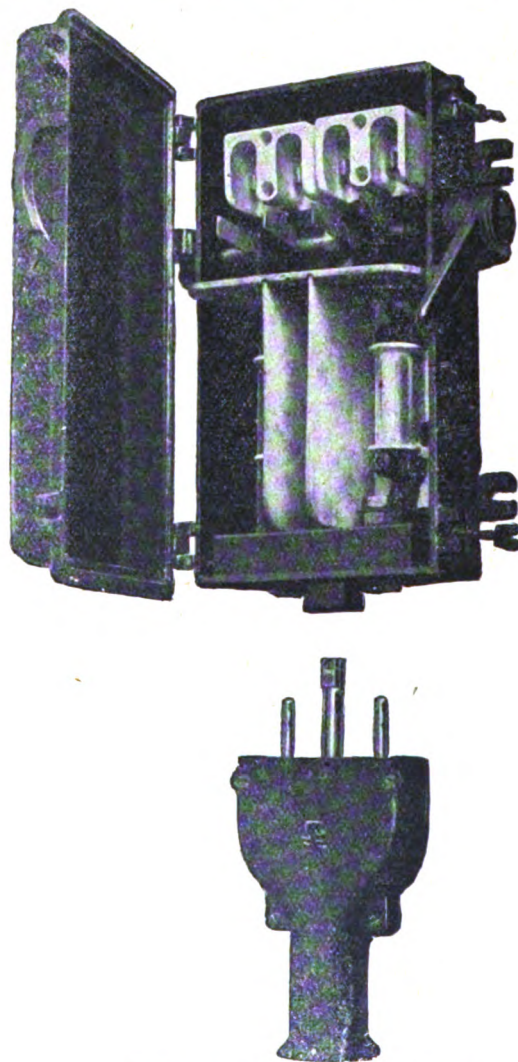
## GOOD ILLUMINATION

A PAPER by Mr. Leon Gaster entitled "The Economic and Hygienic Value of Good Illumination," was read and discussed at the Royal Society of Arts recently. The four electroliters in the Hall were each fitted with a different method of diffusion. The author treated the subject in his own characteristically enthusiastic way. Under the sub-heading, "The Hygienic Aspects of Illumination," he showed how bad and insufficient lighting in schools is responsible for bodily deformities as well as optical troubles. It was now generally agreed, he said, that for ordinary desk work an illumination of 2 to 3 foot-candles was necessary, and about 4 foot-candles on the blackboard. Sections of the Paper were also devoted to the avoidance of glare, good illumination as a means of preventing accidents, the meaning of "adequate illumination," and the importance of shades and reflectors. It was pointed out that different manufacturers seemed at the present time to have very different ideas as to the amount of illumination actually required to carry out similar processes. The following figures were given in this connection. In the case of six different printing works, values ranged from 3.4 to 26.8 foot-candles. Again, for printing, cotton factories, &c., these illuminations in foot-candles were given:—Clothing (machine room), 2-36; handkerchiefs (machine room), 2-8; composing rooms, 3-30; cotton weaving, 1-5; linen weaving, 3-18; while in cotton spinning and preparing rooms much lower values, ranging from 0.01 to 6 foot-candles were met with.

During the discussion, Sir Henry T. Wood narrated the history of the lighting of the room in which the meeting was held. When it was first built, about 140 years ago, it was lighted by four or five sets of oil-lamps. Each pendant had, he believed, three or four lamps. This method of lighting continued for about eighty years. Towards the middle of the last century a Bude light was installed in the centre of the room. In 1854 the oil-lamps at the four corners were removed, and a large central "Sun" gas-light was put in. This was continued until 1882, when electric light was introduced into the building. He believed this installation of electric light was the oldest in any public building in London. This lighting was effected by an Otto gas-engine and a Siemens machine, followed by the addition of an E.P.S. storage battery. In 1899 current was taken from the street mains. The first introduction of gas occurred in 1815, when the Society put up a lamp outside the street entrance. The purification being at that period very imperfect, gas illumination could not be introduced inside. In the 'thirties or 'forties gas was used on the stairs, and was gradually employed in other parts of the building.

## A COMBINED SWITCH FUSE AND PLUG

THE GENERAL ELECTRIC CO., LTD., 67 Queen Victoria Street, are introducing a new patented combined switch fuse with a plug attachment for use in docks, non-fiery mines, and other work where a flexible connection to a motor is employed. The apparatus is so constructed that neither can the switch-cover be opened, nor the plug withdrawn nor inserted with the switch closed. The switch spindle carries a cam which, when the switch is closed, presses down the upper end of a hinged steel bar. The lower end of the bar is turned at right angles and forked. In addition to its two current-carrying pins, the plug is equipped with a long steel pin, which passes through a hole in the case into the interior of the switch-box, and is so notched that it can be gripped and held firmly by the fork on the hinged bar, so that when the plug is in position and the switch closed the fork engages



COMBINED SWITCH FUSE AND PLUG.

with the steel pin and absolutely vetoes all attempts to withdraw the plug. Moreover, if one tries to insert the plug while the switch is closed, the end of the steel bar effectually blocks up the aperture through which the steel pin has to pass, so that access is completely denied, and the operator is compelled to switch off before he can insert the plug. The earthing conductor from the motor terminates at a contact in the plug, and the first step in the process of inserting the plug is to complete this earth connection. Then, and not before, the brass pins enter their sockets. On withdrawing the plug the earth connection is the last to be broken. To prevent all possibility of insertion of the plug in the reverse way, the steel pin has a projection which fits into a slot in the aperture through which the pin enters the case, like a key in a lock. The switch itself is of the Company's standard "Twinbreak" pattern, and the whole device may be obtained with or without fuses.



## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelopes.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,332.

The switch of a 3-phase alternator fitted with discriminating fault protection of the Merz-Price balanced type has been giving considerable trouble by opening repeatedly owing to the action of the relay without apparent cause, as no fault can be discovered in the generator. The relay connections and pilot connections are quite sound and unbroken, and the balance of the current transformers proved sufficiently good right up to short-circuit current, and, indeed, the plant often runs satisfactorily for days without trouble of any kind. The neutral of the alternator, which is in parallel with others, is earthed. "Current" balancing is utilised with a relay across the mid-point of the pilot. The current transformer secondaries are both star-connected and their neutrals earthed, and there are no overload or time-limit fuses. What is the cause of the trouble?—"Kink."

(Replies must be received not later than first post April 3rd.)

### ANSWERS TO No. 1,330.

Rotary converters when running with fixed A.C. input voltage are capable of delivering D.C. variable voltage within small range, without special boosting arrangements.

In the case of a six-phase rotary giving a D.C. voltage of 550-600, how can the power factor and exciting current be calculated for the different voltages, the A.C. input voltage being constant?

How much reactance should the transformer, which is supplying current to the slip rings, have? A. D.

The first award (10s.) is made to "ALPH" for the following reply:—

In an ordinary rotary converter, without booster or split poles, the D.C. voltage always bears a fixed ratio to the A.C. voltage impressed on the sliprings. This ratio depends on the number of phases for which the machine is wound and on the ratio of pole arc to pole pitch, but for any given machine it is constant except for the slight amount of the C.R. drop as the machine is loaded up. In a six-phase rotary of normal construction this ratio will probably be about 1.41, i.e., the diametrical A.C. voltage on the sliprings will be 0.707 of the D.C. voltage. If the field of such a converter is over-excited, i.e., beyond the amount necessary to provide sufficient flux to give the D.C. voltage corresponding to the A.C. impressed volts, the D.C. volts will not be raised, but the machine will draw a wattless leading current from the line. The M.M.F. of this current flowing in the armature will be directly opposed to the main field M.M.F., and the leading current taken will be of such amount that the armature ampere turns exactly counterbalance the extra ampere turns on the field, leaving a resultant M.M.F. sufficient to drive the correct flux through the machine. Similarly if the D.C. field is under-excited the machine will draw a lagging current sufficient to bring the total M.M.F. and the flux up to the correct value. If a reactance is connected between the A.C. line and the rotary sliprings the leading or lagging current passing through the reactance will add or subtract a voltage (proportional to the wattless current and the amount of reactance) to the voltage impressed on the sliprings; since

the D.C. voltage is strictly proportional to the slip-ring voltage, this affords a ready means of varying the D.C. voltage. In the present case the voltage range is 9 per cent., or, allowing 5 per cent. C.R. and reactance drop at full load with unity power factor, and assuming that it is necessary to obtain the full voltage range at any load from no load to full load, we have a total internal voltage variation of 14 per cent. 15 per cent. reactance in the transformer should be satisfactory for this, and allowing 3 per cent. for the reactance of the rotary we have 18 per cent. total reactance. It is now necessary to determine the voltage ratio for which the power factor is to be unity. The most economical value for this is dependant on various factors, such as the load factor of the machine, the degree to which the field can be over-excited without overheating, and the amount of wattless current which can be carried by the armature without overheating (as is well known, the armature heating of a rotary converter increases very rapidly with a reduced power factor, whether lagging or leading). We will assume as a fair average case that the power factor should be unity at 575 volts D.C. with full load on the machine; then the transformer will be wound to give a normal secondary voltage at full load, unity power factor, of  $0.707 \times 575 \times 1.05 = 426$  volts, the factor of 1.05 being, of course, to allow for the assumed drop of 5 per cent. at full load. The maximum voltage required on the slip-rings is at full load 600 volts D.C., and is  $0.707 \times 600 \times 1.05 = 445$  volts. This is an increase of  $\frac{4}{3}$  per cent. above the normal voltage, and therefore necessitates  $100 \times \frac{4}{3} / 18 = 25$  per cent. leading current, so that the power factor in the rotary armature will be  $100 / \sqrt{100^2 + 25^2} = 0.97$ . Similarly the slipring voltage at no load 550 volts D.C. =  $0.707 \times 550 = 389$  volts, a decrease of  $\frac{8}{3}$  per cent., necessitating a lagging current of  $100 \times \frac{8}{3} / 18 = 47$  per cent. This wattless current corresponds to a power factor of 0.905 at full load, but since there is no load on the machine the actual power factor will be very low, probably about 0.10 to 0.12. Generally, if  $v$  = per cent. rise or fall in voltage from the normal, allowing for the C.R. drop,  $w$  = per cent. reactance = volts across reactance with full load current flowing expressed as a percentage of normal volts, and  $A$  = normal A.C. full load current, then the wattless current taken will be  $C = A \times v / w$ , and will be a leading current when the voltage is raised and a lagging current when the voltage is lowered. Knowing the efficiency of the rotary, the load current input corresponding to any particular load and voltage is readily obtained, and calling this current  $I$ , the power factor in the rotary armature will be  $P = I / \sqrt{I^2 + C^2}$ . On the supply side of the reactance the current will, of course, lag further behind the volts than on the rotary side, and the power factor on the line will be  $P' = IVr + (I^2 + C^2) / V \sqrt{I^2 + C^2}$ , where  $I$  = A.C. load current,  $C$  = A.C. wattless current,  $Vr$  = volts on slip-rings =  $V(1 \pm v)$ ,  $V$  = transformer secondary volts at unity power factor, and  $r$  = C.R. drop at full load.

To determine the exciting current required, first determine in the usual way the ampere turns to give the required voltage if the machine were running as an ordinary D.C. generator without load. Call this  $At$ . Next determine the equivalent D.C. armature reaction of the machine at full load from the equation  $Ar = \text{D.C. current per path in armature at full load} \times \text{number of armature conductors} \div \text{twice the number of poles}$ . Then if  $V$  and  $W$  have the meanings assigned to them above, the total ampere turns per pole will be  $At \pm VAr / W$ , using the + sign for increased voltage and the - sign for decreased voltage. To the ampere turns thus found it will be necessary to add a small percentage of the armature reaction if the brushes are not on the neutral, say about 10 to 15 per cent. at full load and proportionately for other loads. The exact amount of this final correction can only be determined on test. Having determined the ampere turns, the proportion of these which should be series turns (if the rotary is to be compound wound), also the number of shunt turns and the shunt field current, are obtained exactly as for the field coils of a D.C. generator.

It is usual to allow about 15 per cent. reactance in the transformer for this method of control. More reactance is commercially difficult to obtain in a good transformer, and less reactance leads to excessive wattless currents for the amount of voltage regulation usually required.

The second award (5s.) has been made to "C.E.B."

## "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

### Specifications Published March 20, 1913

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

Names in italics indicate communicators of inventions from abroad.

4,460/12. **Regenerative A.C. Commutator Motors.** BROWN, BOVERI. To obtain regenerative working of single or polyphase commutator series motors, two or more saturating magnetic fluxes displaced in time are introduced into the system. Six figures.

8,569/12. **Discriminative Protective Gear.** B.T.-H. and E. B. WEDMORE. Pressure transformers are connected between the phases of the system and earth, and a relay is excited from these transformers. The currents in the windings of the relay normally neutralise one another, but when a fault occurs there is a resultant magnetising current in the windings, which is practically in phase with the pressure to earth, and operates the relay. Three figures.

10,534/12. **Submarine Telegraphy.** J. GOTT. The system described in ELECTRICAL ENGINEERING (Feb. 27th, 1913, p. 120). The direction of the current is reversed for each signal.

15,483/12. **Arc Electrodes.** B.T.-H. (*G.E.C., U.S.A.*). To steady the magnetite arc, the current is led into the electrode at right angles to the arc and in equal symmetrical branches. The positive electrode is a disc shape. Four figures.

17,778/12. **Light Baths.** G. E. GAFFE. For the local treatment of parts of the body, the hinges connecting adjacent elements also serve as couplings for the lamp circuits. The elements are bell-shaped or rectangular. Seven figures.

21,471/12. **A.C. Commutator Motors.** SIEMENS SCHUCKERT. To improve the running of the motor, a transformer is placed in series between the stator and rotor. The transformer winding connected to the stator is connected in star, and that connected to the rotor is in mesh. One figure.

### Specifications Published To-day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, E.C., at the price of 8d. each, post free.

Summaries of some of the more important of these patents will appear in our next issue.

**Arc Lamps:** KORTING & MATHIESEN [Trimming indicator] 253/13.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** WILSON [Storage battery charging] 9,593/12; WILLIAMS [Movable sleeve for inspection of wires in cables] 21,215/12.

**Dynamos, Motors, and Transformers:** HARTMANN & BRAUN [Metal vapour rectifiers] 5,345/12, 5,415/12, and 18,603/12; MACKIE [Rotary converters] 10,804/12; MASCH. OERLIKEN [Repulsion motor] 11,434/12; REY [Generating set] 18,025/12; BERDON [Brush-holders] 20,224/12.

**Electrometallurgy and Electrochemistry:** JOHNSON (*Badische Anilin und Soda Fabrik*) [Electrolysis of alkaline chlorides] 16,779/12.

**Heating and Cooking:** DOWNE and B. & K. ACCESSORIES [Cooking apparatus] 25,586/12.

**Ignition:** MACKAY [Testing spark-plugs] 12,672/12.

**Incandescent Lamps:** JAHODA and ELEK. GLÜHLAMPENFABRIK "WATT" SCHARF LÖTTI & LATZKO [Filament manufacture] 7,977/12; BAILEY and McDOWELL [Filament manufacture] 20,621/12; GILL (*Wolframlampen*) [Supports for metal filaments] 26,249/12.

**Instruments and Meters:** SEIBT [A.C. frequency measuring and speed indicating] 16,874/12.

**Switchgear, Fuses, and Fittings:** MASCORD [Motor controllers] 26,864/11; JOEL [Portable battery lamps] 5,170/12; MÜLLER [Holders for lamps, switches, plugs, &c.] 6,395/12; WYNNE [Switches] 26,517/12.

**Telephony and Telegraphy:** SIEMENS BROS. & Co. (*Siemens & Halske*) [Automatic and semi-automatic telephony] 2,320/12; KILLAR and GROVE [Telephones] 9,714/12; TORIKATA, YOKOYAMA and KIAMURA [Dischargers for wireless] 10,823/12; PORE [Telegraphy] 11,604/12; BAUMANN [Telephony] 18,677/12; RHODES [Telephonic transmitters] 20,196/12; KELTY [Telegrapher's key cushion] 27,079/12.

**Traction:** STRACHAN and STRACHAN & HENSHAW [Telphers] 190/12; POTTS [Signalling] 6,050/12; EMMETT [Signalling on and stopping trains] 21,723/12.

**Miscellaneous:** B.I. and H. and BAYLES [Condensers] 2,701/12; HEINRICH [Production of active carbon masses] 2,862/12; BLANCHARD [Electrostatically separating minerals, &c.] 6,772/12; ELECTROMOTOR EQUIPMENT and ARCHER [Opening and closing lift gates] 11,500/12; SOZZI [Primary batteries] 20,101/12; WEIKEL and WEIKEL [Alarms] 21,939/12.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Distributing Systems, &c.:** KRUPP [Connections for D.C. apparatus] 1,407/13.

**Dynamos, Motors, and Transformers:** VEDOVELLI, PRIESTLEY & Co. [Manufacture of small power transformers] 4,090/13; LJUNGSTRÖM [Commutator machines] 4,773/13; CIE. POUR L'EXPLOITATION DES PROCÉDÉS THOMSON-HOUSTON [Automatic regulators for variable-speed dynamos] 5,020/13.

**Incandescent Lamps:** CHARLES [Filament arrangement] 5,028/13.

**Storage Batteries:** KETTERING [System] 5,545/13.

**Switchgear, Fuses, and Fittings:** DE FRETES [Contacts for flashers] 3,006/12; APPAREILLAGE GARDY [Switch-fuses] 4,686/13.

**Telephony and Telegraphy:** SIGNAL GES. [Wireless radiating system for aeroplanes] 736/13; SHREEVE [Telephone repeater system] 4,611/13; BETULANDER [Automatic telephone impulse transmitters] 4,792/13.

**Traction:** CLARK [Automatic wireless train control] 4,901/13.

**Miscellaneous:** A.E.G. [Automatic ticket printing by selectors] 3,680/13; IMME [Typewriter] 4,405/13.

### Expiring and Expired Patents

The following Patents expire during the current week, after a life of fourteen years:—

6,685 of March 28th, 1899. **Standard Cells.** R. O. A. HEINRICH. Certain improvements in the construction of H-type cells are covered. Diaphragms, for use between the liquid electrodes and the electrolyte, which permit of the liberation of any air accumulating under them on their being fixed in position, are constructed of two discs fixed to an escape tube. Porous packing is placed between the discs. The lower disc is funnel shaped.

6,712 of March 28th, 1899. **Common Battery Telephony.** G. ABOILARD ET CIE. The specification is a long one, and there are 12 sheets of drawings. Supervisory signals, exchange connections, and apparatus, and connections for junction line signalling are described.

6,883 of March 30th, 1899. **The Silent Discharge.** M. OTTO. An apparatus to produce ozone, &c., by gradual and successive startings and interruptions of the discharges between the various opposing points of the electrodes is described. It is similar in principle but different in construction from that described in specification No. 11,010/97. In this case movable separating discs, having alternately conducting and insulating sectors, are arranged between the electrodes. Thus short circuits are prevented.

6,982 of April 1st, 1899. **Induction Coils for Wireless.** G. MARCONI and the MARCONI Co. Coils for use as in specification No. 12,326/98 (*ELECTRICAL ENGINEERING*, Vol. VIII., p. 296. May 30th, 1912), are made very short—not exceeding two cms. in length—or else are wound in sections. The turns per layer of secondary, and sometimes of the primary, are diminished as the distance from the centre is increased. It is also desirable to connect direct to the coherer (not through the condenser) the end of the secondary remote from the nucleus. Diagrams and particulars of coils are given.

The following are the more important Patents that have become void through non-payment of renewal fees.

**Arc Lamps:** T. L. CARBONE [Inclined carbon lamp using pure carbon electrodes] 26,772/03; F. JANECK [Thermally controlled lamp—the carbons are provided with fusible pins] 25,257/05.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** J. WILKINSON [Reinforced asphalt or earthenware conduits] 26,220/04; SIEMENS SCHUCKERT [Rolling mill motor control] 27,073/07.

**Heating:** O. HAWKES [Convecter with openings at top and bottom and baffle plates] 25,032/05.

**Ignition:** ALBION MOTOR CAR Co. and T. B. MURRAY [Details of magneto construction] 27,570/06.

**Switchgear, Fuses, and Fittings:** W. FAIRWEATHER (*Crocker Wheeler Co.*) [Motor controllers of the knife-switch type—the switches are interlocked so that they can only be closed in a certain order] 24,186/99; W. B. CLEVELAND [Cable connectors for stranded cables and method of fixing in the cable suitable for use where there is much vibration] 21,991/00 and 22,010/00; H. LEITNER, R. N. LUCAS and H. HILL [Automatic accumulator charging switch] 26,374/04; B. T.-H. (*G.E.C., U.S.A.*) [Automatic electro-magnetic motor starter] 27,038/07.

**Traction:** B.T.-H. (*Union Electricitäts Ges., Berlin*) [Trolley wire supports] 24,457/01; SIEMENS BROS. & Co. (*Siemens & Halske*) [Hand levers and gearing for block signalling instruments] 26,920/07.

**Miscellaneous:** B. J. B. NOLLS (*Gamewell Fire Alarm Teleg. Co., U.S.A.*) [Fire alarm system in which interference between the circuits is prevented] 26,541/02.

# ADAMS IGRANIC

ELECTRIC MOTOR CONTROL GEAR FOR STEEL MILLS.

ADAMS  
M<sup>FG</sup> CO<sup>L</sup> LTD  
BEDFORD  
AND  
LONDON

## THE "ELECTRIC ARC"

UNDER this title Mr. W. B. Hird (Mavor & Coulson, Ltd.) delivered a lecture in Edinburgh recently to the Scottish Local Section of the Institution of Electrical Engineers. The *Electric Arc*, it will be remembered, is a small experimental electrically-driven boat built by Messrs. Mavor & Coulson, Ltd., to demonstrate the flexibility of electrical control. Information as to this vessel has appeared in *ELECTRICAL ENGINEERING*, Vol. VII., June 15th, 1911, p. 330, and Sept. 7th, 1911, p. 500.

Mr. Hird began by pointing out that turbine speeds vary from 1,200 to 3,000 r.p.m., while propeller speeds vary from 90 to 120 r.p.m. only. Dealing with D.C. electrical gearing, commutation gives much trouble, he said, but speed regulation is more easily obtained than with A.C. motors. Pole-changing and cascade working are both rather complicated, while with a spinner motor three speeds may be obtained. It is also desirable that the generators do not have to run in parallel, and that the motors be of the squirrel-cage type. The *Electric Arc* was built at Dumbarton by Messrs. Maclelland & Whitson, Ltd. It is 50 ft. long, with a 12-ft. beam, moulded depth 7 ft. 4 in., and maximum draft 4 ft. 6 in. The displacement is about 19 tons. The propeller diameter is 3 ft. 6 in. A four-cylinder internal combustion engine drives a 310-volt alternator having 72 slots containing two windings of six wires each. The frequencies obtained from the windings are 20 and 33½. The control of the driving motor is effected from the bridge by two inter-locked switches, one controlling the excitation of the alternator, and the other the direction of supply to the motor in one or both windings.

The discussion was opened by Professor F. G. BAILY (Heriot-Watt College, Edinburgh), who apparently regarded the obstacles in the way of electrical ship propulsion as very formidable. With cascade motors, would both have to run dead slow, he asked, when dead-slow ship speed was required? As the maximum torque was required for reversing, he did not think that a squirrel-cage motor could be designed for this work. The Author, however, replied that experiments had showed that it did not take the full torque corresponding to the load power to reverse the propeller rapidly, since a propeller as a turbine had a very low efficiency. The squirrel-cage motor was satisfactory on small boats, but on bigger ones it would fail, though there were considerations which indicated that larger sizes of squirrel-cage motors could be used.

Mr. J. A. ROBERTSON (Burg Electrical Engineer, Greenock) could not reconcile the author's statement about the difficulty of synchronising on board ship, and the statement that one of the advantages of electrical propulsion was the concentrated power of one generator and one motor. Mr. Hird replied that the scheme considered did not prevent a combination of three alternators and three different motors unless the latter were all of the multiple-wound type. With three separately-driven propellers they would have to synchronise. Mr. SAM MAVOR mentioned a scheme for driving a 500-ton yacht in which the weights of machinery were steam 100 tons, and electric 90 tons. The centre of gravity was also lower in the latter case, and there was greatly increased accommodation and convenience. The Chairman (Mr. McWhirter) made a few remarks, and Mr. Stevenson and Mr. J. S. Nicholson also spoke.

## SOME USES OF THE STROBOSCOPE

AT a recent meeting of the Western Section of the Institution of Electrical Engineers, which was held in Bristol, Professor D. Robertson (Merchant Venturers' Technical College, Bristol), gave a lecture on, and showed some interesting experiments with the Stroboscope. The lecture dealt mostly with mechanical applications, such as the investigation of the noise of gears, hammering of tappets on cams, combustion of gases in the cylinders of internal combustion engines, whipping of shafting and torsion when shafting is under a uniform torque. The slip of induction motors was demonstrated and the calibration of motor-type meters was discussed. The lecturer suggested that the discs should be marked with, say, 117, 120 and 123 spots in three circles representing 2½ per cent, up and down from correct speed. If the load was then put on the meters in series the glimpses given of the disc so arranged for the correct speed of the

disc corresponding to the given load would show the middle circle of dots appearing to remain stationary when adjusted by means of the permanent magnet. He suggested that this would be far quicker than taking the speed of the disc by means of a stop-watch and very much more accurate. The phase swinging of alternators when the same were synchronised was clearly demonstrated by means of the stroboscope. The hunting effect being very clear when the machine was put in slightly out of step.

## CATALOGUES, PAMPHLETS, &c., RECEIVED

**REFLECTORS FOR INCANDESCENT LAMPS.**—The British Thomson-Houston Co., Ltd. (Mazda House, 77 Upper Thames Street, E.C.), have just issued new editions of two folders which have spaces for the names of contractors. One folder, with a bold cover design, deals with the advantages of the well-known Veluria glass reflectors, the various patterns of which are illustrated. The second deals concisely with Mazda lamps, Veluria, Holophane, and Mazdalux reflectors. Short notes supplemented by diagrams are given, and the uses of each type. The list is made complete by the inclusion of the prices of the galleries suitable for use with the various shades, and an article entitled "Why Scientific Reflectors are Necessary."

*Readers desiring copies of catalogues or pamphlets should apply to the firms in question, referring to the notice in "Electrical Engineering."*

**ALUMINIUM.**—New leaflets from the British Aluminium Co., Ltd. (109 Queen Victoria Street, E.C.), illustrate aluminium collector bows, aluminium low pressure feeders for light railways, and miscellaneous fittings.

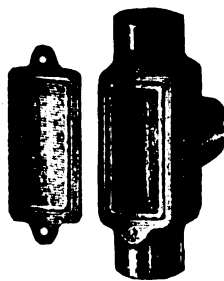
**CONDUITS AND FITTINGS.**—The 1913 edition of the convenient pocket catalogue dealing with conduits and accessories, distribution boards, and water-tight fittings issued by Simplex Conduits, Ltd. (116 Charing Cross Road, W.C.), and which is just to hand, contains in a condensed form practically all the matter falling under the above heads in the firm's general catalogue.

The size is only 8 in. by 4 in., so that it may be easily carried by a contractor for reference on the job. One or two new designs of conduit fittings have been added, notably back outlet bends and tees; these are intended for screwed conduit installations, and have heavy cast covers to serve as a drawing point where a branch is taken off at right angles to the main run of conduit. We illustrate a short arm tee.

**TOOL STEEL.**—An interesting book from Cammell, Laird & Co., Ltd. (Cyclops Steel & Iron Works, Sheffield), forms a catalogue of the various special tool and other steels which the firm supply. A very large number of different brands are included for different classes of tools, and such special steels as magnet steel, nickel and automobile steels, &c., are dealt with.

## ANSWERS TO CORRESPONDENTS

"MAN."—(1) We will possibly publish this for competitive replies. (2) The Wiring Rules of the Institution of Electrical Engineers (which we can send you, post free, 7d.) contain extracts from the Board of Trade and Home Office Regulations so far as they relate to wiring, and work in accordance with them is accepted by practically all fire offices and a large number of corporations. Most corporations, however, publish certain requirements to which installations must conform before being connected up, and in some cases these embody a few rules as to wiring details more stringent than the Institution code. (3) The speed is about 192,000 miles per second. The measurement is a difficult and delicate one, and you could not expect to perform it with the apparatus likely to be at your disposal.



## FARADAY HOUSE.

ESTABLISHED 1889.

(Proprietors: The SYNDICATE OF ELECTRICAL ENGINEERS, Ltd.)

### Oil Tests

Faraday House tests every kind of Electrical Machinery and Instrument, and all Apparatus and Materials used by the Electrical and Allied Industries.

Scale of fees will be sent on application to the Secretary,

THE ELECTRICAL STANDARDIZING  
AND TESTING INSTITUTION,  
62-70, Southampton Row, London, W.C.

Telep. No.: 9999 Central. Teleg.: "Standardizing, Westcent, London."

## FARADAY HOUSE.

## DON'T MACHINE!—CAST!

The scientific accuracy and perfection of finish that can be secured by

"PRANA"

### DIE FINISHED CASTINGS

renders unnecessary all expensive and costly machining, and will

### CUT DOWN COST ON COMPLICATED PARTS

Holes, Slots, Teeth, Notches, Screw Threads accurately cast and finished by the "Prana" process.

Send for booklet E.A., illustrating and describing this money-saving process to:—

AERATORS LIMITED, EDMONTON, LONDON, N.



### ELECTRICAL PORCELAIN

OF

HIGHEST QUALITY

APPLY TO

JAMES MACINTYRE & CO., LTD.,  
BURSLEM.

The Micanite & Insulators Co., Ltd.

WALTHAMSTOW,  
London, E.

FOR **FIBRE**  
SHEETS, RODS  
AND  
TUBES.

ONCE  
USED



ALWAYS  
USED

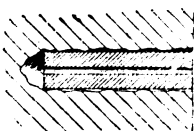
PRICE: ONE SHILLING PER STICK.

Sole Manufacturer—**S. W. CUTTRISS**, Prudential Buildings, LEEDS.

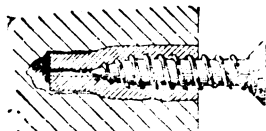
**STEATITE  
INSULATORS**  
SUPPLIED  
FOR ALL KINDS OF  
ELECTRICAL WORK  
**WILLIAM SUGG & CO. LTD.**  
WESTMINSTER.

### A NEW PLUG FOR FIXING WIRING

WE illustrate here a new plug which W. T. Henley's Telegraph Works Co., Ltd. (Blomfield Street, London Wall, E.C.), have brought out for fixing the link clips, saddles or protective covering used in the Henley wiring system (ELECTRICAL ENGINEERING, September 28th, 1911, Exhibition Supplement, page 31) to plaster, brick, marble, slate, stone, &c. This device should prove very useful for many purposes as a good fixing can be obtained with a minimum



PLUG IN POSITION  
READY FOR SCREW.



PLUG EXPANDED BY  
SCREW.

amount of labour and trouble. The hole that is made for the plug is only a little larger in diameter than the screw that fits it. The plug is made of stiffened fibres which expand when the screw is driven in. The company inform us of two very satisfactory tests of the holding power of these plugs. In one case two holes were punched in plaster 12 in. apart, and an iron rod  $\frac{1}{4}$  in. in diameter was secured with a link clip. When over 50 lbs. pull was exerted, the plaster around the plugs broke away. In another case, a hole was drilled in brick, and the same iron rod was secured in a similar manner. When something over 100 lbs. pull was exerted, plug was withdrawn.

Ferranti A.C. Meter.—The Board of Trade have approved the Ferranti A.C. meter, type C.

### ELECTRIC TRACTION NOTES

A number of London and Greater London local authorities appeared before the Court of Referees in the House of Commons last week, asking for a *locus standi* against Clause 16 of the Metropolitan Electric Tramways (Railless Traction) Bill when this measure comes before a committee in due course. The point is a rather interesting one, as under the clause in question the Board of Trade would be given powers to sanction other trolley omnibus routes, presumably on any part of the Tramways Company's system. A similar power has been already inserted in a number of provincial trolley omnibus Bills, but owing to the multiplicity of local authorities in London the position is very complicated, and it is feared that the Board of Trade may be in the position under the clause of sanctioning trolley omnibus routes without the local authorities having the right to be heard. The whole question will, however, be discussed before the Parliamentary Committee, as the Court of Referees granted the *locus* asked for.

As we have previously mentioned, the East Ham Council have been in negotiation with the Barking Council with regard to the leasing of the latter's trams, but it has not been found possible to arrange terms.

A service of "pay-as-you-enter" tramcars was put into operation in Leicester on Wednesday last week.

The Merthyr Corporation have accepted an offer of the Merthyr Electric Traction & Lighting Co. to pave certain portions of the tram track with wood sets on condition that the period within which the Corporation may purchase the lines is extended by ten years.

A centre-entrance double-deck car is being built for the Washington Railway and Electric Company. The stairways are at the ends of the car and terminate on a platform two steps below the upper deck floor level, and at that point turn right and left for the final rise. Fifty seats are provided on each deck. There will be four motors of 32 h.p. each, says the *Electric Railway Journal* (New York). At the ends of the

car there will be latticed steel columns, rigidly framed into the steel sheathing of both decks and connected also to the plate at the eaves. By this construction the whole side assists in supporting the weight of the car and its load.

From the electric railway statistics of the Dominion of Canada for the year ending June 30th, 1912, the total length of single track appears to be 1,723.5 miles. The average working expenses are 60.7 per cent. of the gross earnings. The total number of passenger cars in service was 3,489, and the number of freight cars 989. In addition, says the *Electrical News* (Toronto), about twenty-nine miles of track have since been put into operation, and nearly 100 miles will be opened shortly.

In view of the increasing price of petrol, and the proposed substitution in Berlin of electric vehicles for the present petrol-driven taxis, it is interesting to note that according to the official Berlin police returns, there are 277 electromobiles working as public vehicles in Berlin. This number is 12.6 per cent. of the total number of 2,194 power-driven cabs, and 5 per cent. of the total number of cabs (Droschken). Of the 277 electric cabs, 178 belong to one company, while 31 are owned by their drivers. Over 200 of these were manufactured by the Neuen Automobil-Gesellschaft (A.E.G.).

### TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

A Reuter telegram from Melbourne states that the Federal High Court has allowed an application by Marconi's Wireless Telegraph Co. to inspect the Government's wireless apparatus in connection with the Company's action against the Government for infringement of the Marconi patents.

In an action for libel by the Attorney-General (Sir Rufus Isaacs) and the Postmaster-General (Mr. H. Samuel) against the French daily paper, *Le Matin*, Sir Rufus Isaacs stated that he had purchased 10,000 shares in the American Marconi Co. prior to the sanctioning of the agreement with the English Marconi Co. for the imperial wireless telegraph scheme. He said that he had been expressly informed that the American Marconi Co. was totally distinct from the English Company. One thousand of these shares he sold to the Chancellor of the Exchequer (Mr. Lloyd George) and another thousand to the Master of Elibank. The whole of the facts are now being explained to the House of Commons Committee by Sir Rufus Isaacs, who will be followed by Mr. Lloyd George.

It is reported that the U.S. scout *Salem* has recently received complete messages from the 70-kw. Fessenden wireless station at Arlington at 2,400 miles in full daylight.

Experiments carried out in a balloon in Prussia last January show that wireless transmission is not so easy at great heights as near the earth's surface. Drs. Wigand and Lutze, in a short article in the *Elektrotechnische Zeitschrift* of March 6th, describing the experiments, state that at a height of 6,500 metres the signals received from the Norddeich station were less than half as strong as those received from the same station at a height of 1,500 metres, the distance being about the same in each case. It was further proved that the difference of altitude did not affect the sense of hearing or the sensitiveness of the detector, so that the reduction in the wave strength was due to altitude only.

Telegraphic communication with the States of Coahuila, Chihuahua and Sonora in Mexico was down on 18th inst., and on the following day the Teheran-Meshed line was also broken, but was repaired on the 20th.—The Oran-Tangier lines gave out on 22nd inst., and as a result of heavy storms in Ontario, Canada, and the United States of America, land lines in those countries have been considerably disturbed, which must cause delay to telegrams in transit.—The line between Teheran and Kermanshah is down between Hamadan and Kermanshah.—The cables between Shanghai and Nagasaki are down, cutting off the direct lines to Japan, which can be reached *via* Formosa, subject to delay.

**The Batti-Wallahs.**—The annual dinner of this Society was enjoyed by a large gathering on Saturday, March 15th. Mr. Collis, the retiring President, took the chair, and a feature of the evening was the original menu and programme in the form of a uniform cap embellished with humorous illustrations. Mrs. J. Cornille, Mr. Martin Muir, Miss Ada Fox, Mr. Olley Oakley, Mr. Ernest Pike, and Mr. Louis Nikola entertained the guests. The second number of the Batti-Wallahs' Journal was distributed at the dinner, and contains numerous items mostly of a personal and humorous nature that will interest members of this energetic Society.

### LOCAL NOTES

**Belfast: Street Lighting.**—A number of additional streets are to be lighted by means of electric arc lamps. This decision is the result of experiments in other streets with centrally hung arc lamps, which have proved so much more satisfactory than the previous gas lighting.

**Bingley: Bulk Supply.**—The proposed agreement with the Keighley Council for a supply of electrical energy in bulk, referred to in our last issue, has now been passed by the latter body on the terms already given.

**Carlisle: Salary of Electrical Engineer.**—A long debate took place last week with reference to a proposal of the Electricity Committee to advertise for a successor, at a salary of £500 per annum, to Mr. S. T. Allen, the Borough Electrical Engineer, who has recently been appointed to a similar position at Wolverhampton. The objection was to the amount of the salary, and various amendments were moved fixing it at £350 or £400 rising to £500. Eventually, however, the Committee's recommendation to offer £500 per annum to commence with was adopted.

**Dublin: Electricity Profits.**—It has been stated that a sum of £10,000 would be available for relief of rates from last year's electricity profits, but the Electricity Committee are rather averse to handing over such a large sum, their desire being to build up a reserve fund first.

**Durban: Electric Heating.**—A reduction has been made in the price of electric current with a view to encouraging its use for electric heating and cooking. As we pointed out some time ago, Mr. J. Roberts, the Borough Electrical Engineer, has designed a cheap form of electric cooker, and the Council will shortly be asked to adopt a scheme for the supply of apparatus on the hire-purchase or some similar system.

**Gloucester: Rateable System of Charging.**—The Corporation has adopted a recommendation to give consumers the option of taking a supply of electricity at the ordinary rates, or on the basis of 12½ per cent. upon the rateable value of their premises, plus 1d. per unit for all energy consumed.

**Galaahiel: Electric Supply.**—Mr. T. C. Parsons, who has been consulted by the Council with regard to an electric supply scheme, has advised that the lowest charge for power should be ½d. per unit, but the local manufacturers contend that current must be supplied at ¾d. per unit for this purpose. The Committee in charge of the matter is strongly in favour of the ¾d. per unit charge, and a conference between the Council and the local manufacturers has been adjourned in order to obtain further information.

**Grimsby: Supply of Cables.**—The Borough Electrical Engineer is to visit Vienna in order to test cable to the value of £1,500, which is on order from there. The cost of the visit is estimated at £27, but at the last meeting of the Council it was pointed out that the saving by giving the order abroad was £500.

**Hornsey: Electricity Charges.**—At the last meeting of the Council attention was called to the fact that the Electric Lighting Committee has £5,000 in hand, and a request was made for a reduction in the charges to consumers. The Chairman of the Lighting Committee, however, stated that this course could not be entertained at present. The Committee was anxious to pay back to the ratepayers the £7,000 which had been contributed to it during the early years when losses were incurred. Nevertheless the Committee has this year voted £500 to relief of rates.

### TENDERS INVITED AND PROSPECTIVE BUSINESS

Generating Stations, Sub-Stations, Mains, &c.

**Canada.**—The date for receiving tenders for the generating sets required by the Swift Current Council, referred to in our last issue, has been extended to April 14th.

FOR  
**STEAM JOINTS**  
USE



JOHN HUDSON & CO.'S SUCCESSORS, Mansell St., London, E.



**Chile.**—An electric generating station and distribution system is required at the Port of Valparaiso. Particulars may be seen at the offices of the Chilean Legation, 48 Grosvenor Street, W., any day except Saturdays, between 3 and 5 o'clock. Tenders by September 10th.

**Dundee.**—E. H. T. switchgear and transformers. City Electrical Engineer. April 4th. (See an advertisement on another page.)

**Grimsby.**—In connection with the extensions at the electricity works, a certain revision in the estimates has been found necessary in consequence of the need for an additional feeder panel, extension of the cooling towers, and an oil separator.

**Haywards Heath.**—A Board of Trade inquiry has been held concerning an application by the Mid-Sussex Electric Light and Power Co. for a provisional order.

**New Zealand.**—An electrical installation is required at the Queen Street wharf, Auckland. Particulars from Harbour Board.

**Peterborough.**—1,023 yards of cable. City Electrical Engineer. March 31st.

**Waterford.**—The Guardians have under consideration an electrical installation at an estimated cost of £3,000.

**Woodford.**—Arrangements are being made by the Walthamstow Council to give a supply of electricity in this district.

### Wiring

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Cardiff.**—Premises for South Wales Mining School. Architects, Teather & Wilson, Andrews' Buildings, Queen Street.

**Dalkeith.**—New fever hospital.

**Dundee.**—Additions at Westgreen Asylum. Architect, T. M. Cappon, 32 Bank Street.

**Greenock.**—Cinematograph theatre.

**London: Lewisham.**—Wiring and fittings for 500 lights in workhouse, and a similar number in infirmary. Clerk to Guardians. March 31st.

**Paignton.**—Business premises. Architect, F. G. Moore, 9 & 10 Fleet Street, Torquay.

**Swansea.**—New police station.

**West Ham.**—Electric lighting of Guardians' workshops, Aldersbrook Road, Wanstead. Architect, W. Jacques, 2 Fen Court, E.C.

**Worcester.**—New school.

### Miscellaneous

**South Africa.**—The Bloemfontein Council have decided to proceed with their trackless trolley system at an estimated cost of £80,000.

## TENDERS RECEIVED AND ACCEPTED

**Belfast.**—Thirteen tenders have been received by the Harbour Board for the supply of four 5-ton electric gantry cranes. These have been referred to the Engineer for report.

**Hornsey.**—A contract for meters has been placed with Messrs. Chamberlain & Hookham.

**Manchester.**—The tender of Messrs. Anderson, Ltd., of Salford, has been accepted for an electric lighting installation at the Crumpsall Workhouse.

**Salford.**—The tender of Messrs. Davenport, Sparrow & Co. has been accepted for the electric lighting of the new juvenile labour bureau, and that of Messrs. Willoughby & Wilcox for the electric wiring of the Committee's new laboratories and workshops.

## MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. G. Smith & Son, of 5 Philpot Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night, was £68 15s. to £69 5s. (last week £69 to £69 10s.).

**Bankruptcy.**—A first and final dividend of 2 1/16d. in the £1 will be paid on April 8th at the offices of Messrs. Elles, Salaman & Co., 1 & 2 Bucklersbury, E.C., in the bankruptcy of the late Mr. F. H. Medhurst, consulting electrical engineer.

## APPOINTMENTS AND PERSONAL NOTES

A Clerk of Works is required for the new electricity station at Bolton. Salary three guineas a week. Town Clerk, April 10th.

The Manchester City Council have sanctioned the following increases of salaries in the Electricity Department:—Mr. L. H. Marlor, installation inspector, £220 to £235; Mr. F. R. Radcliffe, chief rental clerk, £215 to £225; Mr. E. J. Constable, assistant resident engineer, city stations, £200 to £220; Mr. L. K. Lee, mains engineer, £450 to £475; Mr. H. A. Ratcliff, head of testing department, £300 to £325; and Mr. E. Bolton, sub-stations engineer, £350 to £375.

## COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &c.

**W. T. Glover & Co.**—At the annual meeting last week satisfaction was expressed with the past year's trading, which has permitted of the payment of a 5 per cent. dividend on the ordinary shares, together with a bonus of 2 1/2 per cent.

**British Insulated & Helsby Cables.**—At the annual meeting last week attention was called to the fact that, notwithstanding the coal strike last year, the company's turnover has been largely increased as the result of general prosperity throughout all departments. The directors have every confidence in their large holding in the Automatic Telephone Co., and for the past year it will not be necessary for them to provide anything under their guarantee in respect of the dividend on that company's preference shares.

**South Wales Electrical Power Distribution Co.**—The total units sold last year, viz., 19,689,656, show an increase of 5,319,081 over the previous year. The working results show that after meeting all expenses and interest on prior lien debenture stock, and making provision for depreciation, there is a fairly substantial surplus which, according to agreement, will be utilised in discharging the indebtedness to certain consumers of the Treforest Company.

**British L.M. Ericsson Manufacturing Co.**—At the annual meeting last week a smaller revenue was reported for 1912 than for 1911, due to the fact that in the latter year the Postmaster-General put through a considerable number of orders in anticipation of the acquisition of the National Telephone Co. The prospects, however, are considered particularly favourable in view of the present position of telephones in this country, and the directors have every expectation of a very successful year. Regret was expressed at the decision of the Postmaster-General to continue the policy of the National Telephone Co., and withdraw the hand micro-telephone from use in this country. It was pointed out that France has made this a standard, and other countries are installing it. The net profits for the past year amounted to £18,562, and an 8 per cent. dividend is to be paid on the ordinary shares.

**British Aluminium Co.**—After providing £40,000 for depreciation, and carrying £30,000 to reserve, the profits for 1912 allow of the payment of the full 6 per cent. preference dividend, and the carrying forward of £10,206.

## NEW COMPANIES

**ARDWICK ELECTRIC REGULATOR CO.**, 52 Queen Street, Ardwick, Manchester.—Capital, £1,000. To acquire certain inventions relating to controllers for electrical purposes.

**GENERAL TELAUTOGRAPH CO.**, 20 Bucklersbury, E.C.—Capital, £1,000. To adopt an agreement with the National Telewriter Co.

**NORTH BRITISH DIESEL ENGINE WORKS.**—Capital, £1,000,000. In 500,000 preference shares, and 500,000 ordinary shares of £1 each.

**PERNAMBUCO TRAMWAYS & POWER CO.**—Capital £1,000,000.

**CITY OF LAS PALMAS WATER & POWER CO.**—Registered by Ashurst, Morris, Crisp & Co., 17 Throgmorton Avenue, E.C. Capital, £125,000. To acquire a concession for the supply of electricity in Las Palmas.

**WOODBIDGE & DISTRICT ELECTRIC LIGHT CO.**—Capital £4,000. To adopt an agreement with Rural Districts Electric Undertakings, Ltd. The directors include Mr. Haydn T. Harrison and Mr. W. Riggs.

**BRITISH ELECTRIC HEATER CO.**, 105 West George Street, Glasgow.—Capital, £50,000.

# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 327 [Vol. IX., No. 14]

THURSDAY, APRIL 3, 1913.

[PRICE ONE PENNY.

All rights reserved.

Registered as a Newspaper.

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES and TECHNICAL COLLEGE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

Other Advertisement Rates on Application.

Latest Time for Receiving

Letters for Insertion, Tuesday first post

Small Advertisements and Official Announcements, Wednesday first post.

Displayed Advertisements, Tuesday first post.

Corrections in Standing Advertisements, Monday first post.

All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 308-306, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Cireling, Fleet, London." Telephone No.: 5509 Holborn

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## CONTENTS

	PAGE
SUMMARY	181
Arrangements for the Week	182
The Institution Council Election	183
The Convention of the Municipal Electrical Association	183
Power Supply on the Rand	183
Petrol-Electric Cars for Light Railways	184
ELECTRICAL ENGINEERING IN THE MINING AND METAL INDUSTRIES:	
Explosion Proof Motors	184
Miners' Electric Lamps	185
A Flame Proof Mining Telephone	186
The "Oldham" Emergency Electric Lamp	187
Electricity in Metal Mining	187
Electrical Mining and Metallurgical Patents of March	188
Electric Heating and Cooking	189
Electric Lighting of a Printing Works	190
Questions and Answers by Practical Men	191
Answers to Correspondents	191
Catalogues, Pamphlets, &c., Received	191
Patent Record	192
Electric Traction Notes	193
Telephony and Telegraphy (Including Wireless)	193
Local Notes	195
Tenders Invited and Prospective Business	195
Tenders Received and Accepted	196
Miscellaneous Business Notes	196

## SUMMARY

THE Council of the Institution of Electrical Engineers have nominated Mr. W. Duddell for a second year of office as President. Other nominations for the new Council are also published in an article on p. 183.

THE preliminary programme of the forthcoming convention of the Incorporated Municipal Electrical Association has been issued. (Page 183.)

MR. A. E. HADLEY's Paper on power supply on the

Rand has been discussed by the Manchester Local Section of the Institution of Electrical Engineers. (Page 183.)

A PAPER by Mr. J. P. Tierney, read recently before the Dublin Local Section of the Institution of Electrical Engineers, discussed the relative merits of petrol-electric and other self-propelled cars for light railways, and described a car that has been designed for through running from the Dublin tramway system to the Dublin and Blessington light railway hitherto worked by steam. (Page 184.)

THE results of an exhaustive series of tests by the U.S. Bureau of Mines on explosion-proof protective devices for electric motors showed that each of five types of protection tested was liable to failure under certain conditions. A combination of gauze and battle plates at the commutator end or a set of plates at each end of the motor appears best. (Page 185.)

THE beneficial effect resulting from the introduction of electric safety lamps in mines was urged in a recent lecture by Mr. W. Maurice at a joint meeting in Nottingham. (Page 185.)

A NEW mines telephone set, in which flame-proof protection instead of the gas-tight system is employed, is described on page 186.

SOME information as to the various uses of electricity and the power required for different classes of machinery used in precious-metal mining is given. (Page 187.)

AN illustrated description is given of an "emergency" electric lamp for mines. (Page 182.)

SEVERAL patent specifications of interest to mining electrical engineers were published last month. Included are a safety lamp by H. F. Joel, a differential catalytic detector by A. Guasco, and water-tight bells by E. A. Graham. The metallurgical patents include one for an induced current furnace with revolving inductor by J. Bally. (Page 188.)

A PAPER on electric heating and cooking, by Mr. T. Roles, has been discussed by the Yorkshire local section of the Institution of Electrical Engineers at Leeds and at Sheffield. (Page 189.)

THE electric lighting of a printing works is described in an illustrated article. (Page 190.)

A PROBLEM connected with the earthing of the neutral in mining installations is propounded in our "Questions and Answers" column. (Page 191.)

THE Specifications published by the Patent Office on Thursday last included one by the Maschinenfabrik Oerlikon for a single-phase repulsion motor with split stator windings. The grant of patents to the Candolite Co. and to the Maschinenfabrik Oerlikon for candle lamp-holders and for a system of driving locomotives, boats, &c., respectively, has been opposed. Three patents expire during the current week after a life of fourteen years. They include one for details of the Sprague system of multiple-unit train control, and one

for two-rate meters by the Aron Electricity Meter, Ltd. (Page 192.)

ELECTRIC traction has been inaugurated upon the East London Railway, and we give some particulars of the equipment.—An important decision has been made by the German Patent Office upon the Winter-Eichberg single-phase commutator motor patent. (Page 193.)

We describe the Gott patent for transmission of submarine telegraph cables.—The Automatic Telephone Manufacturing Co. had a very successful year in 1912.—The Attorney-General and the Chancellor of the Exchequer have explained their position to the House of Commons in relation to the purchase of American Marconi shares.—The Committee of experts which the Select Committee appointed to inquire into the various wireless telegraph systems, is to visit Germany to see the Goldschmidt system. (Page 193.)

An ice-making and cold-storage plant is being installed in conjunction with the Chichester electric power station.—A special report has been issued upon the position of the Redditch electricity undertaking, in which it is stated that original mistakes in design are largely responsible for the present unsatisfactory financial position.—The Board of Trade have granted the Truro Corporation an electric lighting provisional Order in preference to the local gas company. (Page 195.)

A 2,000-kw. turbo-alternator and a number of rotary converters are required at Burnley; condensing plant at Darlington; mains and services, &c., at Manchester; a 500-kw. generating set at Peterborough; a 5,000-kw. plant at Fife; E.H.T. switchgear at Salford; meters, arc-lamp carbons at Sydney, and stores at Limerick.—The following expenditures are contemplated on electrical extensions:—Doncaster, £12,500; Chester, £11,550; Londonderry, £13,000; Rochdale, £45,000; and Stalybridge, £22,554. (Page 195.)

## ARRANGEMENTS FOR THE WEEK

### FRIDAY, APRIL 4TH.

*Electro Harmonic Society.*

8 p.m. Smoking Concert at Holborn Restaurant.

*Faraday Society.*

8 p.m. Joint meeting with Manchester Section of Society of Chemical Industry to discuss "The Corrosion of Iron and Steel."

### SATURDAY, APRIL 5TH.

*Finsbury Technical College Old Students' Association.*

6.30 for 7 p.m. Annual dance at Caxton Hall, Westminster.

### TUESDAY, APRIL 8TH.

*Institution of Electrical Engineers: Manchester Section.*

7.30 p.m. Annual meeting at the University.

### WEDNESDAY, APRIL 9TH.

*Institution of Electrical Engineers: Newcastle Section.*

7 p.m. At Literary and Philosophical Society's Rooms, Middlesbrough. "Power Supply on the Rand," by A. E. Hadley.

*Royal Society of Arts.*

8 p.m. "Electric Supply in London," by Frank Bailey.

*Association of Engineers-in-Charge.*

8 p.m. At St. Bride's Institute, Fleet Street, E.C. "Notes on the Design and Economy of Diesel Oil Engines," by Capt. H. Riall Sankey.

### THURSDAY, APRIL 10TH.

*Institution of Electrical Engineers.*

8 p.m. "Self-Synchronising Machines (Self-starting synchronous motors and rotary converters)," by Dr. E. Rosenberg.

*Institution of Electrical Engineers: Dublin Section.*

8 p.m. At Royal College of Science. "Interpoles, their Design and Use," by R. G. Allen.

## The London Electrical Engineers.

(TO-FAY) THURSDAY, APRIL 3RD. C. Company.—Recruit and Company Training, 7 to 10 p.m.

FRIDAY, APRIL 4TH. D. Company.—Company Training, 7 to 10 p.m. F.

SATURDAY, APRIL 5TH. Headquarters open from 10 a.m. till noon.

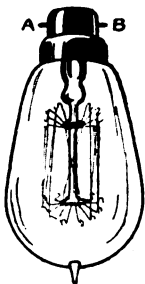
MONDAY, APRIL 7TH. A. Company.—Recruit and Company Training, 7 to 10 p.m.

TUESDAY, APRIL 8TH. B. Company.—Company Training, 7 to 10 p.m.

THURSDAY, APRIL 10TH. C. Company.—Recruit and Company Training, 7 to 10 p.m.

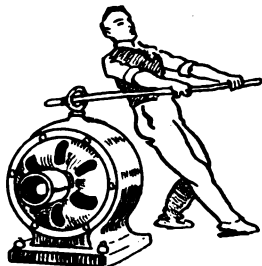
FRIDAY, APRIL 11TH. D. Company.—Company Training, 7 to 10 p.m.

SATURDAY, APRIL 12TH. Headquarters open from 10 a.m. till noon.



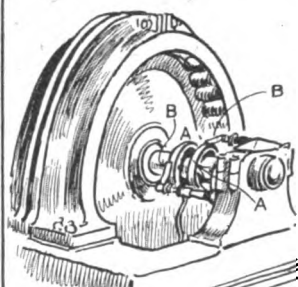
**Tantalum Arc Lamp.**

The current enters and leaves the lamp at A and B, and the fine metal wires glow brightly and give the light.



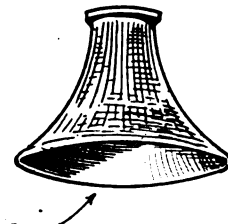
**Electrical Motor.**

The ring at the top of the machine is for turning the current on or off.



**Alternate Dynamo.**

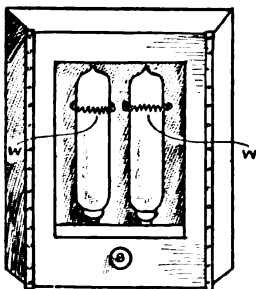
To increase or decrease the pressure, the brushes B B are moved round the rings A A.



**Hollowphane Shade.**

The lamp is inserted in the hollow portion.

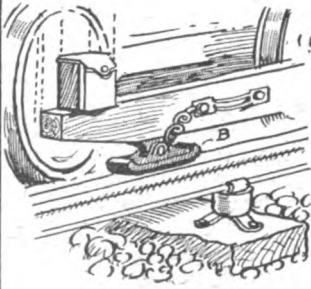
The first of this series of illustrations and its descriptive note is taken from an interesting new publication, "The Parents' Book: a Book which answers Children's Questions." We suggest some similar ones for future editions.



**Radiator.**

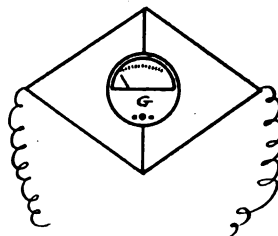
The current passes through the spiral wire around the tubes, causing the glass to become hot.

N.B.—It is therefore dangerous to touch these wires.



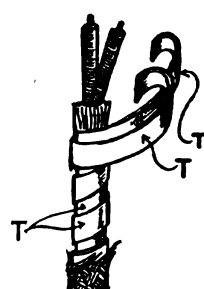
**Track-Brake.**

The track-brake B is a form frequently employed on electric trains and electric tramcars.



**Wheatstone Bridge.**

A delicate testing device. If the electric wires are laid out to form a lozenge, any slight variation of the current is immediately detected by the instrument called a galvanometer placed in the centre.



**Armoured Cable.**

It will be noticed that there is a strong "armouring" T T, which is made of steel to keep in the high pressure electric current.

## THE INSTITUTION COUNCIL ELECTION

### The Council's Nominations.

ANY nominations which members may desire to make for the Council of the Institution of Electrical Engineers to fill the annual vacancies must be sent in by April 21st, and, in accordance with No. 50 of the new Articles of Association, such nominations must be made by ten members.

The Council's own nominations have now been issued. Mr. W. DUDDLELL, F.R.S., is nominated as PRESIDENT for a second term of office, and the Hon. Sir CHARLES A. PARSONS, K.C.B., F.R.S., and Mr. J. F. C. SNELL are selected to fill the two vacancies as VICE-PRESIDENTS.

Sir C. A. Parsons, K.C.B., F.R.S., is an honorary member of the Institution, and has previously served on the Council. His position in the engineering industry generally as the inventor of the steam turbine, and the influence which this has had upon electricity supply, need be no more than referred to here. Mr. Snell retires from the office of vice-president, but is nominated for re-election. He has also served on the Council previously as an *ex-officio* member when Chairman of the Newcastle local section of the Institution at the time he was chief electrical engineer to the Sunderland Corporation. For several years, however, he has been in London, and is now, as a partner in the firm of Preece, Cardew & Snell, one of the leading consulting electrical engineers.

The Vice-Presidents remaining in office are:—Mr. W. JUDD and Mr. C. H. MERZ.

Mr. Robert HAMMOND is nominated as usual for re-election as Honorary Treasurer.

There is one vacancy in the list of ordinary Members of Council; Mr. A. L. C. FELL and Mr. G. SCOTT RAM are nominated by the Council; and if, as is probable, no other nominations are made by the membership, the ballot will decide which of these two will take office.

Neither have served as ordinary members of Council before. Mr. Fell is Chief Officer of the London County Council's extensive tramway system, and has held many high offices in the tramway associations. Mr. Ram, as Chief Electrical Inspector of Factories to the Home Office, has exerted considerable influence upon the destinies of the industrial applications of electricity in connection with the various rules and regulations now in force.

The members remaining in office are:—Messrs. F. GILL, J. S. HIGHFIELD, H. HIRST, B. M. JENKIN, J. E. KINGSBURY, Dr. A. RUSSELL, Messrs. W. RUTHERFORD, A. H. SEABROOK, Roger T. SMITH, C. P. SPARKS, H. E. WIMPERIS.

As a consequence of the revised Articles of Association which were passed last year, there are for the first time to be three Associate Members and three Associates on the Council. For the three new vacancies for Associate Members, the following have been nominated:—F. E. BERRY, Capt. E. O. HENRICI, R.E., A. W. MARTIN, and S. W. MELSOM, one in excess of the number to be elected. Mr. F. E. Berry, of the British Electric Transformer Co., Ltd., is not quite so well known as his brother, A. F. Berry; Mr. A. W. Martin is one of the Staff Engineers of the General Post Office; and Mr. Melsom is a Senior Assistant in the Physics Department of the National Physical Laboratory.

There are two vacancies as Associates on the Council, for which the Council has put forward three names:—Mr. E. CLARKE RUSSELL (the well-known barrister, who has appeared in many electrical law suits; he has already filled a similar position), Mr. FRANCIS INCE (a Governor of the Syndicate of Electrical Engineers, Ltd., proprietors of Faraday House), and Mr. A. M. J. OGILVIE C.B. (Third Secretary to the General Post Office). Neither of the latter have served before. Mr. A. B. ANDERSON remains in office.

In addition the Chairman and immediate Past Chairmen of each of the Local Sections are *ex officio* Members of Council.

## THE CONVENTION OF THE MUNICIPAL ELECTRICAL ASSOCIATION

THE preliminary programme of the eighteenth annual convention of the Incorporated Municipal Electrical Association, to be held in London on June 17th to 21st, has now been issued. At the opening meeting (in the theatre of the Institution of Electrical Engineers), a paper will be read, after the address of Mr. Shawfield (ex-president), by Dr. S. Z. de Ferranti, on "Prime Movers." In the afternoon visits have been arranged to the electricity works of the West Ham Corporation and the London Electric Supply

Corporation at Deptford. The subject for discussion at Wednesday's meeting is not yet announced, but the afternoon visit will be to the Lots Road power station of the London Electric Railways, and the Annual Dinner will be held in the evening. Thursday will be spent at Kingston-upon-Thames, where a paper will be read by Messrs. A. H. Seabrook, W. Watson and R. J. Mitchell on "Electric Vehicles," and one by Mr. J. Christie on "Air Filtration." For the afternoon a river trip is planned. Friday will be devoted to the Annual General Meeting and a Special Meeting to consider the revision of the Articles of Association. It is hoped that it may be possible to arrange for a visit to the Metropolitan Water Board's new gas-pumping plant at Chingford on the Saturday. The official headquarters of the Association will be at the Hotel Cecil.

## POWER SUPPLY ON THE RAND

MR. A. E. HADLEY'S Paper on this subject (ELECTRICAL ENGINEERING, March 20th, page 159) was discussed at Manchester on March 11th.

Dr. E. ROSENBERG (British Westinghouse Co.) commented on the very high power-factor of the Rand undertaking.

Mr. B. WELBOURN (British Insulated & Helsby Cables) referred to cable trouble due to white ants and surface subsidence. It had been found that expansion joints overcame this latter trouble. He thought that the accumulation of dust in sand storms would have the effect of altering the distribution of potential over the suspension insulators, so that individual discs might be overtaxed. It appeared to him that any form of arrester that involved a spark was distinctly a thing to avoid, for sparking at such high frequency was simply lightning discharges artificially produced, and would seem to introduce into the system the very thing it was necessary to avoid.

Mr. G. D. SEATON and Mr. LAMB also spoke, and Mr. J. LUSTGARTEN (Manchester Municipal School of Technology) asked if during the period of lightning any insulators had been punctured. Regarding earthing of neutrals, while in L.T. distribution earthing was the best policy, on H.T. circuits opinion was against earthing the neutral. Recent American practice had been to work with a non-earthed neutral and to use an arc suppressor.

Mr. COATES asked if the switches in the sub-stations were of similar breaking capacity to those in the main stations, and also if, since the earthing of the neutral, there had been any less difficulty in breaking the load on the switches.

Mr. PARRY remarked that the newer power-stations had been put down at the place where the power was required, and the coal taken to them; and asked whether there was any reason why they should not have been put down at the collieries and the power distributed from these.

Mr. W. BOLTON SHAW also spoke.

Mr. HADLEY, in reply, said they had not had any trouble on the cables through white ants, subsidence, nor from dust on the suspension insulators. Regarding the puncturing of insulators, in the ordinary way where they had induced discharges, they had punctured generally in the places where the glaze had been rubbed off, and water had worked its way in.

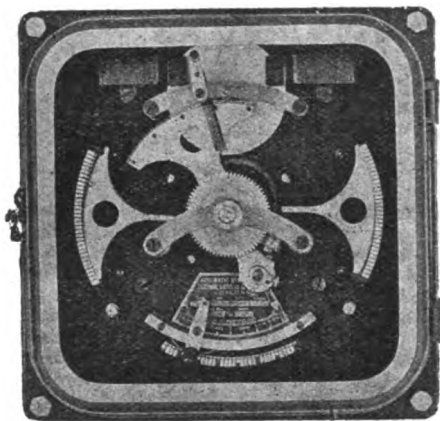
**Stearn Lamps.**—The Stearn Electric Lamp Co., Ltd. (47 Victoria Street, S.W.), inform us that, owing to the trade name "Globolite" having been already adopted for another electrical device, they have changed the name of the lamp described on page 150 of ELECTRICAL ENGINEERING of March 13th, to the "Softlite" lamp.

**American Hydro-electric Schemes.**—The New York State recently proposed a very extensive hydro-electric scheme with high-pressure transmission, under State ownership and management, similar to that now in operation in Ontario. A joint Legislative Committee appointed to investigate the water-power resources, according to the *Electrical World* (New York), finds that there is only 1,196,800 undeveloped water h.p. available within the State, of which only 262,700 h.p. is owned by the State, whereas 3,000,000 h.p. is actually required. The committee also finds that, according to economic and business standards, the Ontario scheme is not a success. Electrical energy is furnished to the municipalities below cost, the actual annual loss being about £90,000. It is also claimed that the municipal system of Toronto showed a net loss to June 30th, 1912, of about £56,000. Several bills have, however, been introduced in the New York State Legislature. It is provided that the initial cost shall not exceed about £125,000, the plant to develop 12,000 h.p. The charges are to be such as to pay off the debt in 50 years. The Bills are not altogether favourably received, as the transmission lines to New York would be about 171 miles long, and it is pointed out that the city of Buffalo, served over eight independent lines, which can be connected together in any way, does not obtain absolutely continuous service, notwithstanding that the lines are only 25 miles in length.

# BROWN-BOVERI

## AUTOMATIC

### PRESSURE REGULATORS



**RAPID AND ACCURATE REGULATION.**  
**NO SPARKING.**  
**NO "TOUCHING UP" OF CONTACTS.**

**CAXTON HOUSE**  
**LONDON S.W.**

## PETROL ELECTRIC CARS FOR LIGHT RAILWAYS

A PAPER entitled "Self-Propelled Cars for Light Railways," by Mr. J. P. Tierney, was read before the Dublin Local Section of the Institution of Electrical Engineers a short time ago. The author first gave a few notes on steam motor-cars and on direct petrol-cars, mentioning in the latter case the petrol tramcars at Morecambe and a remarkable American car with a special design of body, described as similar to a racing yacht turned upside down with the front end wedge-shaped. Tests had shown, he said, that at high speeds a car with a plain front end consumed 40 per cent. more power than a wedge-fronted car. He next described the car in use on the Central South African railways, equipped with the Thomas transmission gear, where the power is transmitted from the petrol engine to the wheels partly electrically and partly mechanically (see *ELECTRICAL ENGINEERING*, Vol. VIII., p. 627, Nov. 7th, 1912, and Vol. VII., p. 236, May 4th, 1911). He also gave a few particulars of the accumulator rail-cars used to some extent on the Prussian railways and the Beach tramcar in America, equipped with the Edison battery. The greater part of the paper was, however, devoted to pure petrol-electric cars for use on railways, and descriptions were given of the Westinghouse pattern in use on the Great Central Railway (see *ELECTRICAL ENGINEERING*, Vol. VIII., p. 187, April 11th, 1912) and on the Continent. He claimed great advantages over the steam car in point of cleanliness, absence of boiler, ease of control, necessity for only one driver, economy in upkeep and standing charges, readiness for use, and the possibility of exerting full horse power at low speeds. Over the geared petrol car also it had the last-mentioned advantages, as well as that of smoother acceleration. A description was also given of the petrol-electric system of the A.E.G., in which the engine is mounted on one bogie clear of the body. Other cars were referred to made in America by the General Electric Co. and the Strang Gas Electric Car Co., which have also been fully described in the technical Press from time to time, and also the well-known Pieper "Automixte" system. In conclusion the author described a car that he had designed for the purpose of

running over the lines of the Dublin United Tramways Company and the Dublin and Blessington Company, which is at present operated by steam locomotives.

The car measured 40 ft. overall over the buffers, the body was of the centre-entrance type, the entrance for passengers being not exactly in the centre, but placed at a point one-third of the total length of the car from one end. At this entrance a doorway to the right led into the passenger compartment and a door to the left into a special compartment containing the plant. Also to the left was a straight incline staircase leading to the top deck. By this means space was economised and it was possible to get the plant partly under the staircase. At each end of the car was a driver's compartment, with the necessary control apparatus. The passenger compartment, which seated thirty-six passengers, was divided into two classes, first and third; the top deck seated sixty-nine, leaving a total seating capacity of 105 passengers. One bogie truck was equipped with two 54-h.p. motors capable of propelling the car with a 10-ton trailer at a speed of twenty-five miles per hour on the level and a speed of from six to eight miles per hour on a grade of 1 in 25. On the Blessington line, for a distance of three miles the grade averages 1 in 35, which in one place is as steep as 1 in 20.

The power plant consisted of a 100-h.p. petrol engine driving a 65-kw. direct-current compound-wound interpole dynamo. In addition there was a small petrol engine driving a vacuum exhaustor for the vacuum brakes and a small lighting generator for lighting the car. The engine was water-cooled, radiators being provided on the roof in front at one end, in the position usually occupied by the destination indicators. The car was also fitted with an ordinary trolley for running on the city lines. The control would be duplicate, the ordinary series-parallel controller for operating on the trolley section, and a controller on the shunt field of the dynamo for operating on the petrol set.

Mr. Harriss, in the discussion, expressed the opinion that the mechano-electric combination was not a permanent one, but that the various systems would ultimately resolve into purely electrical or purely mechanical one, whichever ultimately became perfected. Mr. Sandford stated that the Thomas transmission system claimed an efficiency of 96 per cent., as compared with 60 per cent. on a pure petrol-electric system. Since the car referred to in the Paper had been put into regular operation, two trailers had been added, the chief result being to improve the fuel consumption per passenger-mile. Mr. Eaton said that the employment of the Edison storage battery had greatly reduced the objection to battery systems. It stood vibration and shocks very well. The efficiency, although not so good at the outset as that of lead batteries, improved with use, while with the lead battery this was very much the reverse. Mr. Tatlow drew attention to the wide variations in voltage and current from the machines on the Westinghouse system. He supposed that the use of intervals had made such fluctuations possible.

Mr. Tierney, in reply, said that in South Africa, using the Thomas transmission system, and with petrol at 1s. 6d. per gallon, the costs worked out at 4d. per car-mile. They hoped by the use of paraffin to reduce the cost to 1½d. per car-mile. He did not advocate a petrol-electric system in favour of a purely electrical one where the latter could be obtained, especially on account of the very superior acceleration obtainable with electric cars.

**Osram and Robertson Staff Dinner.**—The Annual Staff Dinner of the Osram and Robertson Lamp Works was held on Friday evening last at the Clarendon Restaurant (Hammersmith), and proved to be as pleasant a function as any which have preceded it. As soon as the dinner had been partaken of, a long and varied musical programme, ably organised and carried out by members of the staffs of the associated Works, was enjoyed by the guests. As usual, the toast list was kept short. The announcement of most interest was made by the Chairman, Mr. C. Wilson (General Manager, Osram and Robertson Lamp Works). After reminding the audience that it is now 21 years since the Robertson Works was first started, that the number of employees was now about 1,700, and that when the extensions now in progress were completed the number would be increased to 2,000, he said that he had been authorised by the Directors to state that they had decided to found a Staff Club. For this purpose the premises known as Poplar House (Brook Green, Hammersmith) had been purchased. The management would be vested in a Staff Committee. Mr. Samuelson (Solicitor to the G.E.C.), who was present, then intimated that he would be pleased to act as Honorary Solicitor for the new Club. The other speeches brought out the spirit of co-operation existing between the Management and Staff, which is responsible in a large measure for the success these Works have attained. The arrangements for the function were in the capable hands of Mr. A. S. Gosling (Confidential Assistant to the General Manager).



## ELECTRICAL ENGINEERING IN THE MINING AND METAL INDUSTRIES

### EXPLOSION PROOF MOTORS

THE results of an investigation into the properties of different kinds of explosion-proof motors have been recently published by the United States Bureau of Mines. In carrying out the tests the motor was placed in an explosive mixture of mine-gas—or methane—and air, and by setting the valves in the piping system so that the circulating fan took the mixture from the motor casing only, it was possible to determine quickly and accurately when the motor casing was filled with the desired mixture. This test was made by means of an apparatus in which a small quantity of the mixture was burned in close proximity to a thermo-couple connected to a delicate millivoltmeter.

The motors tested had relief valves to relieve the pressure caused by internal explosions. Five types of protection were tested. Type *a* consisted of three layers of gauze protected by a poppet valve; type *b*, two unprotected layers of gauze having an exposed area of approximately 4 in. by 5½ in.; type *c*, five brass baffle plates; type *d*, two sets of plates, one set at each end of the motor casing; and type *e*, two sets of gauze and baffle plates, one set being at each side of the motor casing at the commutator end. On type *a* 191 tests were made under forty-five different conditions. Flames, varying from 2 in. to 4 in. in length, were discharged through the protective devices in almost every test. They lasted only a fraction of a second and varied in colour from pale blue to bright red. The safety of a motor protected in this manner appears, says Mr. H. H. Clark, the author of the report, to depend upon the efficient dissipation of heat in the gases surrounding the motor, instead of upon the removal of heat from the escaping gas by the protective devices. It would seem that, even when no puncture occurs, the escaping gases fail to ignite the surrounding mixture by only a small margin. The poppet probably assists in cooling the escaping gases, and it also serves to equalise the pressure on each side of the gauzes, and so prevents their being torn from their fastenings. Since explosions occurred with poppets open, with poppets closed, with 8·6 per cent. of gas (taken as the most explosive mixture), with "overgas" and "undergas," with low pressure (12·5 lb. per sq. in.) and with high pressure (30·5 lb. per sq. in.), it is not possible to define exactly what is the explosive condition in this case. Practically no tests were made on types *b* and *c*, as it was seen from the results of the tests on type *a* that they were doomed to failure, but 236 tests under twenty-five different conditions were made with type *d*. A fan was mounted on the armature shaft so as to cause a considerable circulation of air through the motor casing. Flames 4 in. to 6 in. long were observed only when the fan was in use. The duration of the flames was short, and the surrounding gases were not ignited. This may also have been due to the first gases discharged being cooled by the plates below the ignition temperature of the methane, and driving away the gases immediately surrounding the relief openings. It is pointed out that the value of this form of protection may be entirely destroyed by separating the plates by a very small amount, and if the motor were designed to work without a fan, "after-burning" sufficient to destroy the insulation would take place if the rotation of the armature should produce a circulation of gas through the casing, so that, as fast as it was drawn in, it was burned at the inner edges of the plates. The failure of this type was due, says Mr. Clark, more to the extremely severe conditions imposed by the motor design than to imperfections in the design of the devices themselves. With the type *c* device 268 tests were made under twenty-six different conditions. In no tests were any flames observed, but when coal dust was sifted into the devices it was driven out in a cloud, and the explosion seemed to start from a point within this cloud. This probably indicates that the dust was raised to its ignition temperature before it left the casing of the motor, and upon reaching the outer air burst into flame and ignited the gaseous mixture surrounding it. The pressure developed in the motor casing in the test in which there was a "puncture" was less than 40 per cent. of the average maximum pressures produced in ten

other tests made with gas alone, in which no "puncture" took place. It appears, therefore, that when coal dust is present type *c* devices do not afford the protection which they are designed to give.

In conclusion it is pointed out that the motor casings should have the minimum number of openings and the amount of unoccupied space within should be as little as possible, and the total area of protected openings should be a maximum and should use as much metal as possible. By this means the maximum pressure is decreased, whereby the flame temperature is lower. Use may be made of the fact that the advancing edge of the explosive wave is the most likely to be chilled, because it passes through the coolest metal. If, then, this relatively cool dead gas is passed through a comparatively long passage, like that between the baffle plates of the type *c* devices, subsequent flames will be cloaked with non-combustible gas and can cause no ignition. It is suggested that a very suitable place for the protective devices would be entirely within the motor casing, with vent holes for the escaping gases.

### MINERS' ELECTRIC LAMPS

A LECTURE under this title was delivered at University College, Nottingham, on March 15th, by Mr. W. Maurice, of Hucknall Torkard (Past-President of the Association of Mining Electrical Engineers). The lecture was arranged under the auspices of the Midland branch of the National Association of Colliery Managers and the Notts Education Committee. Mr. H. R. Watson (President of the Midland branch of the National Association of Colliery Managers) presided over a large number of colliery managers, mine deputies, mining students and miners. The lecturer first outlined the introduction of the earlier types of electric lamps. The first attempt ever made to adapt the incandescent lamp to mine illumination dated from 1881, when Mr. (afterwards Sir) J. W. Swan devised a lamp for this purpose, which was first used in a Nottinghamshire colliery. On December 12th, 1885, Mr. Swan exhibited the first portable electric lamp before the North of England Institute. The electric lamp, said Mr. Maurice, was destined to promote the welfare of the miner and the industry generally in far-reaching and, perhaps, not yet wholly recognised ways. The principal features of the different types of lamps were touched on, as well as the organisation of electric-lamp installations for mines, and the management of electric-lamp cabins, and gas-testing appliances. In conclusion he expressed the belief that the flame lamp was destined to rapid and complete disappearance, and that the working faces and every centre of activity in all important mines would, within the next few years, become as brilliantly illuminated as the best-lighted pit-bottom. Light in the mine was not a luxury: it was an urgent and far-too-long-delayed necessity. If only one point of justification were needed for making so important a change in underground conditions, it was surely to be found in the remarkable increase in the number of cases of nystagmus. It had been shown that 25 per cent. of all underground workers had latent nystagmus, and from 0·05 to 2 per cent. the ordinary form of the disease. Dr. Court had found that 34·75 per cent. of all coal-cutters were affected, and nearly 95 per cent. of the total number of cases occurred among this class of worker.

In moving a vote of thanks to the lecturer, Mr. F. A. Frazer (H.M. Inspector of Mines) said that Dr. Court's contention that nystagmus was due to insufficient light was a rather debatable point, for there was a colliery in Derbyshire—a naked-light pit—at which there more cases of nystagmus than at safety-lamp pits.

**Electric Miners' Lamps.**—According to the *Colliery Guardian*, over 2,000 electric lamps have been obtained by the Brodsworth Main Colliery Company to replace ordinary oil lamps. A new electric lamp station is now in course of erection, near the old lamp cabin. Already about 100 electric lamps are in general use, and are stated to give every satisfaction.

## A FLAME PROOF MINES TELEPHONE

THE telephone should be one of the most useful pieces of electrical apparatus in mines, yet in this country its introduction for this purpose has been very slow. This may only have been due to conservatism of mine managers, but it is conceivable that there has also been the feeling that the telephone might be a source of danger underground; the mining engineer would obviously look askance at a box in which gas might accumulate and the possibility of sparking within that box. Whether this objection is a valid one or not, it is surprising that it has not been met long ago by makers of telephone apparatus, and we are therefore very pleased to learn that the Western Electric Co., Ltd. (North Woolwich, E.), has taken up the point and has placed upon

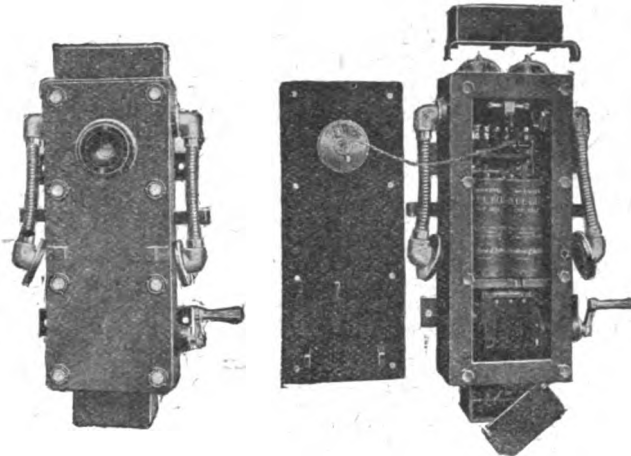


FIG. 1.—TELEPHONE SET CLOSED.

FIG. 2.—TELEPHONE SET OPEN.

the market a telephone designed on the same lines as other electrical apparatus in mines, and absolutely removing any risk.

The "gas-tight" construction hitherto adopted by most telephone manufacturers must be difficult to keep effective. For this construction glands have to be employed, through which such moving parts as the generator handle, the switch-hook and the receiver tubes or wires have to project, and there has to be yet another gas-tight joint to enable the instru-

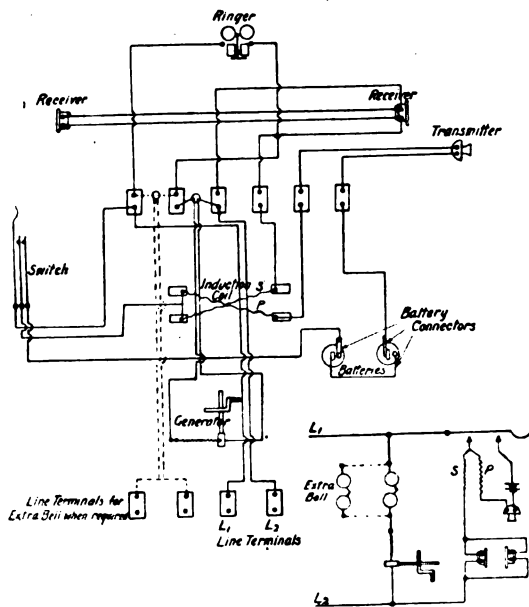


FIG. 3.—DIAGRAM OF CONNECTIONS.

ment to be inspected. That the packing at all these joints would deteriorate in time is a foregone conclusion. The Western Electric Co., in their set illustrated in Figs. 1 and 2, have removed the difficulty entirely by adopting a rational "flame-proof" construction.

The details of the instrument, we are informed, have been worked out after consultation with many experienced mining engineers. It is a local battery magneto set, in which all the apparatus is enclosed in a heavy cast-iron case, and a flame-

proof or explosion-proof flange is provided to render the presence of gas in the set innocuous. If any explosion occurs, the resulting flame, in passing through the flange, will be cooled down sufficiently to render it harmless. The chief feature of the set is the provision of this flame-proof flange, which consists of a wide machined flange running all round the edge of the case, suitably drilled and tapped to accommodate the bolts which secure the cover. Similarly, every spindle or tube extending through the walls of the case is arranged with a suitable cooling surface, with the exception of the leads, which are sealed in a gland.

In a telephone used in mines, it is even more important to provide means for preventing the moisture, due to condensation within the case, from doing damage than to attempt to render the case absolutely water- and moisture-proof. This is accomplished in this instance by mounting the apparatus on special frames or shelves, and providing suitable bosses and ribs on the walls of the case so that all condensed water can flow to the bottom. There is 4-in. clearance there where the water can collect harmlessly, and a drain plug is provided for drawing it off periodically.

The mouthpiece of the transmitter is cast on the front cover of the set, a perforated protective steel grid is provided over the opening, and the diaphragm is protected from moisture by

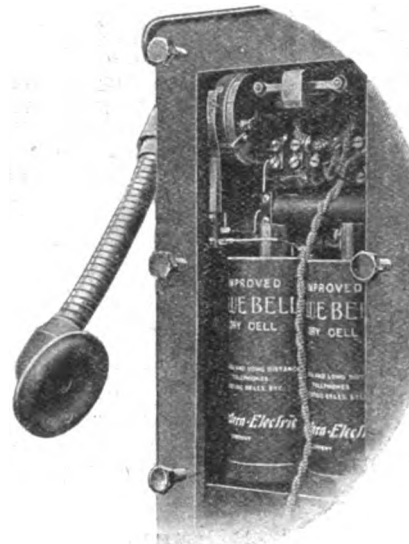


FIG. 4.—VIEW OF PART OF CASE, SHOWING SWITCH WORKED BY RECEIVER ARM.

a celluloid shield. The two receivers are mounted on rotary arms provided with short hinged acoustic tubes and earpieces. These actuate contacts, taking the place of the usual switch-hook for connecting up the microphone circuit when the instrument is in use.

The internal arrangements are such that there is very little space over in which gas can accumulate, and as a further precaution the generator is permanently bridged across the circuit in series with the bell, and has not the short-circuiting contacts at which sparking frequently occurs in ordinary magneto-telephones. A diagram of connections is given in Fig. 3. An interesting detail is that the cover is secured by brass bolts which are surrounded by annular bosses, so that the set can only be opened with the special box-spanner provided for the purpose. Cast-iron covers are provided for the gongs and terminals, and the gong cover also carries a drip plate which protects the top joint of the set. The coils of the receivers, generator, bell and induction coil are all impregnated with a moisture-proof compound.

The gongs are carried on separate posts mounted outside the set, and are eccentrically drilled to provide a means of adjustment; the clapper rod is carried in a separate brass liner, which is screwed into the case, and is provided with the necessary flanges for the explosion-proof feature.

There are special German silver connectors for the cells of the transmitter circuit, so arranged that it is only possible to connect the cells in the correct way.

In fact, every small detail has been thoroughly thought out, and particular care has been taken to render inspection and the replacement of parts as easy and simple as possible.

**CAPPER PASS & SON, Ltd.,**  
Bedminster Smelting Works, BRISTOL

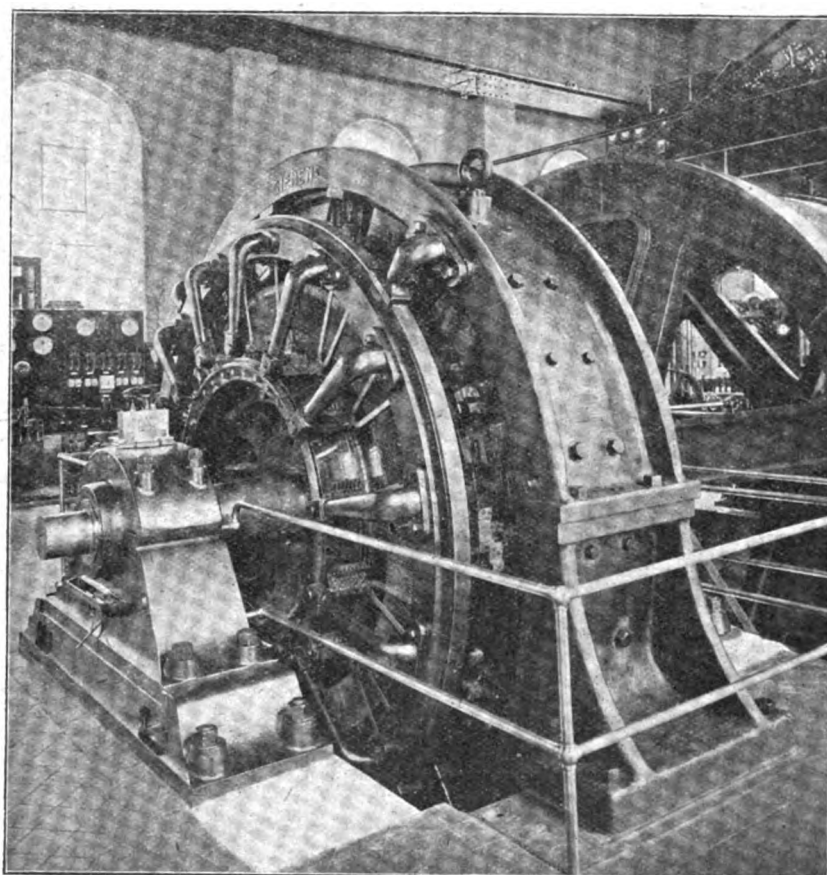
SELLERS OF  
**ANTIMONIAL LEAD OF ALL GRADES.**  
BUYERS OF  
**LEAD ASHES & LEAD RESIDUES FROM ACCUMULATORS.**

Telegrams: "PASS, BRISTOL."

Telephone: 8475 & 8476.

# SIEMENS

## ELECTRICALLY-DRIVEN WINDING ENGINES



**DIRECT-CURRENT MOTOR WITH SIEMENS-ILGNER CONTROL,  
COUPLED DIRECT TO WINDING DRUM AT A COLLIERY IN SOUTH WALES.  
MAX. OUTPUT:—1,320 B.H.P. at 52.5 R.P.M.**

### SIEMENS BROTHERS DYNAMO WORKS LIMITED.

**Head Office:**  
CAXTON HOUSE, WESTMINSTER, S.W.  
Telephone: GERRARD 860.  
Telegrams: "SIEMBRALOS VIC LONDON."

**Supplies Dept. & Stores:**  
38 & 39, UPPER THAMES STREET, E.C.  
Telephone: LONDON WALL 8270.  
Telegrams: "SIEMOTOR CENT LONDON."

**"Tantalum" Lamps & Fittings:**  
TYSSEN STREET, DALSTON, N.E.  
Telephones: CENTRAL 8387/9 & DALSTON 2440.  
Telegrams: "SIEMODYN KINLAND LONDON."

#### Works: STAFFORD. BRANCHES:

AUCKLAND (N.Z.)	CALCUTTA	DURBAN	MANCHESTER	OSAKA	SHANGHAI	TOKYO
BIRMINGHAM	CAPE TOWN	GLASGOW	MELBOURNE	PEKIN	SHEFFIELD	TORONTO
BOMBAY	CARDIFF	HONG KONG	MEXICO	PENANG	SINGAPORE	VALPARAISO
BRISTOL	DELHI	JOHANNESBURG	MONTREAL	RANGOON	SOUTHAMPTON	WELLINGTON (N.Z.)
BUENOS AYRES	DUNEDIN (N.Z.)	MADRAS	NEWCASTLE	RIO DE JANEIRO	SYDNEY	WINNIPEG

*When corresponding with Advertisers, please mention "Electrical Engineering."*

**ELECTRICAL  
PLANT  
OF ALL  
KINDS**

E

D

I

N

**LONDON:**

Hastings House,  
Norfolk Street,  
Strand, W.C.

**BIRMINGHAM:**

Exchange Buildings,  
Stephenson Place.

**MANCHESTER:**

30, Cross Street.

P

E

E

B

L

E

S

**BRUCE  
PEEBLES  
& CO. LTD.  
ENGINEERS  
EDINBURGH**

U

R

G

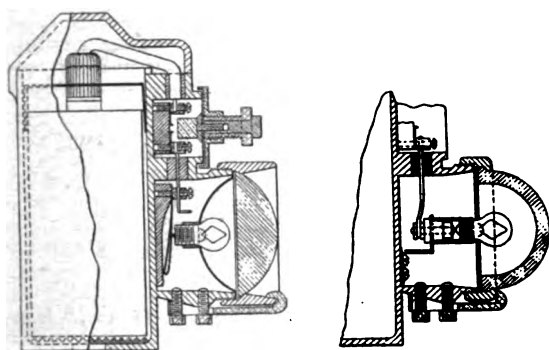
H

Dynamos  
Alternators  
D.C. Motors  
A.C. Motors  
Boosters  
Balancers  
Traction Motors  
Motor Generators  
Rotary Converters  
MOTOR CONVERTERS  
(Peebles la Cour Patents)  
Etc., Etc., Etc.



## THE OLDHAM EMERGENCY ELECTRIC LAMP

THE Oldham Emergency Electric Lamp has been approved by the Home Office for use in mines. According to the official description, this lamp, which is of the bull's-eye type, as shown in the figure, possesses the following general features: (1) A cast aluminium case, with a cover secured by a lead rivet lock. (2) An electrical accumulator, so constructed as to prevent escape of the liquid, whatever the position of the lamp, whilst allowing the escape of gas generated by chemical action in the accumulator. (3) A flame-tight screwed plug of vulcanite, or other suitable material, enclosing the contact made between the insulated lead and the positive terminal of the cell. (4) A switch contained in a flame-tight enclosure, the cover of which, with its washer, is secured by screws. The screw heads are pierced so that a wire may be threaded through, and the ends sealed with lead seals. (5) A bulb and reflector contained in a second enclosure, which communicates with the switch enclosure. It is made flame-tight by means of a screwed ring containing the lens, and a washer. The ring is prevented from unscrewing by means of a clip secured by screws, the



With bull's-eye glass. With well glass.  
OLDHAM ELECTRIC LAMP, ONE-QUARTER FULL SIZE.

heads of which are pierced as in the case of the switch-cover screws. The lens may be of either of the types shown in the drawing, or of other types if not inferior in strength.

The lamp is approved for use under the following conditions: Provided (1) That the total weight of the lamp is not more than 4lb. 8 oz. (2) That the strength of material and attachments throughout the lamp is not less than in the sample submitted to test on the 30th October, 1912. (3) That the lamp is capable of maintaining a light of not less than 1.5 c.p. throughout a period of not less than ten hours. (4) That the lamp shall be used only for work of rescue or exploration in the case of an accident or other emergency or by officials. (5) That the lamp has been made at the works of Messrs. Oldham and Son, at Denton, near Manchester. (6) That the lamp shall have marked upon it its name and the name of the maker.

## ELECTRICITY IN METAL MINING

SOME particulars of the uses of electricity for precious metal mining in Colorado are given by a writer in the *Electrical World* (New York). A pressure of 440 volts alternation is standard in all districts, and the motors are squirrel-cage slip-ring induction motors with external rotor resistance. In most mines an eight-hour shift from 7 a.m. to 4 p.m. is worked. The maximum hoist speed is about 500 ft. per minute, and 15 h.p. per bucket ton is ordinarily installed. The demand usually approximates 1.5 kw.-hour per 1,000 ft. per ton in vertical shafts. Mostly the charges are based on the motor rating plus the energy consumption. Most of the drills are driven by compressed air. The compressor motor usually consists of 10 h.p. per 2½-in. drill, requiring about 100 cub. ft. of air per minute at 100 lbs. pressure. The charge, if not included in the total charge based on readiness to serve plus energy metered, is sometimes rendered on a flat-rate basis of about 40 kw.-hour per drill. Energy for motor-driven pumps and fans is usually sold on a flat-rate. It is usual to instal 8 h.p. per 100 gallons on a 100-ft. head. Dealing with mills, the writer states that no approximate rule can be given for the size of motor for crusher service. In one large mill a 9-in. by 5-in. crusher for tungsten ore is driven by a 15-h.p. motor and handles

40 tons in from six to eight hours, grinding it to 2-in. mesh. Usually crushing and grinding loads are combined on a single motor through a short line shaft. Where the grinding is divided among a number of machines and storage is provided between steps, the crusher and grinding load becomes a desirable one. Rolls are operated in pairs, each being usually belt-driven with spring compression. One mill with an eight-hour crushing, grinding, trommelling and elevator load of 300 tons is driven by a 100-h.p. motor belted to a line shaft. The speed of stamps ranges from 80 r.p.m. to 100 r.p.m., and the travel from 3 in. to 12 in. In one mill with five-stamp batteries, running at 90 r.p.m. and with 6-in. strokes, the demand is 25 h.p. The power demand at about 240 r.p.m. of Wilfrey and Card tables is about 2 h.p., of Monnell slimers about 1 h.p., and vanners slightly less. For ordinary sizes of jigs, speeds and amplitude of the piston throw, the demand ranges from 2 h.p. to 7 h.p. per jig. Trommels are usually belt-driven from shafts to which are also connected crushers and rolls or jigs and mills. The power requirements vary with the speed, which is limited to a range of from 30 r.p.m. to 60 r.p.m. From 1 h.p. to 1.5 h.p. is required in a slowly driven 3-ft. by 5-ft. trommel, and from 3 h.p. to 4 h.p. is the average demand of a 5-ft. by 9-ft. trommel. Conveyor loads are not large and the practice is to drive the conveyors from a short line shaft, which also drives the machines with which they are associated. Electrolysis is employed to some extent in connection with the recovery of metals from cyanide solutions. In the Ajax mill at Cripple Creek a 20-h.p. motor is belted to a 10 volt, 1,500 ampere generator. Energy from this is fed to baskets having 4 in. by 4 ft. cylindrical graphite anodes, the surrounding iron forming the cathode, and the baskets are sunk in the weak chemical solution of the agitators to hasten the chemical separation of the metals from the compounds in the ore slimes. Electrolytic methods are also employed in the zinc press treatment for recovering metals from cyanide solutions. Instead of forming zinc compounds and continuously wasting the zinc, the gold-bearing solution is passed between plates spaced so that, with proper flow, the ion travel will theoretically cause all of the gold to be deposited on the iron cathode, whence it may be removed as a precipitate. In the Davis precipitator a semi-circular tank 3 ft. in diameter by 12 ft. long is used to hasten the process. The solution in flowing through the precipitator is intercepted by twenty-four revolving perforated steel discs connected as cathodes. Anodes consisting of numerous ¼-in. graphite rods are hung in the solution between the discs.

Electrical drying and melting of ores is being introduced. The drying is effected in brick furnaces on metal plates, under which heater coils are placed. It is necessary to make very low rates for this class of work to compete with steam. From 10 kw. to 25 kw. is required to dry from 15 tons to 30 tons of tungsten per month. Arc furnaces are occasionally used to melt gold and silver from their precipitates. Oil-burning tilting furnaces are in more common use.

**Notts and Derby Branch of the Association of Mining Electrical Engineers.**—At a meeting on Saturday last, Mr. E. K. Scott's Paper on shaft cables was discussed. A special meeting of this branch is to be held at Chesterfield next month.

**Electrical Mining Accidents.**—The death of a boy of 14 named B. Bettridge is reported at Langwith Colliery on March 5th, due to electric shock. The deceased, who was a pony driver, was leaning against a prop to which a lamp was attached, and appears to have touched the lampholder, which by some means had become live, and to have drawn it out of place when falling. The evidence brought out the fact that the lamp was one of a series of four 110-volt lamps on a 440-volt circuit, and the electrician to the mine, thinking that they were on a 110-volt circuit, had omitted to earth the holders. All such lamps in the pit have since had their holders earthed.

Another fatality occurred on March 6th at Houghton Main Colliery, when John Bain was killed by a shock while working on an electric coal-cutter. After telling his mate to switch on, the deceased took hold of the handle of the machine and received a fatal shock, although he had rubber gloves on at the time. Two other men received shocks in endeavouring to switch off. Mr. R. Nelson (H.M. Electrical Inspector of Mines) expressed the view that the voltage at which the coal-cutter was worked (650 volts) was higher than was necessary, and that the earth connection, which had too many joints, was of too high a resistance to be effective. With 200 volts the danger would be practically non-existent, even with the existing earth connection. He deprecated the use of rubber gloves, and said that apparatus which required them was obsolete for mining work.

## ELECTRICAL MINING AND METALLURGICAL PATENTS OF MARCH

### Mining.

The following are the patent Specifications of particular interest to mining electrical engineers published during March: No. 4,983/12, by C. H. Worsnop, covers the use of a glass cylinder surrounding the bulb of a miner's safety lamp and a lens forming the top, bottom or front, as the case may require, so that the lamp may be used as a searchlight as well as giving a light all round. In specification No. 5,170/12, by H. F. Joel, is described an improved mechanical construction of the lamp casing, particularly applicable where contact is made within the case, as described in specification No. 4,019/11, by the same inventor (*ELECTRICAL ENGINEERING—MINING SECTION*, Vol. VIII., p. xxvi., April 4th, 1912). In one form the lamp is made in four parts: a cylindrical stamped or spun metal battery case, having a male screwed ring on the outside top edge, a detachable cover plate on the lid over this case for carrying the lamp on the top, a lantern cage with a protecting glass cylinder having a flanged end on its base, and a female-screwed flanged nut turning on the flanged edge of the lantern which, when screwed to the top of the battery case, fastens the lantern tightly to it and also secures the cover and lamp in place. The top, side bars and flanged edge of the lantern cage are all made in one piece. A set pin or screw ensures that all the parts are placed accurately and prevents the lantern turning when the nut is being screwed down. Arrangements are also made so that the battery must be in its correct position. It will be seen that by the one operation described the lantern is made airtight and the contacts brought into position. The case is locked by a pin or lead lock in an approved manner. Alternative constructions embodying slight modifications are given.

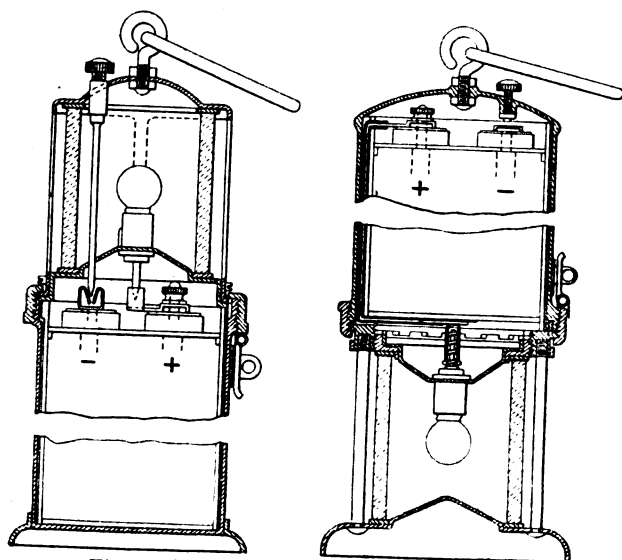


Fig. 1.

Fig. 2.

TWO DESIGNS OF SAFETY LAMP.

The illustrations, Figs. 1 and 2, show the construction of two designs of the lamp.

A catalytic detector for inflammable gases is described by A. Guasco (Paris) in specification No. 3,628/12. Two closed chambers are arranged within an insulating case provided with one porous wall, e.g., asbestos, which permits of endosmose (the inflammable gases can pass through more readily than can the air), so that normally the chambers are at the same temperature and in perfect equilibrium. One of the chambers is made of glass or bare metal and the other carries fragments of a catalytic metal or alloy. They are connected by a U-tube containing a liquid which normally stands at the same height in each limb, but the presence of inflammable gases in the air causes the catalytic chamber to be heated and so the air expands and acts on the liquid, which may close warning or indicating circuits. Alternately the two closed chambers may be made by dividing one chamber by a thin diaphragm, which is acted on by excess of pressure and so closes the electric circuit.

Watertight bells are described in specification No. 19,587/12, by E. A. Graham. The contacts of the interrupter are en-

closed in the same casing as the electromagnet, and they are separated through the action of a diaphragm due to an impact received by a lever from the hinged lever or its equivalent when the magnet is energised. By this means the diaphragm is relieved of strain except when the bell is ringing, and the contacts are capable of fine adjustment.

For blasting drilled rocks, coal seams, &c., F. Kessler and F. Berger (Germany) propose, in specification No. 30,110/12, a watertight, hollow cylindrical casing with a longitudinal slot to admit the explosive cartridges, which are electrically ignited. Water is contained in the casing to neutralise any flames.

The following pocket device for mining officials has been patented by G. Watts, specification No. 5,845/12. A knife blade, a pricker for preparing cartridges to receive detonators, a shotfiring battery key, a manhole doorway, an electric lighter key and a safety-lamp key are all arranged like an ordinary pocket-knife.

### Metallurgical.

There were two specifications having a particular bearing on electricity in the metallurgical industry published during March. No. 16,041/12, by J. Bally, describes an improved retort furnace in which the heat is produced by currents set up by a rotary inductor. Fig. 3 shows an outline of the

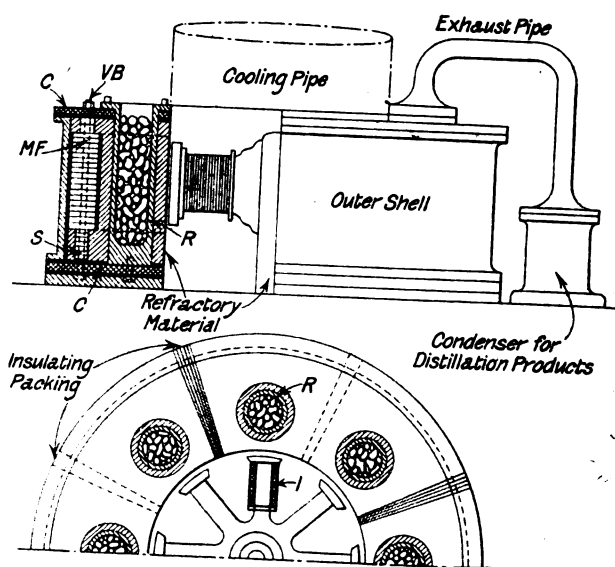


FIG. 3.—ELEVATION AND PLAN OF INDUCTION FURNACE.

furnace, as given in the specification. Vertical retorts, *R*, are arranged in a circle round the revolving inductor, *I*. They are embedded in refractory material and are connected in series by the upper and lower covers, *C*, one to each pair of retorts. The upper and lower cover sections are staggered, as shown in the figure. The magnetic frame, *MF*, is cut away to receive the retorts and is carried by braces, such as the sleeves, *S*, threaded in the vertical bolts, *VB*. If no advantage is to be taken of the heat produced by eddy currents in the magnetic frame, this may be cooled as indicated in Fig. 3. Modifications in the arrangements for special purposes may also be made, and by arranging the retorts in concentric circles heat gradations are possible.

The other specification is No. 10,882/12, by H. Plauson (Russia) and G. Tistschenko (Russia), describing a method for the production of tough ductile iron by electrolysis. Three methods are given of preparing simple mixtures of ferrous and conducting salts, which, at temperatures between 30° C. and 70° C., yield tough electrolytic iron if the solution is kept acid.

**South Wales Branch of the Association of Mining Electrical Engineers.**—The annual meeting and dinner will be held during the present year at Cardiff some time in May next. Preceding the meeting a cinematographic lecture will be delivered by a technical expert, and the subject of the lecture will detail the manufacture of electric cables. Full particulars will be issued in due course, and any further information can be obtained by application to the hon. secretary, Mr. G. Humphry, Victoria Avenue, Cardiff.

## ELECTRIC HEATING AND COOKING

A DISCUSSION on electric heating and cooking was opened by Mr. T. Roles at a meeting of the Yorkshire Local Section of the Institution of Electrical Engineers on March 12th, at Leeds. In his remarks on heating and cooking generally, he mentioned that over 1,000 kw. of such apparatus was known to be connected up at Bradford, not including the small appliances run from ordinary plugs. Owing to the continually improving designs of apparatus, a hiring scheme had not yet been introduced. The charge was 15 per cent. of the rateable value per annum plus  $\frac{1}{4}$ d. per unit, with no meter rent. Dealing more in detail with heating apparatus, he distinguished between radiators and convectors, preferring the former, where the heater is only required for intermittent use or to provide warmth immediately, and the latter to warm the whole room in the shortest possible time and to maintain the warmth afterwards. The consumption of the heater should be not less than one watt per cubic foot of the room to be heated. Radiators were sometimes designed so that lamps were more or less hidden at the top, bottom or sides by some portion of the body, but this tended to overheating of the lamps and shortening of their life. A fault of convectors was often that the air inlets were not nearly large enough. He described various well-known types of heater, including the Bastian, Ferranti, and other glowing-quartz patterns. Passing on to electric cooking, he referred to the deserved popularity of the "Tricity" cooker, but spoke of minor but annoying troubles with the flexibles and plug connections used. Manufacturers generally had not yet settled down to standard lines, and they did not seem to have studied sufficiently the requirements of the various classes of people for whom they have to cater. In different parts of the country the conditions were very different. In Bradford cookers should be of sufficient size to bake bread, and should have a larger proportion of bottom heat than is required in the south of England. The following were some of the requirements which were indicated by his experience. The ovens should be provided with at least three separate sets of heating elements, so controlled that not less than three regulations are provided. It would appear an advantage if ovens were constructed so that a glowing type of unit can be used for the cooking of meat, and controlled by a series-parallel arrangement so that the heat in each individual element can be reduced when bread or pastry is being baked. It is generally found that two hot-plates and one grill mounted above the oven are sufficient for all ordinary purposes, but in the case of an oven suitable for large families it might be advisable for three hot-plates to be fitted. A flat plate of not smaller dimensions than 36 in. by 18 in. should be fitted at the top of the oven, level with the base of the hot-plates, so that cooking utensils, dishes, plates, &c., may be stood thereon. It is advisable that this plate should not be painted or blackened, but should be left bright and kept clean. The space between the underside of the top plate and the oven should be utilised partly as a hot cupboard for warming dishes, plates, &c., and partly as a grill, the grill elements being fixed to the underside of the plate. The whole of the heating units above described should be separately switched and fused. Porcelain vessels even with specially ground bottoms were not very satisfactory for cooking on hot-plates on account of their poor thermal conductivity and uneven thickness. Thin, stamped, metal utensils were better, but the best results were obtainable with stiffly constructed vessels, such as those made of cast-iron or cast-aluminium, having machine-ground or turned bottom surfaces of fair thickness. Excellent contact was made by such vessels with the turned surface of the hot-plate, which contact, owing to the vessels' rigid construction, was not broken by buckling. In addition to this, due to the thickness of the metal in the base of the utensil, the heat, even if absorbed unequally over its under-surface, was equalised by the rapid conduction which takes place in the metal itself before reaching the surface exposed to the liquid.

Mr. H. Churton (Leeds), in opening the discussion, expressed the view that both Canada and the United States were ahead of us in the manufacture and use of electric heating and cooking apparatus. He thought that the price charged in Leeds for current for heating and cooking was too high. Cleanliness was an important factor in favour of electric cooking.

Mr. W. B. Woodhouse (Engineer-in-Chief, Yorkshire Electric Power Co.) mentioned the case of a friend who has everything possible done by electricity in his house, the annual consumption

being 100,000 units at  $\frac{1}{4}$ d. Although financially this is not economical, he considers the benefit derived as of more value. From a supply engineer's point of view, the fact that a cooking load would be greatest on Sundays he considers an important consideration. He deprecated the tendency of manufacturers of cooking apparatus to copy the lines of gas stoves; they should develop a distinctive type determined by the special requirements.

Mr. A. B. Mountain (Borough Electrical Engineer, Huddersfield) found an encouraging demand for electric irons and radiators, but cooking had not yet caught on. The best way to develop the business was to interest the ladies in the testing and use of the apparatus, as servants were quite indifferent and careless.

Mr. H. Visger (Leeds) considered that electric radiators were very convenient for temporary heating in a bedroom at night and morning, but out of the running compared with anthracite stoves for continuous heating even with coal at £2 5s. a ton. He favoured electric cooking even at 1d. per unit. He had made a practical test in his own house, and cooked a dinner for four people at a cost of 2'9d.

Dr. R. Pohl (Phoenix Dynamo Manufacturing Co.) had been examining figures given in a German paper relative to the cost of cooking by electricity and gas. In that particular case electricity cost 3'6 times as much as gas, but the price of the gas was 3s. 5d. per 1,000 ft., and electricity 2'4d. per unit. With gas at 2s. 5d. and electricity at  $\frac{1}{4}$ d., the cost for cooking would be equal in each case. Gas stoves had not an efficiency of more than 60 per cent., while electric cookers had from 80 to 90 per cent.

Mr. W. Lang (Leeds) referred to the saving in weight of meat resulting from electric cooking without loss of flavour. The heating discs have to be made very light, and are apt to develop a tendency to buckle when the cooking vessels only rest on a few points. For heating the air for bedrooms, he would suggest making a hole in the outside wall and placing an electric radiator in the hole; the air would then be warmed as it entered the room.

Mr. A. Innes (Leeds), speaking as a contractor, said that current at 1d. per unit was not cheap enough. He found that ladies invariably preferred lamp radiators. He did not approve of all the switches being fixed on a board away from the apparatus, as they were more likely to be overlooked than when attached to the apparatus. In his own house the consumption of electricity for last year was for lighting 305, heating 473, and cooking 1,214 units, which worked out at an average of 1'35d. per unit. If the price charged had been calculated on the rateable value system, as at Bradford, the cost would have been reduced to 0'9d. per unit.

Mr. E. C. Wallis (Leeds) was of the opinion it would be to the advantage of manufacturers to take the ladies more into their confidence, as they could give many useful hints with regard to cooking. In times of emergency and illness electric radiators were of great use.

Mr. J. W. Hame (Borough Electrical Engineer, York) said they had only had the rateable value system charging in force at York for about seven months, but the result so far has been gratifying. Out of 24 cooking outfits which had been connected, only two had been returned. He mentioned an instance where a church in York was heated entirely by electricity. Despite the cost, which was about 7s. a Sunday, the result was considered satisfactory, as the extra convenience more than balanced the expense.

Mr. R. N. Campion (Borough Electrical Engineer, Dewsbury) considered that an important advance had been made by manufacturers undertaking to maintain the elements for 5 per cent. of the cost of the apparatus per year, which he hoped to see reduced before long to 3 per cent.

Mr. Roles, in replying, agreed that electric heating could not compete with coal fires or central heating, but radiators, &c., had their uses for intermittent and out-of-the-way heating. In a £25 to £30 house the lady generally has to take charge of the cooking, leaving the servant to do the household work. In such cases electric cooking had advantages over gas stoves, the atmosphere was purer, and the quality of the cooking was unquestionably superior.

The subject was also discussed by the Yorkshire Local Section at Sheffield on March 26th.

Mr. W. N. Y. King (Sheffield) said his experience enabled him to estimate that in a nine-roomed house for, say, five people, the annual cost of lighting, cooking, and heating would be increased by a sum of £4 or £5 by adopting electricity, allowing £1 per year for coal for heating water. The price of gas in Sheffield being only 1s. 3d. per 1,000ft., made it practically impossible for electricity to compete as to cost of running. The various economies and convenience resulting from its use would, however, more than balance the extra cost.

Mr. E. J. Marsh (Sheffield) contended that the present cost

of cooking outfits was too high for them to be generally adopted, and also that the construction was too flimsy. They should be manufactured on sound engineering lines, making them as fool-proof as possible, and thoroughly tested before being put into the hands of untechnical people.

Mr. W. E. Burnand (Sheffield) referred to experiments he had been making in connection with the heating of rooms. He found it much more satisfactory to have a large volume of air slightly heated, than a small quantity of air at a high temperature. The best position for a radiator he found to be about two-thirds the height of the room from the floor, with the heat deflected downwards.

Mr. E. A. Barker (Barnsley) quoted actual figures for a period of twelve months as the result of his experience with electric cooking and heating. The net saving in cost of coal, after allowing £2 for coke for heating water, was £8 2s. The electricity bill amounted to £8 4s. 8d. As he saved  $1\frac{1}{2}$  lb. of meat in the cooking process per week, the value of this more than covered the £2 2s. 8d. annual increase in expenditure, the other well-known advantages being clear gain.

Mr. Hames said the fact that gas in Sheffield was as low as 1s. 3d. went to prove that  $\frac{1}{2}$ d. per unit for electricity was the maximum that could well be charged for domestic purposes, apart from lighting. He supported the remarks which had been made as to the flimsy construction of some of the earlier apparatus which had been placed on the market, also the want of thorough individual testing before delivery. At the Bradford Electricity Works, where meals were provided daily for 60 men, the chef was strongly in favour of electric cooking, not only because of the increased comfort, but on account of the saving in meat, which was a matter of personal interest to him.

## ELECTRIC LIGHTING OF A PRINTING WORKS

GOOD illumination is essential in a printing works, and a good example of how this has been attained is presented by the installation in the works of J. Boots, Ltd., at Nottingham, recently equipped by the British Thomson-Houston Co., Ltd. The main object has been to secure adequacy and uniformity of illumination, without glare or shadows, with economy in current consumption. Mazda drawn-wire electric lamps are used throughout. In all the rooms, with the exception of the machine room, the Mazda lamps are equipped with metal reflectors of scientific design. In the machine room holophane prismatic glass reflectors are used. The metal Mazdalux reflectors are of sufficient depth completely to hood the lamps, so that the brilliant filament cannot be



FIG. 1.—COMPOSING ROOM.

seen. The lighting in the composing room is partly local and partly general. The type-cases are lighted by Mazda lamps equipped with focussing Mazdalux reflectors, suspended about 4 ft. from the working plane, while the general illumination is provided by means of several extensive units fixed close to the ceiling. The illumination on the surface of the type-cases, &c., is of a high intensity, but there are no shadows, owing to the thorough diffusion and even distribution of the light. In the bindery general illumination only is employed. This is provided by a number of intensive Mazdalux units fixed close to, and spaced evenly over, the ceiling. The illumination of the machine room is also general, and is provided by intensive holophane units suspended at a considerable height from the ground. We are asked to state that

the illuminating engineers of the British Thomson-Houston Co., Ltd.—and inquiries should now be addressed to this department at Neasden Lane, Willesden—will be pleased to prepare designs for projected installations, and to demonstrate

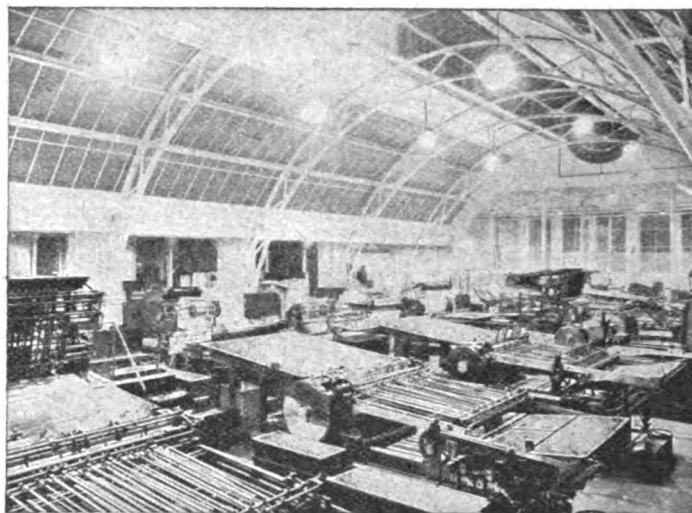


FIG. 2.—MACHINE ROOM.

how Mazda lamps and Mazdalux reflectors, arranged on correct engineering lines, will improve the illumination of printing works and other industrial premises.

**Faraday House Old Students' Association.**—The Annual Dinner of this Association will be held at the Hotel Cecil (Victoria Hall) on Friday, April 11th, at 7 (for 7.30 p.m.), with the President, Mr. Haydn T. Harrison, in the Chair. Any Faradians desirous of attending, who have not received a notice, are requested to communicate with the Hon. Sec. of the Association, Faraday House, Southampton Row, London, W.C.

**Berlin Electricity Supply.**—The concession of the Berliner Elektrizitäts Werken expires in 1915, and the extension of the concession, or the alternative of a complete or partial purchase of the undertaking by the City, is being much discussed in Berlin in conjunction with the future power requirements of the Berlin Stadt- Ring- und Vorortbahn. The City of Berlin will bear part of the cost of conversion of the Stadt-bahn, and it is suggested that the City should take over the general light and power supply, including the railway supply, and deal with the whole from one large power station. This, it is claimed, would enable power to be supplied for the railways at the lowest rate possible. Another proposal is that the City should take over and link up all the power stations of Berlin, but leave the distribution systems and selling business in the hands of the private companies, supplying them with power in bulk. In this connection it is interesting to note that the special Commission dealing with the electrification of the Berlin railways has recommended that only half the required sum of 50 million marks be voted, and that the "Stadt und Ring," but not the "Vorort" (suburban), system be electrified.

**Copper Production in Canada.**—From the preliminary report on the mineral production of Canada for the year 1912, just published by the Department of Mines, it appears that the average price obtained for copper was 16'341 cents, as compared with 12'376 cents in 1911. The report states that there is practically no recovery of refined copper in Canada, and the production is represented by the copper contents of smelter products, matte, blister-copper, &c., together with the amount of copper in exported ores, estimated as recoverable. On this basis the production in 1912 was 34,650 tons, against 24,850 tons in 1911. The exports of copper in 1912 were: fine, in ore, &c., 34,100 tons, valued at £1,830,000, and black, coarse, or pig copper, 870 tons, valued at £49,200. The total imports of copper were valued at £1,046,500.

**High-speed Rotary Converters.**—Two 1,000-kw. 60-cycle 12-pole compound wound rotaries without commutating poles have been running successfully for over a year in a substation of the Housatonic Power Co. They are wound six-phase, and work in parallel with four 500-kw. rotaries on a traction system. Line current at 33,000 volts is transformed to 430 volts. The transformers have two  $2\frac{1}{2}$  per cent. full capacity taps above and two below 33,000 volts in the primaries, and  $\frac{1}{2}$  and  $\frac{3}{4}$  voltage starting taps in the secondaries. They have 15 per cent. inherent reactance. The rotaries will carry 50 per cent. overload for two hours, and 100 per cent. momentarily. The brushes are of a composition of copper and graphite. Speed-limiting gear is provided.



## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelopes.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,333.

In connection with a group of collieries there is a power plant generating about 4,000 kw., voltage 2,500, periodicity 40. At the different pits there are transformers, 2,500 to 500 volts, for supplying current to several motors, also some of the motors are driven direct from the 2,500-volt circuit. At one pit about half a mile from the power station there are several 150-kw. 2,500 to 500 volt transformers. At the generator end the neutral point is not earthed; the electrical rules in mines require all transformers fitted with some arrangement to prevent the low-tension side being charged with H.T. through any leakage, &c. This can be done, of course, by earthing the neutral point of the low-tension side of the transformer. Will it be a suitable and safe arrangement in the circumstances to earth the neutral points on the low-tension side of all the transformers and to connect all the neutrals to two common earth-plates? Supposing also that the neutral points of the generators are connected to earth, are there any objections to connecting the low-tension neutrals from the transformers to the same two earth-plates as the generator neutrals would be connected to? In addition to earthing all neutral points, is it also advisable to connect up all ironwork in connection with plant to the common neutral earth-wires?—ELECTRIC.

(Replies must be received not later than first post, April 10th.)

### ANSWERS TO No. 1,331.

No reply of sufficient merit for an award has been received.

## ANSWERS TO CORRESPONDENTS

**D. LLEWELLYN.**—(1) The resistance of 600 yards of your 37/16 cable, that is, the go and return conductors, is 0.126 ohms; the voltage drop will therefore be  $150 \times 0.126 = 18.9$  volts. (2) The resistance of 200 yards of 7/14 cable is 0.1417 ohms, and the current required to produce a voltage drop of 3 volts is  $3 \div 0.1417 = 21.15$  amperes.

## CATALOGUES, PAMPHLETS, &c., RECEIVED

**A.C. MOTORS.**—A very complete new catalogue of polyphase induction motors has just been issued by Bruce, Peebles & Co., Ltd. (Edinburgh). A number of standard patterns of machine are listed, comprising protected motors, semi-enclosed motors with expanded metal grid covers, motors for textile mills with perforated steel covers, totally enclosed motors, pipe ventilated motors, and flameproof mining motors. The above can all be of the squirrel cage, slip-ring, or automatic centrifugal starter type, and can be arranged with a two-speed stator winding. A very full specification of the motors is given in the pamphlet, together with illustrations of various parts, and of some of the different types of motor referred to above. In addition, outline illustrations and full lists of approximate weights and dimensions of every size which they manufacture are given, while full lists of technical data for 50 and 25 cycle motors are also included, machines being dealt with for three separate ranges of

voltage from 110 up to 3,500 volts, at speeds of from 1,500 down to 150 r.p.m.

**WATER-POWER INSTALLATIONS.**—A well-illustrated pamphlet from the A. E. G. (Foreign Department) describes in English several large water-power schemes carried out by the company.

**MOTOR CONTROL.**—Another new publication sent us by the A. E. G. is a catalogue of starters in controller form.

**NUMBER INDICATORS.**—A pamphlet from the Electrical Co., Ltd., gives particulars of an electrical lamp number indicator for places of entertainment. The necessary changes of connections causing the particular lamps forming the numbers to light up are made by a controller worked by a lever with a self-locking position for every point, connected by a 25-strand cable to the lamp case.

**PLUGS FOR FIXING, WIRING, &c.**—We have received from Siemens Brothers and Co., Ltd. (Woolwich), a pamphlet describing the "Rawplug" plug, of which they are wholesale agents. This plug is the piece of apparatus described and illustrated in *ELECTRICAL ENGINEERING*, March 27th, page 178. A large number of sizes are listed, and some useful hints as to their use are given in the pamphlet. Extensive tests have been made of the force required to withdraw screws fixed in these plugs, and with suitable sizes of screws and plugs a resistance of as much as 670 lbs. has been obtained in a hole drilled in slate, 45 lbs. in brick, and 500 lbs. in good plaster.

*Readers desiring copies of catalogues or pamphlets should apply to the firms in question, referring to the notice in "Electrical Engineering."*

**ENGINEERING AND ELECTRICAL SUPPLIES.**—Two new leaflets from the General Electric Co., Ltd. (67 Queen Victoria Street, E.C.), deal, respectively, with a convenient form of cylindrical bellows for blowing dust out of electrical machinery and a line of sliding resistances for cinematograph and other purposes where fine current regulation is required. Another new leaflet, cancelling a previous one, describes the "Arm-earth" system of cable protection by a continuous earthed conduit, which can be applied to existing unarmoured cables. This system, which was designed particularly to meet the Home Office rules, was described and illustrated in *ELECTRICAL ENGINEERING*, August 22nd, 1912, page 468. Another new publication from the General Electric Co. is a card illustrating a range of porcelain-covered connections for conduit work.

**SERVICE CUT-OUTS.**—A complete list from Siemens Brothers Dynamo Works, Ltd., Supplies Department (38-39 Upper Thames Street, E.C.), deals exhaustively with a variety of main fuses for house-service connection from underground or overhead distribution networks, as well as for motor-control panels and ironclad switchboards. The well-known "Zed" fuse fittings are used in all designs.

**PUMPS.**—Another descriptive list from the same firm gives information about the "Melda" house-water rotary pumps, which are of very simple construction, and have only few and inexpensive wearing parts. These pumps are eminently suitable for country houses, hotels, garden supply, fire extinction, &c. Among the advantages claimed are that the pump will suck although the suction pipe is empty, and that the volume delivered depends only on the speed.

**"INDESTRUCTIBLE" CABLES.**—A pamphlet from Scholey and Co., Ltd. (151 Queen Victoria Street), describes various grades of a cable protected by a special covering, consisting of a cotton or jute braiding, impregnated with a patented composition consisting of red lead, linseed oil, and other ingredients. Cables insulated in this way are protected against atmospheric and chemical effects, and are supplied for voltages up to 2,000 for indoor and outdoor use. These cables are not, however, suitable for draw-in systems. Tests on some cable in use have shown that the insulation resistance increased with time.

**CABLES.**—An effective card from the Armorduct Manufacturing Co., Ltd. (Farringdon-avenue, E.C.), calls attention to an order for 100 miles of 5,000 megohm V.R. cable received from a railway company.

**THE LIGHTING OF PICTURE THEATRES.**—This is the title of a well-printed brochure which the British Thomson-Houston Co. (Mazda House, Upper Thames Street, E.C.) issued most opportunely at the time of the Cinematograph Exhibition last week. It describes the application of the company's well-known "Eye-rest" system of indirect illumination to these places of entertainment, and gives a fine selection of views showing the fittings and their use, several of which have been reproduced in our columns.

**Manchester Electro-Harmonic Society.**—The closing concert of the season was held on Friday last, with Mr. F. Sells in the chair. Mr. Sells said that the Society were very fortunate in their President, Mr. Pearce, and mentioning that since October the membership had risen from 70 to 170, expressed the hope that a total of 300 might be attained next season. A vote of thanks was passed to Mr. W. J. Smith, the Musical Director.

## "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

### Specifications Published March 27, 1913

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications. Names in italics indicate communicators of inventions from abroad.

26,864/11. **Starting Gear for Rotary Printing Presses.** G. W. MASCORD. The usual clutch, for reduced speed at starting, and direct drive are displaced by magnetic clutches controlled in regular sequence by the motor controller. Constructional details are given. Ten figures.

10,823/12. **Quenched Spark Gaps.** W. TORIKATA, E. YOKOYAMA, and M. KITAMURA. The electrodes practically touch. One is made of silicon, ferro-silicon, carborundum, boron, and minerals such as graphite, meteoric iron, magnetite, iron pyrites, copper pyrites, bornite, molybdenite, marcasite, native copper, or a material not burnt away quickly or short-circuited, even when the electrodes are practically in contact. Four figures.

11,434/12. **Single-phase Repulsion Motor.** MASCH. OERLIKON. The motor has a shunt characteristic, and the direction of rotation is changed by shifting the magnetic axis. The stator winding is divided into groups connected in series, and part is reversible. Auxiliary brushes displaced 90° from the short-circuited brushes are connected to the reversible stator winding. Arrangements are made so that the current in the working brushes is not reversed during the change-over. If a transformer is used to feed the auxiliary brushes, it is provided with a supplementary winding, through which the working brushes are constantly short-circuited. Five figures.

25,586/12. **Adjustable Grills or Salamanders.** R. S. DOWNE and B. & K. Co. To vary continuously the distance between the heat source and the food support, the latter is carried on a pair of lazy tongs, which are operated by a hand-wheel and screw. Three figures.

26,249/12. **Fixing Metal Filaments to their Supports.** H. A. GILL (*Wolframlampen A.G.*). The pairs of ends of the filaments are held by being nipped, without heat, in double eyelets on the nickel, copper, or nickel-copper arms. Three figures.

### Specifications Published To-day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, E.C., at the price of 8d. each, post free.

Summaries of some of the more important of these patents will appear in our next issue.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** B.T.-H. (*G.E.C., U.S.A.*) [Distributing systems] 6,212/12; BROOK [Insulators for railway conductor rails] 6,473/12; BLAKE and KILBURN [Conduit support] 6,562/12; BJUR [Automobile lighting systems] 6,803/12; FELLEBERG [H.P. insulators for overhead lines] 17,761/12.

**Dynamos, Motors, and Transformers:** LEITNER [Variable-speed dynamos for starting internal-combustion engines, &c.] 6,189/12; SHAW and SHARP [A.C. generators] 10,427/12.

**Electrometallurgy and Electrochemistry:** TISCHENKO [Refining of iron] 5,855/12; UBBELOHDE [Resistance furnaces] 9,203/12; VON LIEBEN, REISZ, and STRAUSS [Improvements in discharge tubes having an incandescent cathode] 15,975/12; WERTH [Continuous action apparatus for the electrolytic treatment of metal strips and wires] 16,535/12; LEE [Apparatus for endo-thermic gas reactions] 23,459/12.

**Heating:** LONDON ELECT. TRADING CO. and BASTIAN [Element for hair-dryers] 5,723/12; DE BERNARD and EBBSMITH [Therapeutic appliances] 19,267/12; BYNG and COLLINGS, 28,542/12.

**Ignition:** BLOXAM (*Bosch*) [Adjusting time of] 17,489/12.

**Incandescent Lamps:** B.T.-H. (*A.E.G.*) [Machine for making lamp bases] 13,788/12.

**Instruments and Meters:** ROBINSON [Taximeters] 27,536/11; KILROY and EVERSHED & VIGNOLES [Indicator for use more particularly on ships] 6,792/12; HATFIELD and CHAMBERLAIN & HOOKHAM [Electrodes for electrolytic instruments] 18,341/12; LANDIS and GYR [Two-rate] 24,503/12.

**Switchgear, Fuses, and Fittings:** SMITH [Incandescent lamp switching] 5,814/12; CLATWORTHY [Automatic gear for starting switches, &c.] 6,599/12; BONNELLA [Bell push] 10,360/12; DAY [Terminal mounting and cord gripping for lamp-holders, &c.] 14,306/12; KNOFF [Pocket lamps] 22,093/12; RILEY [Motor controllers] 25,591/12.

**Telephony:** COX [Spreaders for receiver casings] 26,474/12.

**Traction:** TYRER and WHALLEY [Working of tramway track and conductor points] 5,721/12; MELLOR [Railway signalling] 5,850/12; HOLLIDAY [Traffic controlling] 486/13.

**Miscellaneous:** PHILIP and STEELE [Detectors for combustible gases] 27,281/11 and 3,002/13; ROZIER [Lifts] 6,304/12; BRAARUP [Electro-medical appliance] 6,645/12; ERICH F. HUTH GES. and BEHNE [Remote adjustments by periodic oscillations of different frequency] 9,181/12; NEAL and MOORE [Fire alarm]

10,927/12; WHITEHEAD & Co. A.G. [Submarine mines] 17,126/12; BELDIMAN [Rotary engine with electric power transmission] 19,787/12; GROSS [Thermo-electric batteries] 25,372/12; BOHLE and "VOLTA" COMMANDITGESELLSCHAFT FÜR ELEK. KLEINBELEUCHTUNG [Dry batteries] 26,699/12.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Distributing Systems, &c.:** A.E.G. [D.C. machine braking by parallel armature resistances] 5,529/13.

**Electrometallurgy and Electrochemistry:** SCHOOF [Starting a furnace for the production of metallic powders] 5,510/13.

**Ignition:** KEITERING, 4,508/13; SCHLICK, 5,365/13.

**Switchgear:** BOUTARD [Automatic] 5,546/13.

**Traction:** ANGUS [Railway signalling and control] 5,916/13, 5,917/13, and 5,918/13.

**Miscellaneous:** NICHOLSON [Electrically-operated mechanism] 30,059/12; SOC. CONIDELON [Manufacture of a catalyst containing vanadium] 5,174/12; PAUL [Gyroscopic steering for ships] 5,453/12 and 5,454/12.

### Opposition to Grant of Patents entered

1,178/12. **Imitation Candles.** E. J. WILSON and the CANDOLITE Co. A construction to ensure a rigid connection between the lamp-holder and the candle sconce is described.

19,890/12. **Locomotives, Boats, &c.** MASCH. OERLIKON. [ELECTRICAL ENGINEERING, Feb. 6th, 1913, p. 80.]

### Expiring and Expired Patents

The following Patents expire during the current week, after a life of fourteen years:—

7,277 of April 6th, 1899. **Two-rate Meters.** H. ARON and ARON ELECTRICITY METER, LTD. There are two dials and two counting trains; the change is made from one train to the other by clockwork, which has wheels displaceable longitudinally on their axes at predetermined times. The mechanism connecting with the counting train consists of three gear-wheels in mesh in a tilting frame. The central wheel is constantly in gear with the counting train, while one of the others is in gear with the recording train.

7,370 of April 7th, 1899. **Multiple Unit Train Control.** H. H. LEIGH (*F. J. Sprague, America*). This specification amplifies the earlier Sprague patents for multiple unit control. This system was worked in this country by the B.T.-H. Co. By means of the combination of working parts herein described, the number of control wires connecting the cars is reduced. The reverser drum is operated by a pilot motor, in combination with which is a limit switch and a circuit-breaker for the series parallel and reverser switches. Besides the interlocking and cut-out arrangements described, it is arranged that the circuit is opened in passing from the series to the parallel position. The trolley shoes on each car are connected together. Fourteen figures.

7,427 of April 8th, 1899. **Rotary Converter.** J. IMRAY (*Soc. Anon. pour la Transmission de la force par l'Electricité*). The converter consists of an asynchronous single or polyphase motor mounted on the same axis as a D.C. machine. The asynchronous armature coils are connected to those of the D.C. armature, and also in shunt to the commutator segments, but the groups of coils are displaced symmetrically to a fixed plane. The speed, when once started, is one half that of a similar synchronous motor. The machine is reversible.

The following are the more important Patents that have become void through non-payment of renewal fees.

**Arc Lamps:** F. M. LEWIS [Series single coil] 27,199/03.

**Dynamos:** B.T.-H. (*G.E.C., U.S.A.*) [Self-exciting and self-compounding A.C.] 26,093/05.

**Incandescent Lamps:** B.T.-H. (*G.E.C., U.S.A.*) [Machine for welding platinum to copper wires; also counting and arranging] 27,404/04; C. H. STEARN and C. F. TORHAM [Bulb exhausting] 28,680/06.

**Instruments and Meters:** EVERSHED & VIGNOLES and S. EVERSHED [Converting reciprocating into locked rotary step-by-step movement for counting trains] 24,646/99; J. Y. JOHNSON (*W. C. Heraeus, Germany*) 27,298/07; [Resistance thermometers] 27,569/07.

**Switchgear, Fuses and Fittings:** A. ECKSTEIN and A. J. D. KRAUSE [Tubular fuse] 22,819/00; A. WALTHO [Bayonet fittings, &c.] 28,637/06.

**Telephony and Telegraphy:** F. RITCHIE [Telautographs—adjusting and testing] 25,496/01; C. ADAMS-RANDALL [Telephony] 27,095/04.

**Miscellaneous:** B. J. B. MILLS (*General Fire Alarm Teleg. Co., U.S.A.*) [Street-box fire-alarm system] 24,717/99; J. T. DAWES [Magnetic separators] 27,298/05.

# ADAMS IGRANIC

ELECTRIC MOTOR CONTROL GEAR FOR CAPSTANS.

ADAMS  
M<sup>C</sup> & L<sup>D</sup>  
BEDFORD  
AND  
LONDON

## ELECTRIC TRACTION NOTES

The repairs to the two generators and other apparatus in the Greenwich power house of the London County Council Tramways, that were damaged owing to a switchboard mishap, as described in *ELECTRICAL ENGINEERING*, March 20th, p. 160, are complete, the station is at work normally, and the full car service is now running.

The conversion of the East London Railway, which runs from Shoreditch to New Cross, and connects up the Great Eastern, L.B. & S.C. Ry., the S.E. and Chatham Railways with the Metropolitan and District Railways, is now complete. The last steam train was run on Sunday night, and electrical working has been carried on exclusively for the passenger traffic. The line is 5½ miles in length, with intermediate stations at Deptford, Rotherhithe, Wapping, Shadwell, and Whitechapel, and passes through Brunel's original Thames Tunnel. The equipment is generally similar to that of the Metropolitan and District Railways, except as regards the automatic signalling, the leading features of which were pointed out in *ELECTRICAL ENGINEERING*, March 20th, p. 165, and April 11th, 1912, p. 194. The conversion was carried out jointly by these two railways in conjunction with the South Eastern Railway Co., and the electric passenger service is being worked by the Metropolitan Railway with their ordinary rolling stock. Power is taken from the Lots Road station of the London Electric Railways through a new sub-station at Surrey Docks, which contains three 300-kw. Westinghouse rotary converters and the necessary transformers and switchgear. The pumping stations at Surrey Docks and Rotherhithe have been provided with electric pumping plant to replace the original steam pumps.

The *Elektrotechnische Zeitschrift* points out that, as a result of a recent decision of the German Patent Office, the validity of Patent No. 153,730/01, by G. Winter and F. Eichberg, covering the principle of the Winter-Eichberg single-phase commutator motor, cannot now be questioned. The patent covers a motor in which both stator and rotor are connected to the supply mains, and in which there exists a variable cross-field at 90° to the main field. This principle has been the foundation of numerous later designs by Richter, Alexander, Ossana, Latour and other workers.

The German Reichstag Commission dealing with the proposed conversion of the Berlin city and suburban railways has decided against the provision of 50,000,000 marks required for complete electrification, but has recommended the voting of half that sum towards the electrification of the "Stadt und Ring" system only, and not the "Vorort" system. The authorities are requested to submit a further report on the result of certain prescribed experiments with electric traction, and on the choice of systems, &c., before applying for a further sum. Further investigation as to the economy of converting the Vorort (suburban) lines is also required.

The Commission has completed some further experiments with a new type of steam locomotive especially constructed to give high acceleration, the experiments resulting favourably to electric traction.

The traffic problem in Manchester is apparently gradually assuming such proportions that the suggestion has been made to form a traffic board consisting of representatives of the five committees of the Corporation, with a view to devising some comprehensive plan for dealing with the situation.

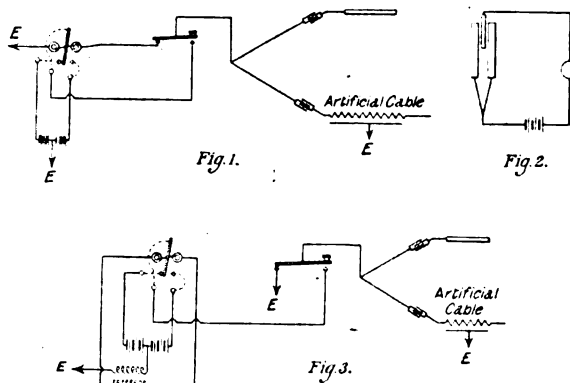
According to the *Elektrotechnische Zeitschrift*, the Italian Railway Authorities are so satisfied with the electric working of the Giovi tunnel line that they have decided to convert immediately to electric working the line from Ronco to Sampierdarena, which runs parallel with the Giovi line. Power will be supplied by the Società delle Forze della Maira, who have recently put into operation a 50,000-h.p. hydro-electric power station at Dronero (Piedmont), on the Maira, and who will later also supply the power for the Mont Cenis line.

The contracts for the operation of the dual rapid-transit

system for New York City have just been signed. The existing single-track mileage is about 271, but in 1917, when it is thought the new system will be in operation, it will be increased to about 600. About £62,500,000 is being spent in new lines, while a third of this amount covers the existing systems.

## TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

As announced in our Patent Record last week, the patent relating to the method of transmission on submarine telegraph cables devised by Mr. John Gott is now available at the Patent Office. There is little more in it than was described in our issue of February 27th. Fig. 1 shows the connections at the transmitting end, and Fig. 2 the connections of the tongue and contacts of the relay at the receiving end. It is clear that the signals are sent in alternate directions through the cable, and that the relay rectifies them into unidirectional currents. Fig. 3 is an alternative arrangement at the transmitting end, not mentioned in our previous note. The discharge current in this case is not taken through the relay. Instead of this a transformer is connected with its primary



between the mid-point of the battery and earth and its secondary connected to the coil of the relay. The object of this alternative arrangement is apparently to effect the reversal when the signalling current is broken, and to enable the current on the next depression of the key to act as a retaining current, ensuring perfect connection between the tongue and contact of the relay.

The Crown Agents for the Colonies have decided to erect wireless telegraph stations at Barbados, Mombasa, Penang, Singapore and Hong Kong. It is stated that tenders have been received, and that, subject to the necessary guarantees, the contract will be given to the Anglo-French Wireless Co., the English branch of the Goldschmidt Co.

The Post Office Telegraph Department has intimated its intention of laying an underground cable from Glasgow to Edinburgh at an early date.

The report for 1912 of the Automatic Telephone Manufacturing Co. shows a balance of £370 after meeting the full 6 per cent. preference dividend, and writing off £1,313 from preliminary expenses. In the early part of 1912 two automatic exchanges, each of about 500 lines, were completed for the Post Office Authorities, and these continue to give satisfaction. Other automatic equipment orders to the extent of about 8,800 lines have since been received.

According to the *Daily Telegraph*, the Expert Committee appointed by the House of Commons to consider the various systems of wireless telegraphy, in connection with the Select Committee's investigation, recently visited Slough and watched certain experiments with the Goldschmidt system. The

# BABCOCK & WILCOX, LTD

MAKERS OF

## ELECTRIC CRANES—TRANSPORTERS FURNACE CHARGING MACHINERY.

**Head Office: ORIEL HOUSE, FARRINGDON STREET, LONDON, E.C.**

 Telegrams:  
"BABCOCK, LONDON."

**Works: RENFREW, SCOTLAND.**

 Telephone:  
HOLBORN 5540 (8 lines.)

**MICA** BRITISH MICA CO., LD.  
*Contractors to  
H.M. Government.*  
Lebanon Road Works,  
Wandsworth, S.W.  
Tel.—405 P.O. Putney.  
Tele.—"Micamini," London.

Plate Tubes,  
Rings, &c., in **MICANITE**

**GLASS TUBES  
AND RODS**  
FOR ELECTRICAL PURPOSES  
GUILBERT-MARTIN  
9, Edmund Place, LONDON, E.C.

 MICA MICANITE FIBRE.  
OILED FABRICS LEATHEROID

### INSULATION

 The Micanite & Insulators Co., Ltd.  
Walthamstow, London, E.

**ELECTRICAL PORCELAIN**

 OF  
HIGHEST QUALITY

 APPLY TO  
**JAMES MACINTYRE & CO., LTD.,**  
BURSLEM.

**CRYSELCO**  
**ELECTRIC**  
**LAMPS.**  
KEMPSTON WORKS, BEDFORD.  
Telegrams: "Cryselco," Kempston.  
Telephone: 2377 Bedford.

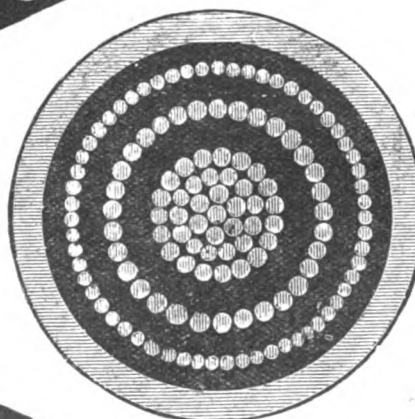
**F. WIGGINS & SONS,**

 FOR **MICA** INSULATION  
102, 103 & 104, MINORIES, LONDON

## "LIVERPOOL"

**ELECTRIC  
WIRES &**

**CABLES**



**LIVERPOOL ELECTRIC CABLE CO., LTD.,**  
LINACRE LANE, BOOTLE, LIVERPOOL.

 Telephone:  
147 BOOTLE.

 Telegrams:  
"CONCENTRIC, LIVERPOOL."

### LONDON:

 Baxter & Caunter, Ltd.,  
219, Tottenham Court  
Road, W.

### BIRMINGHAM:

 W. La Brum,  
54, Doris Road, Sparkhill.

### MANCHESTER:

 H. G. Mabbs,  
Marble Street, Spring  
Gardens.

### LEEDS:

 Loxley & Co., Ltd.,  
20, Basinghall Street.

### NEWCASTLE-ON-TYNE:

 Robert Bowran & Co., Ltd.,  
St. Nicholas Buildings.

### GLASGOW:

 A. & J. M'Culloch,  
140, West George Street.

When corresponding with Advertisers, please mention "Electrical Engineering."



average rate at which messages were received is said to have been between thirty and forty words a minute. The members of the Expert Committee are to watch further experiments of the Goldschmidt system in Germany.

Since our last issue, the whole time of the Select Committee of the House of Commons, which is inquiring into the proposed Imperial wireless telegraph scheme, has been occupied in hearing evidence from Sir Rufus Isaacs (the Attorney-General) and Mr. Lloyd George (Chancellor of the Exchequer) with regard to their dealings in shares of the American Marconi Co. From this evidence it has been shown that the Attorney-General purchased 10,000 shares of this Company several weeks after the contract with the English Marconi Co. had been signed. The purchase was made, he said, after he had satisfied himself that in the event of the English Co. being granted the contract for the Imperial scheme, the American Co. could not possibly have benefited. Although he was offered them at less than market price he insisted upon paying the full market price at the time. One thousand of these shares were subsequently sold to the Chancellor of the Exchequer, and another thousand to the Master of Elibank. This transaction was the only one which either of the Ministers in question have had in Marconi shares, although it has been suggested in certain newspapers that there had been extensive dealings in the English Co.'s shares.

Some astonishment has been caused by the resignation of one of the members of the Committee, viz., Mr. Harold Smith, the Unionist Member for Warrington. It appears that Sir Rufus Isaacs had communicated "most vital information" to certain members of the Committee some time before the disclosures as to the dealings in American Marconi shares had been made, and Mr. Smith, as well as others on the Committee, desired to know who these particular members were, and when the communication was made to them. As the result of a private consultation, the Committee decided by a majority that Sir Rufus Isaacs was not to give the information required.

A new Government telephone factory is being erected at Bordesley Green, Birmingham, to take the place of the National Telephone Co.'s factory at Nottingham, which has been abandoned by the Post Office authorities.

It was stated in the House of Commons last week that about 900 agreements have been accepted for rural party telephone lines, and that 400 subscribers are now using the service. Proposals under consideration will provide for approximately 500 more subscribers, and the demand for this class of telephone service has been such that the Post Office is in communication with the Treasury with a view to an extension of the grant of £10,000 which was made for this purpose last year.

Successful experiments are reported to have been carried out between Berlin and Nauen with a wireless telephone apparatus, employing a high-frequency machine devised by Count Arco. According to the *Elektrotechnische Zeitschrift*, newspaper articles were read out and transmitted without difficulty over a distance of 400 kilometres.

It is stated that the Straits Settlement Government has decided to construct 5-k.w. wireless telegraph stations at Penang and Singapore, which will be independent of the proposed Imperial scheme.

The Bagdad-Bassorah line was down again on 26th March, and the Seattle-Sitka cable failed on the same day, telegrams for Alaska being sent via Ashcroft. On this day, also, the Teheran-Kermanshah line was repaired, as well as the cables between Shanghai and Nagasaki.—The Seattle-Sitka cable was restored on the 27th ult.—The Fao route was restored on the 28th ult., and the Djedda-Souakin cable failed on the same day. Telegrams for all places in the States of Coahuila, Chihuahua, Morelos, Sinshoa and Sonora in Mexico can now be accepted at sender's risk. Owing to a severe storm there is considerable delay to Moroccan offices.—The cable steamer *Relay* was at Halifax at the end of February, after repairing the French Co.'s section at St. Pierre.

## LOCAL NOTES

**Chichester: Electricity Works and Ice Manufacture.**—The Chichester Electric Lighting and Power Co. is installing at the electricity works an ice plant capable of manufacturing 10 tons of ice per day, as well as cold-storage accommodation to the extent of 10,000 cub. ft. The horse power required for running the plant, which will be in continuous operation

during the summer months, is 42, and already numerous contracts are about to be fixed up, both for a regular supply of ice, and for cold-storage accommodation.

**Leeds: Power Supply.**—The Tramways and Electricity Committee, finding it necessary to meet the competition of private generating plants, are proposing reductions in the tariff for power supply.

**Redditch: Position of Electricity Undertaking.**—The Advisory Sub-committee which was appointed by the Council a short time ago to investigate the position of the Municipal Electric Supply undertaking, both from the financial and engineering points of view, has now issued its report. The Committee has come to the conclusion that the non-success of the undertaking in the past, and from which it must continue to be handicapped in future, is to a considerable extent due to (1) the initial mistake in installing a high-tension alternating-current system; (2) the defective laying of cables; (3) the inconvenient situation of the electricity works, and (4) the use of a gas plant, which has proved a failure. The capital cost of superseded machinery amounts to £10,000, and a sum of £600 per annum will have to be paid until 1929 in respect of unproductive capital expenditure. The Committee state that the reasons for the non-success of the undertaking are to a large extent attributable to causes for which the Borough Electrical Engineer cannot be held responsible. At the same time, it is pointed out that some efforts should be made to improve the commercial management of the undertaking, a branch to which the Borough Electrical Engineer has not been able to give sufficient attention owing to the engineering difficulties. Mr. W. J. Ferguson, the Borough Electrical Engineer, has, however, given notice to terminate his engagement, and the Committee recommend that a new works manager be appointed at a commencing salary of £250 per annum. Mr. Ferguson is to be paid £150 in respect of special service as consulting engineer.

**Truro: Electric Lighting.**—The Corporation has received a notification from the Board of Trade that their application for an electric lighting provisional order has been granted. In our issue for March 13th we reported the inquiry in London at which the applications for orders by the Corporation and the Truro Gas Co. were investigated.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

### Generating Stations, Sub-Stations, Mains, &c.

**Burnley.**—It is proposed to instal a 2,000-kw. turbo-alternator with two 500-kw. rotary-converters and transformers at the electricity works. A new sub-station containing two 300-kw. rotary-converters is also to be installed. The total cost of these extensions is put at £28,171.—A loan of £7,000 for mains and services is to be taken up.

**Chester.**—The Borough Electrical Engineer recommends the installation of a battery, switchgear, &c., at an estimated cost of £11,550. Of this it is proposed to pay £4,000 out of reserve fund, and to apply for a loan for the remainder. In his report, Mr. Britton emphasises the fact that he has not at present sufficient reserve plant to carry him through the coming winter.

**Darlington.**—Jet condensing plant capable of condensing 20,000 lb. of steam per hour. Borough Electrical Engineer. April 16th.

**Doncaster.**—Sanction to a loan of £12,500 for new plant is to be applied for. A new 1,000-kw. turbo-alternator is contemplated.

**Fife.**—The Fife Electric Power Co. propose to instal an additional 5,000 kilowatts at their Townhill power station.

**Londonderry.**—The Borough Electrical Engineer estimates the probable expenditure on plant and cables during the next five years at £13,000, and it is proposed to apply for a loan

## THE RECORD ELECTRICAL Co., Ltd.

LONDON OFFICE:  
CAXTON HOUSE,  
WESTMINSTER, S.W.  
Telephone:  
3087 Victoria.

MEASURING  
INSTRUMENTS.

RECORD'S PATENT.

WORKS:  
BROADHEATH,  
MANCHESTER.

Telephone:  
164 Altrincham.  
Telegrams:  
"Infusio."

Telegrams & Cablegrams:  
"Infusio,"  
London.

Write for Prices & Particulars.

for this amount at once in order to avoid the necessity of repeated applications for small sums.

**Manchester.**—Sanction is to be sought to the following loans: mains, £45,000; services, £15,000; consumers' sub-stations, £15,000.

**Peterborough.**—The City Engineer has been instructed to draw up a specification for a 500-kw. generating set and two Lancashire boilers.

**Rochdale.**—Sanction to a loan of £45,000 for electrical extensions has been received.

**Salford.**—Extra high-tension switchgear. Borough Electrical Engineer. April 10th.

**Stalybridge.**—The Joint Electricity Board are amending their application for a loan, from £20,000 to £22,554.

**Tullamore (Ireland).**—A consulting engineer is to be called in with regard to an electric lighting installation.

### Wiring

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Barnsley.**—New town hall.

**Barry.**—Electrical equipment of Glamorgan County Council's training college. Clerk, County Hall, Cardiff.

**Burnley.**—New Territorial Drill Hall.—Architect, W. A. Quarnby, Grimshaw Street.

**Carlisle.**—New post office. H.M. Office of Works, London.

**Doncaster.**—New technical school. Builder, Mr. P. Rhodes, Leeds.

**Dublin.**—New Corporation buildings. City Architect.

**Dumfermline.**—New institution in Netherton district.

**Edinburgh.**—New school at St. Leonard's Lane. Architect, J. A. Carfrae 3 Queen Street.

**London: L.C.C.**—Electrical installation at Shadwell High Street special school. Chief Engineer, J. W. Humphreys. April 23rd.

Electrical installation at Jeffries' Almshouses, Kingsland Rd., Shoreditch. 56 lighting points. Chief Engineer, J. W. Humphreys. April 15th.

**Port Talbot.**—Block of business premises. Architects, Evans and Jones.

**Sheffield.**—New Council school, Hillsborough. City Architect.

**Watford.**—Twenty-two workmen's dwellings.

### Miscellaneous

**Australia.**—The Sydney Corporation require a supply of meters and arc-lamp carbons. Particulars, 73 Basinghall Street, E.C.

**Leicester.**—New tramcar repairing shops are to be erected at an estimated cost of £23,000.

**Limerick.**—A twelve months' supply of stores. Borough Electrical Engineer. April 10th.

## TENDERS RECEIVED AND ACCEPTED

**Bedford.**—An inquiry was held into the Council's application for sanction to borrow £11,590 for additional generating plant. As already notified in our columns, it is proposed to instal Diesel-engine plant, for which Messrs. W. H. Allen, Son and Co.'s tender has been provisionally accepted. During the course of the inquiry, Mr. T. E. Ekin, the inspector, remarked that his experience of Diesel engines has been unfortunate, and the inquiry was ultimately adjourned until April 10th for further information with regard to the engines.

**Belfast.**—The tender of Messrs. Chamberlain and Hookham has been accepted for meters.

**Clacton-on-Sea.**—The application of the Corporation for sanction to borrow £6,000 was inquired into last week by a Local Government Board inspector. It is proposed to instal Diesel-engine plant, for which the tender of the Consolidated Diesel Engine Co. has been provisionally accepted.

**Haslingden.**—The following tenders have been accepted for sub-station machinery: rotary-converter, British Thomson-Houston Co.; switchboard panel, Ferranti, Ltd.; extension of tramway switchboard, Chloride Electrical Storage Co.; feeder cable, Siemens Bros. and Co.

**Heston and Isleworth.**—The tender of Messrs. Chamberlain and Hookham has been accepted for meters.

**Hornsey.**—A contract has been placed with Messrs. Isaria, Ltd., for electricity meters.

**London: Fulham.**—The Board of Guardians have accepted the tender of the Hart Accumulator Co. for a storage battery of 102 cells.

**Wrexham.**—The following tenders have been accepted: meters, Reason Manufacturing Co.; carbon and metal filament lamps, Edison and Swan United Electric Light Co.

## APPOINTMENTS AND PERSONAL NOTES

Mr. E. B. Gimmingham and Mr. C. E. Hunter, Works Managers of the Lamp and Engineering Departments of the Edison and Swan United Electric Light Co., Ltd., have been elected to seats on the Board of the Company. It will be remembered that Mr. H. Wolfenden resigned his position as Chairman recently and was succeeded by Mr. C. J. Ford.

Mr. E. P. Bennett has been transferred from the Sales Department of the London office of Simplex Conduits, Ltd., to the position of Manager of the Liverpool branch.

Mr. Norman Young, chief of the testing staff of Messrs. James Howden and Co., of Glasgow, has taken up an appointment with the Consolidated Diesel Engine Co., of Ipswich.

We regret to learn that Mr. J. E. Starkie, Borough Electrical Engineer at Burnley, is suffering from a nervous breakdown. He has been granted leave of absence by the Corporation.

The salaries of the Mains Superintendents in the Stoke-on-Trent electricity undertaking have been increased as follows: I. Makin, from £180 to £135 per annum; S. J. Marston, from £145 to £150; D. C. Redfern, from £135 to £140 per annum.

Mr. R. B. Leach has been appointed Electrical Engineer and Tramways Manager to the Heywood Corporation at a salary of £200 per annum. There were 134 applicants.

A works manager is required for the Redditch Electricity undertaking at a commencing salary of £250 per annum.

A meter tester, experienced in polyphase work, is required. (See an advertisement on another page.)

A charge engineer is required at the Paisley electricity works. Engineer and Manager, April 7th.

An electric supply company in the Far East requires a junior assistant electrical engineer. (See an advertisement on another page.)

## MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. G. Smith and Son, of 5 Philpot Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night, was £70 to £70 10s. (Last week, £68 15s. to £69 5s.)

**Meldrums, Ltd.**—Mr. A. B. Scorer has joined the board of this Company, the London office of which has been moved to 92 Grosvenor Road, S.W.

**W. G. Watson and Co., Ltd.**—This firm, who are well-known electrical engineers, suppliers and contractors, of 279 Clarence Street, Sydney, are about to open a London office. Mr. Watson will be in England toward the middle of the year, and invites communications on business matters.

**Bankruptcies.**—The last day for receiving proofs in the bankruptcy of A. G. Adamson, Electrical Engineer, 22 Willcott Road, Acton, is April 12th. The trustee is the Official Receiver, 14 Bedford Row, W.C.

**Canadian Agency.**—A Winnipeg firm is desirous of getting into communication with British manufacturers of electric stoves. Further particulars, Board of Trade, 73 Basinghall Street, E.C.

## NEW COMPANIES

**SOUTHERN BRAZIL ELECTRIC CO.** Registered by Messrs. Linklater & Co., 2 Bond Court, Walbrook, E.C. Capital £1,000,000.

**ELECTRIC ZINC CO.** 5, The Sanctuary, Westminster. Capital £2,000,000.

# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 328 [Vol. IX., No. 15]  
*All rights reserved.*

THURSDAY, APRIL 10, 1913.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES AND TECHNICAL COLLEGE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

*Other Advertisement Rates on Application.*

*Latest Time for Receiving*

Letters for Insertion, *Tuesday First post.*

Small Advertisements and Official Announcements, *Wednesday First post.*

Displayed Advertisements, *Tuesday First post.*

Corrections in Standing Advertisements, *Monday First post.*

All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 208-206, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Cireling, Fleet, London."

Telephone No.: 5509 Holborn.

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## CONTENTS

	PAGE
SUMMARY ... ..	197
Arrangements for the Week ... ..	198
Electric Cooking at Brighton ... ..	198
Manchester Street Lighting ... ..	198
Electric Supply at Stoke-on-Trent ... ..	199
Paris Meeting of the Institution of Electrical Engineers ... ..	203
Examination Scheme of the Institution of Electrical Engineers ... ..	203
Recent Developments in Street Lighting at Manchester ... ..	203
Witton-Kramer Tube Cleaners ... ..	204
Cinematograph Theatre Dimmers ... ..	204
Cast-iron Distribution Boxes ... ..	204
Questions and Answers by Practical Men ... ..	205
Patent Record ... ..	206
Dispute between Supply Companies ... ..	207
Pending Electrical Law Suits ... ..	207
Telephony and Telegraphy (Including Wireless) ... ..	208
Electric Traction Notes ... ..	209
Local Notes ... ..	209
Tenders Invited and Prospective Business ... ..	209
Tenders Received and Accepted ... ..	210
Miscellaneous Business Notes ... ..	210
Companies' Meetings, Dividends, Reports, &c. ... ..	210

## SUMMARY

A LARGE electric cooking equipment at Brighton is described and illustrated. (Page 198.)

A JOINT scheme of electric and gas lighting for the streets of Manchester has been prepared. (Page 198.)

THE new power house at Hanley, which has been

built to deal with the increasing load in the various districts comprised in the federated borough of Stoke-on-Trent, is now complete. It contains two 1,500 kw. three-phase alternators, and is connected by new trunk mains to converting plant in the older stations at Burslem, Stoke, and Longton. (Page 199.)

THE preliminary programme of the visit of the Institution of Electrical Engineers to Paris next month has been issued. (Page 203.)

PARTICULARS have been announced of the examinations for Associate membership, which are about to be introduced by the Institution of Electrical Engineers. (Page 203.)

THE Paper by Mr. S. L. Pearce and Mr. H. A. Ratcliffe, on Street Lighting in Manchester, has been further discussed by the Glasgow Local Section of the Institution of Electrical Engineers. (Page 203.)

AN electrically worked tube cleaner, some new cinematograph theatre dimmers, and cast-iron distribution boxes are described in illustrated articles on page 204.

A PROBLEM concerning the connections of transformers in the Merz Price protective system is discussed in our Questions and Answers Columns. (Page 205.)

THE specifications published by the Patent Office on Thursday last included one for an automatic starting arrangement for attachment to ordinary motor-starters by W. A. Clatworthy, and one for an adjustable frequency alternator employing pole-changing windings by the Crypto Electrical Co. and H. G. Sharp. A patent by A. Muirhead for sending-on stations in submarine telegraph-working expires during the current week, after a life of 14 years. (Page 206.)

JUDGMENT was reversed in the appeal in the House of Lords by the London Electric Supply Corporation against the Westminster Electric Supply Corporation. No injunctions were granted, but declarations were suggested in which it is set forth that the Westminster Co. must not act detrimentally to the London Co.'s interests in the Westminster area where they are acting as managers of the London Co.'s undertaking. (Page 207.)

WE give particulars of the electrical law suits which are likely to be heard during the Easter sittings. Among them is an important action for infringement of patent by the Marconi Co. against the Helsby Wireless Telegraph Co. (Page 207.)

Two further members of the House of Commons Committee inquiring into the Imperial wireless telegraph scheme have resigned. It is expected that the Technical Committee appointed by the House of Commons will report early in May.—We review the first issue of the *Wireless World*, issued by Marconi's Wireless Telegraph Co.—Reference is also made to the

New York—San Francisco telephone line. (Page 208.)

SATISFACTION is expressed with the working of the Stevens petrol-electric 'buses at Liverpool.—Two petrol-electric motor-cars have been put into service on the Chicago, Milwaukee, and Puget Sound Railway.—The Chief Railway Commissioner to the Victorian Government is to visit Europe and America to study electric railways. (Page 209.)

THE Coventry Corporation have been granted powers to extend their electric supply area in spite of opposition by the Leicestershire Power Co.—A proposal to supply power at  $\frac{1}{2}$ d. per unit in Aberdeen has given rise to much discussion.—The rateable value system of charging is recommended for adoption at Sheffield.—The Stockton Corporation are to take a supply in bulk from the Cleveland Power Co. (Page 209.)

SUB-STATION switchgear is required at Bradford; mains at Halifax, Newcastle-under-Lyme, and Stoke-on-Trent; plant, mains and sub-station equipment at Leeds; generating plant at Mexborough and Newport (Mon.). A loan of £2,000 is to be taken up at Accrington; a rotary converter is required at Stockton; large quantities of telephone material in Tasmania; and a twelve months' supply of incandescent lamps at Bedford. (Page 209.)

## ARRANGEMENTS FOR THE WEEK

(TO-DAY) THURSDAY, APRIL 10TH.

*Institution of Electrical Engineers.*

8 p.m. "Self-Synchronising Machines (Self-starting synchronous motors and rotary converters)," by Dr. E. Rosenberg.

*Institution of Electrical Engineers: Dublin Section.*

8 p.m. At Royal College of Science. "Interpoles, their Design and Use," by R. G. Allen.

FRIDAY, APRIL 11TH.

*Physical Society.*

8 p.m. At Imperial College of Science, S. Kensington. "On Some Errors in Magnetic Testing due to Elastic Strain," by A. Campbell and H. C. Booth.

SATURDAY, APRIL 12TH.

*Birmingham and District Electric Clubs.*

6.30 p.m. At Swan Hotel, New Street. Concert (Ladies' Night).

MONDAY, APRIL 14TH.

*Institution of Electrical Engineers: Western Section.*

4.30 p.m. At Cardiff. "High-tension Continuous Current or the Thury System in Mines," by S. F. Walker.

TUESDAY, APRIL 15TH.

*Illuminating Engineering Society.*

8 p.m. At Royal Society of Arts. Joint meeting with Institutions of Electrical and Gas Engineers, and Institution of Municipal and County Engineers. "The Specification of Street Lighting," by A. P. Trotter.

*Institution of Electrical Engineers: Scottish Section.*

8 p.m. At 207 Bath Street, Glasgow. "Power Supply on the Rand," by A. E. Hadley.

WEDNESDAY, APRIL 16TH.

*Electrical Trades Benevolent Institution.*

6.30 p.m. Annual Festival Dinner at Trocadero.

*Institution of Electrical Engineers: Students' Section.*

7.45 p.m. At Victoria Embankment. "Alternating-current Railway Signalling," by T. J. Hornblower.

FRIDAY, APRIL 18TH.

*Batti-Wallahs Society.*

8 p.m. Smoking Concert at Holborn Restaurant.

## The London Electrical Engineers.

(TO-DAY) THURSDAY, APRIL 10TH. C. Company.—Recruit and Company Training, 7 to 10 p.m.

FRIDAY, APRIL 11TH. D. Company.—Company Training, 7 to 10 p.m.

SATURDAY, APRIL 12TH. Headquarters open from 10 a.m. till noon.

MONDAY, APRIL 14TH. A. Company.—Recruit and Co. Training, 7 to 10 p.m.

TUESDAY, APRIL 15TH. B. Company.—Co. Training, 7 to 10 p.m.

THURSDAY, APRIL 17TH. C. Company.—Recruit and Co. Training, 7 to 10 p.m.

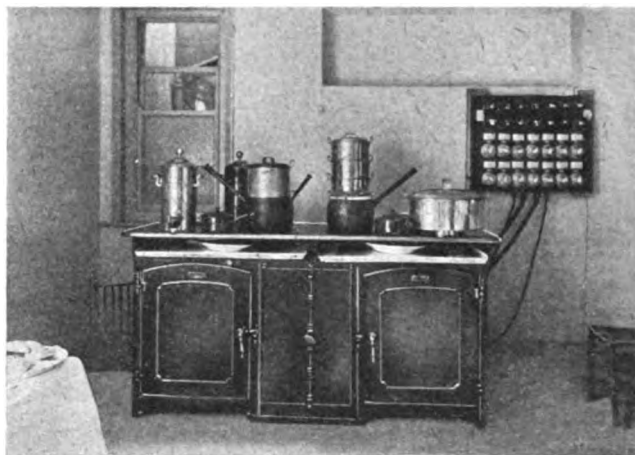
FRIDAY, APRIL 18TH. D. Company.—Co. Training, 7 to 10 p.m.

SATURDAY, APRIL 19TH. Headquarters open from 10 a.m. till noon

## ELECTRIC COOKING AT BRIGHTON

THROUGH the kindness of Mr. J. Christie, Engineer and Manager of the Brighton Electricity Department, we are able to reproduce here a photograph of the first electric cooking installation on a large scale at Brighton. This electric kitchen is due to the enterprise of Messrs. Staffords, of Western Road, and has now been running for a few weeks. The firm has been reconstructing its staff accommodation, and the cooking for a staff of some seventy hands is now being done entirely by the electrical equipment, which was supplied by Messrs. T and J. Jackson, Ltd. (38 Blandford Street, Baker Street, W.). So far, we are told, it has given the greatest satisfaction, and Mr. Christie anticipates as a result of its success a very substantial accession of new business in the electric cooking direction in the numerous boarding houses and hotels of Brighton.

The kitchen is at Messrs. Stafford's boarding house in Crown Street, where the staff dining rooms are situated. The equipment comprises eight hot-plates on which saucepans and other utensils may be placed; two large ovens, where several big joints can be cooked at the same time, and a hot



COMPLETE ELECTRIC COOKING EQUIPMENT.

cupboard in the centre, deriving its heat from the surplus heat of the ovens. All the heating elements are provided with three degrees of heat, and all the control switches and fuses are placed on a distributing board clear of the range, which also carries indicating lamps, so that it can be seen at a glance what circuits are on.

## MANCHESTER STREET LIGHTING

A Joint report upon the lighting of several of the main streets of Manchester, which has been prepared by Mr. S. L. Pearce, Electrical Engineer, and Mr. J. G. Newbigging, Gas Engineer, was approved by the Lighting Committee of the Corporation last Friday. The engineers say they are agreed that a further extension on a moderately large scale of the lighting of the principal thoroughfares in the city should be made with high-pressure gas and electric arc or metal-filament lamps. A schedule of streets allocated to electric and gas lighting respectively accompanies the report. Generally speaking, the shopping districts are to be lighted electrically, and principally those within the central area of the city. In making the division, the position of existing arc lighting cables was considered as well as the suitability or otherwise of the streets for centrally suspended or side lighting, the former being generally allocated to electricity. The length of the streets to be lighted by electricity is 11,835 yds., and that of the streets to be lighted by high-pressure gas is 13,500 yds.

A capital expenditure of £18,000 on gas and £15,000 on electric lighting is contemplated. The scheme does not embrace secondary thoroughfares, &c., and the engineers expressed no opinion as to Stretford Road. By a majority vote of the Lighting Committee, however, this street was added to the list of those to be lighted electrically.

**Meter Approved.**—The Board of Trade have approved of the Chamberlain & Hookham three-phase, watt-hour meter, type A.I.T., and the means for fixing same.



## ELECTRIC SUPPLY AT STOKE-ON-TRENT

THE six pottery towns of Burslem, Fenton, Hanley, Longton, Stoke-upon-Trent, and Tunstall, which now form the federated County Borough of Stoke-on-Trent, are under one management as regards their electricity supply, and the extensions of plant which were becoming necessary at the time of the federation of the different local undertakings have been provided in a new power-house in a central position, instead of additions to the older local stations. This new electricity works is now complete and is being formally inaugurated to-day.

Before describing its equipment, it may be well to give a few particulars of the older systems. The local generating

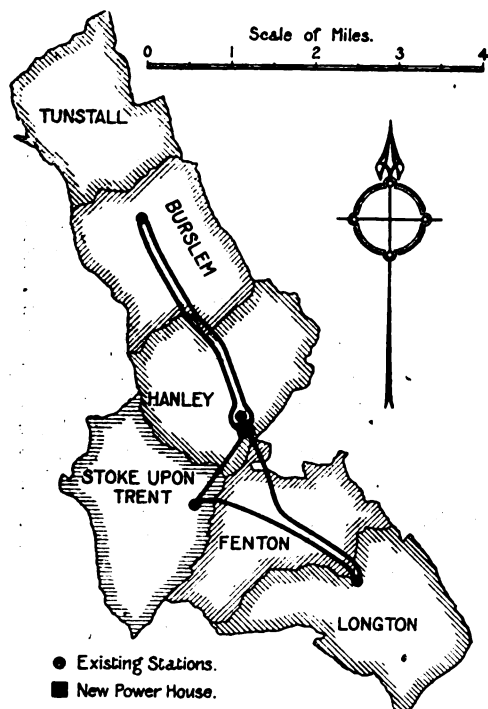


FIG. 1.—SKETCH MAP OF DISTRICT SHOWING NEW AND OLD GENERATING STATIONS AND INTERCONNECTING TRUNK MAINS.

stations were four in number, at Burslem, Hanley, Longton, and Stoke respectively, in the positions shown in Fig. 1, and the following details will give an idea of the size of each undertaking. The Burslem station supplied the northern part of the area, including Tunstall, Burslem, and the district of Wolstanton (outside the federated area), by a three-wire continuous-current  $2 \times 220$  volt distribution system. The output of the station was about 1,700,000 units per annum; the peak load attained to some 930 kw., and the annual revenue was under £11,000. The Hanley system was the oldest, and employs single-phase 2,000-volt distribution, and, with an output of over two million units and a peak load of 1,350 kw., earned nearly £20,000 a year. The two other undertakings were smaller; Stoke sold a little under 1,200,000 units, but its peak load was about 730 kw., and its annual income £7,700; Longton, with its 426,000 units and a peak load under 300 kw., had an income of £4,300. Both of these were three-wire continuous-current systems. We had thus at the time of the federation (in 1910) a continued demand for some  $5\frac{1}{2}$  million units and a peak load of over 3,300 kw. for the whole area of 235,000 inhabitants. The nominal plant capacity at Burslem was 1,250 kw., and at Hanley 2,000 kw., but not more than some two-thirds of these outputs could be dealt with on peak with a proper reserve of plant. The Stoke station, which also supplies Fenton, was loaded up still more heavily with its 800 kw. plant capacity already carrying 730 kw. The small station at Longton was the only one capable of dealing with increasing load, as its 600 kw. of plant were not called on to give half their output. It will thus be seen that extensions of some sort were essential in the district as a whole.

Two propositions were considered to deal with the increasing load. The first was to add plant to the existing stations at a cost of £25,000 to £30,000, and the second to build an entirely new three-phase station

adjoining the old Hanley works, to connect this by trunk mains to the old generating stations, and to provide them with converting plant. The actual cost of the complete new station, with its large units of turbine plant, worked out about the same as that of the additional small units of plant in the first scheme, but the cost of the necessary trunk mains and converting plant brought the cost of the whole scheme up to about £60,000. When the new works was once built, however, the next instalment of plant would cost much less than further additions of plant to the local stations, and again lower working costs, greater flexibility and reliability would be obtained with the inter-connected system. Mr. J. F. C. Snell was called in to advise, and confirmed the Engineer's proposal to adopt the second scheme. The plan was to equip the station in the first instance with two 1,500 kw. sets, to enable it with one running and one as a spare, to supplement the local stations to the extent of dealing easily with the probable increase to the peak load of 3,300 kw. mentioned above, and to provide space and switchgear for further plant to bring the installed capacity up to 9,000 kw., which, considering the local conditions, was estimated to be the "saturation" value of the load.

The amount of power taken in the pottery trade is not very large, and the accession to the lighting load in the straggling districts of which the area is composed should not be difficult to estimate. The position of the station and of the new trunk mains can be seen from Fig. 1. Two 0.10 sq. in. Callender cables, following the same route, lead to Burslem, and the equivalent of a ring main connects the new power-house with the stations at Stoke and Longton.

As will be seen below, the station is equipped with three Stirling boilers and two 1,500 kw. Howden-Siemens three-phase, 6,000–6,600 volt, 50-cycle turbo-alternators, running at 3,000 r.p.m., and Westinghouse switchgear to deal with 9,000 kw. The following sub-station plant also forms part of the new scheme. In the new power-house itself are two 600 kw. motor-generators converting to single phase to add to the supply in the Hanley district. At Burslem two 600 kw. rotary converters have been put in; at Stoke two 500 kw. La Cour motor converters are provided; while

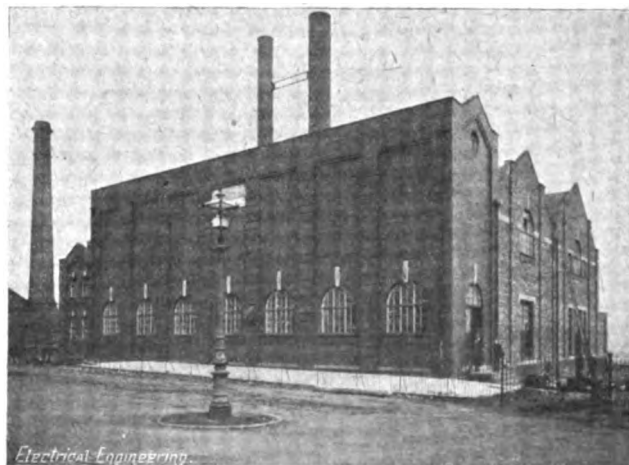


FIG. 2.—EXTERIOR VIEW OF NEW POWER HOUSE.

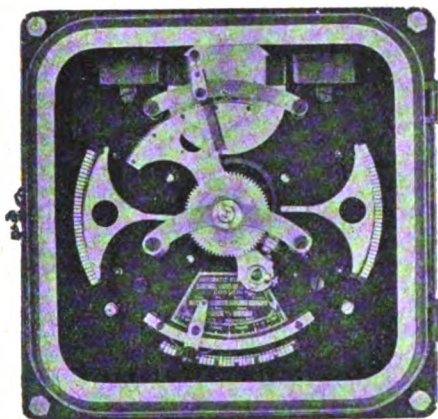
at the Longton station a pair of 300 kw. rotary converters have been installed. It is the general intention to run the new power-house continuously to take the light load, and only to start up the local plants when the peaks come on.

A view of the new power house is given in Fig. 2. It may be said at once that its main characteristics are



# BROWN-BOVERI

## AUTOMATIC PRESSURE REGULATORS



RAPID AND ACCURATE REGULATION.  
NO SPARKING.  
NO "TOUCHING UP" OF CONTACTS.

CAXTON HOUSE  
LONDON S.W.

straightforward simplicity and absence of "fads" and elaborations. What may be described as standard plant is used throughout, and the general lay-out is well thought out and bears distinct evidences of originality and careful study of the conditions. The building itself is of brick, with an

struction is only employed very sparingly, and there is practically no woodwork anywhere. The Borough Surveyor, Mr. A. Burton, acted as architect. His architectural assistant, Mr. P. H. Solon, attended to details and collaborated with the engineer, Mr. C. H. Yeaman. The cost of the building itself did not exceed £7,500.

Coal will be obtained usually by carting, but a short roadway has been made leading up from the adjoining canal, and conveying plant could be arranged to take coal direct from barges if desired later on. The present coal-conveying plant from the hopper to the overhead storage bunker is shown in Fig. 3. The arrangement enables a well-lighted firing floor right opposite the windows to be obtained. The Stirling boilers, three in number, are fitted with the Underfeed Stoker Co.'s platform type of chain-grate stoker. Forced draught is employed, and each boiler has its own short steel chimney. The feed pumps are in a pump room at the far end of the boiler house. A Weir steam pump is provided, as well as an electrically-driven Westinghouse multi-stage turbine pump. In like manner the forced-draught fans can be driven either by steam or electrically.

The engine room, of which a view is shown in the photograph reproduced in Fig. 4, is also extremely light, and a fine effect is obtained by the large windows over the switchboard, the white glazed brick, relieved with green bands, carried half-way up the walls, and the neat tiled floor. The two main sets stand over their condensing plant in the usual way, and there is ample space for future extension. The pump pits between the sets are spacious and well lighted. The turbines are of the Howden Zoelly impulse type. It may be mentioned that they have nine rows of blades and that the full- and half-load steam consumption calculated on delivery of current to the external circuit are 16.8 and 19.42 lb. per kw.-hour respectively. An overload capacity of 25 per cent. continuously and 50 per cent. for ten minutes is guaranteed. The alternators, by Siemens Bros. Dynamo Works, Ltd., are of their standard type with forced ventilation, with 8,280 cub. ft. of air passing per minute axially through the machine from the cubicle chambers beneath the floor through holes actually in the stator plates. Each rotor, which weighs  $4\frac{1}{2}$  tons and is 25 ins. in diameter, consists of a solid forging in one with the shaft, and the winding is embedded in slots accurately machined on the periphery. The exciting coils are of thin, flat copper strip, arranged on the flat both in the slot and beneath the end covers. The capacity of each exciter is 14.5 kw. The net weight of each alternator is approximately 16 tons. The machines are designed to give their rated outputs with a temperature rise not exceeding  $40^{\circ}\text{C}$ . after continuous running. The condensers have 2,150

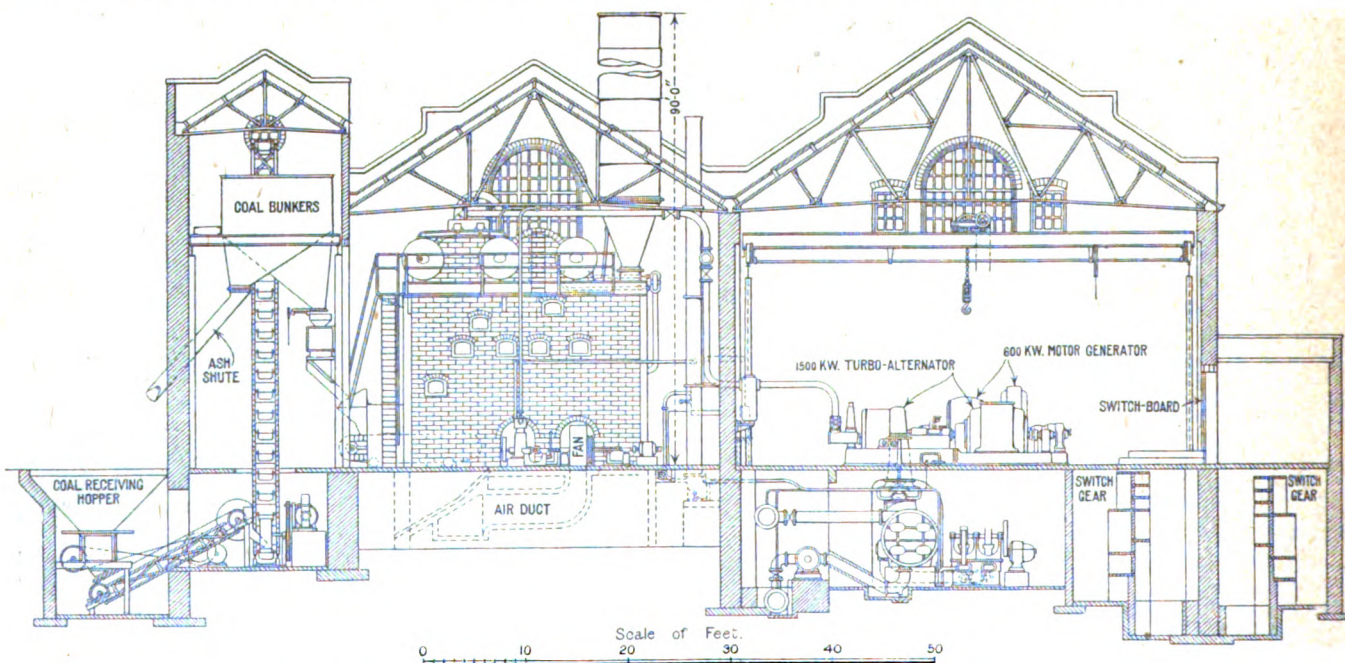


FIG. 3.—SECTION OF NEW POWER HOUSE THROUGH BOILER HOUSE AND ENGINE ROOM.

elevation devoid equally of superfluous ornament and ugliness, and extensive use is made of ferro-concrete in the engine-room floor. Weight-carrying structures are kept as far as possible clear of the walls, even to the length of carrying the traveller gantry on separate columns. Steel con-

tubes each, and are capable of condensing 25,000 lb. of steam per hour with a vacuum of  $27\frac{1}{2}$  ins., with circulating water at  $80^{\circ}\text{F}$ . The pumps are driven by alternating-current motors.

The only other plant is the pair of 600-kw. single-phase



# COUNTY BOROUGH OF STOKE-ON-TRENT

## ELECTRICITY SUPPLY DEPARTMENT.

The whole of the switchgear required for linking up the various stations in the County Borough of Stoke-on-Trent, including new switchboards and extensions to existing switchboards.

Two 600-kw. rotaries, complete with A.C. boosters, exciters, and starting motors.

Two 300-kw. rotaries.

Field rheostats and starting rheostats in connection with these rotaries.

Two 750-k.v.a. OISC transformers and switchgear.

Two 360-k.v.a. OISC transformers and switchgear.

SUPPLIED BY

## THE BRITISH WESTINGHOUSE

— ELECTRIC & MANUFACTURING CO., LTD., —

TRAFFORD PARK,

MANCHESTER.



alternators, running at 600 r.p.m., driven by induction motors, which form the sub-station plant already referred to, and were also made by Siemens Bros. Dynamo Works, Ltd., and a small motor-generator for battery charging purposes made by Bruce Peebles and Co., Ltd. The battery in question has a capacity of 270 ampere-hours and was supplied by the D.P. Battery Co., Ltd. It is placed in a room over the office and lavatories at the far end of the building, and is used for operating the switchgear trips and supplying the station lighting and certain motors in case of emergency.

The appearance of the switchboard is one of the most striking

basement under the switchboard, which is not really underground and can thus be well lighted by windows. The position of the switchcells is shown in the section. The basement also contains the air filters for the generators, the transformers for works service already mentioned, and the bank of resistances through which the neutrals of the generators are earthed. Switches are provided in connection with this so that only one machine is earthed at a time.

Behind the power house on the side further down the hill is placed the cooling tower (by the Davenport Engineering Co.) One will be provided for each generating set. The con-

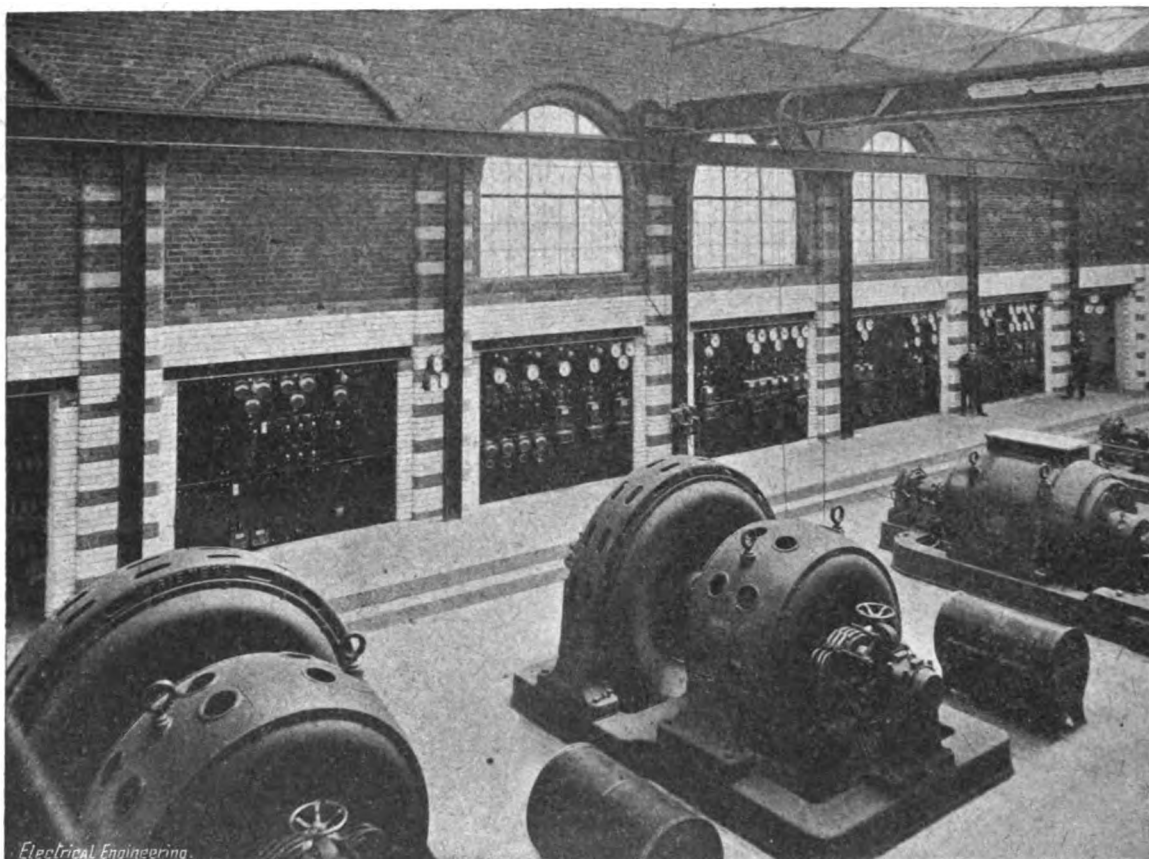


FIG. 4.—VIEW OF ENGINE ROOM SHOWING POSITION OF SWITCHBOARD; THE MOTOR GENERATORS WITH THEIR LIQUID STARTERS ARE IN THE FOREGROUND, AND ONE TURBO-GENERATOR ON EXTREME RIGHT.

features of the engine room. The vertical slate control panels are let into openings under the windows so as to be flush with the wall, and the switchboard platform, instead of being in a high gallery, is only raised 15 in. above the main floor by two steps. It has no rail, and access can be had to any part of it immediately from the engine room. The familiar high switchboard gallery was perhaps originally due to the use of tall reciprocating engines, with which it was necessary to ensure a commanding view of the engine room, but there is no reason why it should survive in turbine stations. The whole of the switchgear was supplied by the British Westinghouse Electric and Manufacturing Co. The actual switchgear is contained in cells below the engine-room floor level, and only instruments and control gear are mounted on the board. The sets of panels are five in number, arranged in the following order from left to right: generator panels, bar coupling and summation panel, H.T. feeder panels, motor-generator and works panels and L.T. battery and motor panels. Of individual panels there are twenty-five. A Brown-Boveri automatic voltage regulator is provided for the main generators, and it may be mentioned here that the generator protection will be on the Merz-Price system, but the pilot cables have not yet been provided. There is an ample passage-way behind the board, and the connections are arranged in a neater and more accessible way than we can remember having seen elsewhere. The works switchboard is situated in this space behind the main board immediately above the transformers, to which it is connected. Owing to the situation of the building on a hill it has been possible to obtain a deeper basement under the engine room than under the boiler house without much excavation, which is convenient for the accommodation of the condensing plant, and a still deeper

condensing water is drawn from the adjoining canal, and very complete straining arrangements with Bracket screens are provided in a screen house on the bank.

In concluding the description of this interesting station, we wish to express our thanks to Mr. C. H. Yeaman, Electrical Engineer to the Borough of Stoke-on-Trent, who is responsible for the design of the station, for facilities afforded to our representative on the occasion of his visit to the works, and for putting drawings of the station at our disposal.

**The Institution Council Election.**—We regret that the name of Mr. E. Russell Clarke, who is nominated for the new Council of the Institution of Electrical Engineers, was given in error as Mr. E. Clarke Russell, on page 183 of our last issue.

**Standard Street Lighting Specification.**—A Paper on the work done by the Joint Committee of the Institution of Electrical Engineers, the Institution of Gas Engineers, the Institution of Municipal and County Engineers, and the Illuminating Engineering Society, in connection with a standard specification for street lighting, will be read by Mr. A. P. Trotter at the Society of Arts on Tuesday next, at 8 p.m. It is intended to stimulate and to continue the discussion of the general principles on which the specification should be based. We understand that the Paper will be frankly controversial, and it has been decided that, in order to allow time for the fullest discussion, the Paper will not be read. Those who desire to attend the meeting should therefore obtain copies in advance; they may be obtained from Mr. L. Gaster (Hon. Secretary of the Illuminating Engineering Society), 32 Victoria Street, S.W.



## PARIS MEETING OF THE INSTITUTION OF ELECTRICAL ENGINEERS

THE provisional programme of the visit to be paid by the Institution of Electrical Engineers to Paris at the invitation of the Société Internationale des Electriciens on May 20th to 24th, has now been issued. Ladies are invited to take part in the meeting.

The party will travel on Tuesday, May 20th, by the 11 o'clock service via Calais, and the inaugural meeting will take place on the following morning at the Conservatoire des Arts et Métiers, where there will be a discussion on the electrification of railways, and opportunity will be given to inspect the exhibits at the Conservatoire. For the afternoon two alternative visits have been arranged: one party will be taken by motor omnibuses to the generating stations at St. Denis and Asnières of the "Electricité" and "Triphasé" companies, while the other will take steamboat to St. Cloud and visit the Sèvres Porcelain Factory. In the evening a reception will be given by the Société Internationale des Electriciens, at which a cinematograph demonstration will be conducted by M. Gaumont.

At Thursday morning's meeting there will be a discussion on long-distance transmission of electrical energy by (a) continuous current, Thury system (Paper by Mr. J. S. Highfield), and (b) three-phase current (Paper by M. Maurice Leblanc). For those not attending the meeting a visit to the Aerodynamical Laboratory of Mr. Eiffel, at Auteuil, under the guidance of M. Eiffel, has been arranged, and alternative visits to the Louvre, the conciergeries, Notre-Dame, the Sainte Chapelle and other places of interest, are suggested. In the afternoon, M. Eiffel will receive the visitors at the highest platform of the Eiffel Tower, and an inspection of the wireless installation will be made. A visit to the Invalides will also be made. An alternative visit will be to the electrical installations of the Metropolitan, the Nord-Sud and the Compagnie des Omnibus. On Friday the discussion on long-distance transmission will be continued, and alternative visits to the Louvre, the Panthéon, the Luxembourg and the Musée de Cluny; the Conciergerie, Notre Dame and the Sainte Chapelle, or to other places of interest, are suggested.

On Saturday a Paper will be read by M. Claude on "Lighting by means of Vapour Tube Lamps," with experiments, and a lecture will be given by Commandant Ferrié on "Wireless Telegraphy." The alternatives for the morning will be visits to the Louvre or to the Panthéon, the Metropolitan and the Musée de Cluny. The afternoon excursion will be by motor-omnibus to Versailles, where the palaces and the park will be visited, and tea will be taken at the Trianon. Afterwards a visit will be paid to the Aerodrome at Buc, and at the Gare de Versailles, before the return to Paris, an inspection will be made of the new electrical rolling stock of the Ouest-Etat Railway. The official visit will terminate on Saturday evening, but doubtless many will remain in Paris over the week-end. Special railway arrangements have been made, and the fee for those taking part will be £5 5s., which will include 1st-class return fare from London to Paris and the expenses of the excursions and visits. Members will make their own hotel arrangements and are advised to book their rooms well in advance. The reception bureau of the Société Internationale des Electriciens will be at the Hôtel Continental.

**Diesel Engines.**—A Paper entitled "Some Notes on the Design and Economy of Diesel Oil Engines" was read by Captain H. Riall Sankey before the Association of Engineers-in-Charge on April 9th. Comparing the cost of running Diesel engines with other prime movers, the Author pointed out that the condensing steam engine can for short periods give as much as 50 per cent. above the rated power, while non-condensing steam engines and the Diesel engine can give 10 per cent., but the gas engine can usually only do its rated power for short periods, and about 85 per cent. continuously. Taking the case where an average load of 200 h.p. and a maximum of 300 for short periods is required, and the total running hours 3,000 per year, the following total annual costs were given:—non-condensing steam plant, £1,445; condensing steam plant, £1,056; oil engine, £1,055; gas-engine suction producer, £1,006; gas-engine pressure producer, £996; Diesel engine, £932; overtype superheated condensing plant, £879. In this connection interest on capital was taken at 5 per cent., and stores, labour, maintenance, repairs, and depreciation and fuel cost were taken into account. The latter costs per ton were taken as: oil, 42s.; coal for pressure producers, 18s.; coal for suction producers, 28s.; coal for steam boilers, 18s. Only 120 tons of fuel are required for the Diesel engine, while 1,022 tons are required for the non-condensing steam plant.

## THE NEW EXAMINATION SCHEME OF THE INSTITUTION OF ELECTRICAL ENGINEERS

ON and after June 1st, candidates for election or transfer to the class of Associate Member will (unless they hold a British University engineering degree or a diploma from certain technical colleges) be required to pass a written examination or to present a thesis upon which they may be orally examined. The examinations will be held twice a year, in April and October, in London, and possibly in other centres. The entrance fee for the examination will be £2 2s. for the first entry (except for students who have paid at least three annual subscriptions, who will be charged £1 1s.), and £1 1s. for any subsequent entry. Applications must be sent in not later than March 1st for the April examination, or not later than September 1st for the October examination. The first part of the examination will consist of an English essay or a translation into English of passages in French, German, Italian or Spanish, and papers on applied mechanics and either elementary physics or chemistry. The second part will consist of two papers on one of the following subjects: electricity supply, electric lighting and power, electric traction, telegraphy, telephony, application of electricity to mines, electro-chemistry and electrometallurgy, manufacture of electric machinery (including works management), or design of electric machinery and apparatus. The papers in Part II. will include optional questions on administrative and economic matters. A British University Science degree will exempt from Part I.

## RECENT DEVELOPMENTS IN THE STREET LIGHTING OF MANCHESTER

THE Paper on this subject by Mr. S. L. Pearce and Mr. H. A. Ratcliffe, read at the London meeting of the Institution of Electrical Engineers on March 6th, and already discussed in Manchester and Birmingham (see ELECTRICAL ENGINEERING, March 13th, p. 141, and March 20th, p. 162), was discussed by the Scottish Local Section at Glasgow on March 18th.

Mr. R. B. Mitchell spoke in favour of lowering gear and automatic switching as adopted in Glasgow as minimising the attendance required, and referred to the falling off in candle-power of high-pressure gas mantles. He did not think that the effect of glare with clear glass globes was as serious as had been made out, but regarded clear globes with the lower surface only obscured as inevitable in view of the competition to be faced. With dioptric inner globes fumes condensed on the cold surface of the outer globe, and in a very short time obscured it.

Mr. A. Wilson (General Manager, Glasgow Corporation Gas Department) said that the falling off in candle-power of gas mantles had been greatly overrated. In arc lighting the candle-power also varied a great deal. Apparently the poorer results with the gas lighting in Manchester were due to excessive leakage, and to the lamps not having been adjusted to suit the Manchester conditions. They were not satisfied in Glasgow with 60 c.p. per cub. ft. per hour. In several ways, the costs at Manchester seemed high.

Mr. J. S. Roberston (Burgh Electrical Engineer, Greenock) referred to the want of a standard street lighting specification. Arc lamps were better adapted to lowering gear than gas. He was not sure, after all, that centre suspension was best from the point of view of the traffic. He thought that, if anything, the authors had overstated the cost of current.

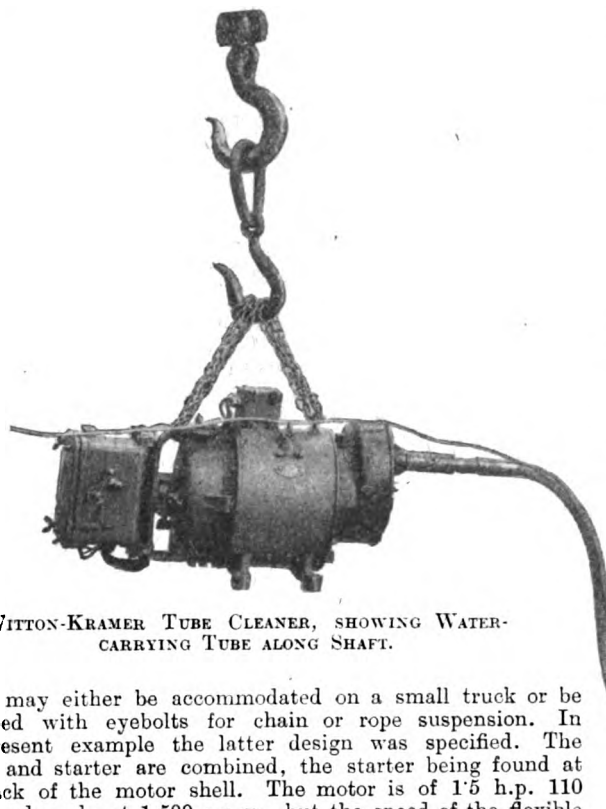
Mr. S. B. Langlands (Inspector of Lighting, Glasgow) put the deterioration of gas mantles at 17 to 19 per cent., and expressed a preference for laboratory rather than street tests of lamps.

Both Mr. Pearce and Mr. Ratcliffe were present, and replied briefly. An interesting point brought out by Mr. Pearce was that the life of the gas mantles depended largely on the nature of the traffic and the vibration arising therefrom.

**The Strength of Metal Filament Lamps.**—The General Electric Co., Ltd. (67 Queen Victoria Street), send us an illustration of a lantern containing a 100-volt, 20-watt Osram lamp which met with an accident and dropped from its position on to a stone floor, a distance of 17 ft. The framework of the lantern was bent out of shape and badly damaged, but the Osram drawn-wire lamp, which had fallen with it the entire distance of 17 ft., was found to be in perfect condition, and when tested instantly lit up. Another interesting case has been furnished to them by Messrs. Henry Wallwork and Co., of Manchester. In their lighting installation they use 200-watt Osram drawn-wire lamps suspended from special fittings. Through some defect in the holder of one of the fittings, arcing set up, which burned away the barrel of the holder, causing the Osram lamp to drop to the bottom of the glass globe. The lower portion of the globe was broken, but sufficient glass remained to keep the lamp from falling further. On examination this lamp has also been found to be intact, with the exception of a slight defect in the cap.

### WITTON-KRAMER TUBE CLEANERS

FOR some years now the Witton-Kramer Electric Tool and Hoist Co., of Witton, Birmingham, for whom the General Electric Co., of 67 Queen Victoria Street, London, are the sole selling agents, has been turning out electrically-driven tube cleaners. A recent example, which was built to Admiralty specification, is shown in the accompanying illustration. In the Witton-Kramer tube cleaners the portable



WITTON-KRAMER TUBE CLEANER, SHOWING WATER-CARRYING TUBE ALONG SHAFT.

motor may either be accommodated on a small truck or be equipped with eyebolts for chain or rope suspension. In the present example the latter design was specified. The motor and starter are combined, the starter being found at the back of the motor shell. The motor is of 1.5 h.p. 110 volts, and works at 1,500 r.p.m., but the speed of the flexible shaft is reduced to the required working speed by machine-cut, case-hardened steel gearing running in oil. To the slow-speed spindle of this gearing is attached the flexible shaft, which consists of a central core of steel wire wound in alternate directions. Special end-bearings to the shaft are provided. As to the cleaner head, this is of the George and Dormoy patent type, and consists of three groups of cutters arranged conically, sloping away from the shaft. The cutters are held in a frame, and successive cutters have teeth of unequal pitch. The scale is attacked gradually along the conical surface, so that the work is evenly distributed amongst the cutters. Springs press the cutters against the scale and permit them to pass round curves and to do their work, in spite of the tube being flat or oval. It is important to distinguish between a cutter head of this pattern and one which relies on centrifugal force for its cutting action.

### DIMMERS FOR CINEMATOGRAPH THEATRES

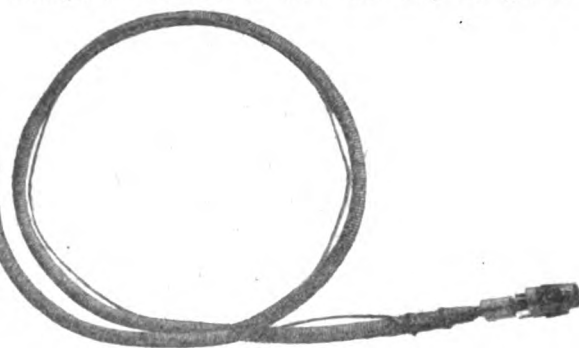
THE effect on the eyes of the sudden turning up of the auditorium lights after the comparative darkness during the entertainment is most trying, and the special type of "dimmer" which the Adams Manufacturing Co., Ltd., have produced to enable the change from darkness to light to be made gradually should be very welcome. They can be arranged so that the same movement which gradually brightens the white light will also gradually dim the red light, or vice versa. The dimmers occupy very little space and can be mounted within the operator's cabin.

Each dimmer consists simply of a resistance plate on a soapstone base in an iron housing, with a large number of contacts, and an operating handle arranged with an "off" as well as a "full on" position. The resistance material (which consists of wire or tape of various alloys, according to the ampere capacity and ohmic resistance required) is placed in slots cut in the soapstone and connected at various points to contacts attached to the soapstone base. The whole of the resistance is then hermetically sealed by filling the slots in which it is placed with a patent fireproof cement, which, when set, practically amalgamates with the soapstone. The terminals are bolted into the soapstone and attached to

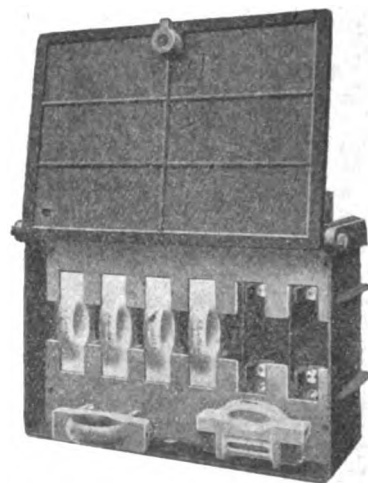
the resistance material by means of conductors embedded in the soapstone like the resistance material itself. The contact lever is carried on a hub post bolted into a central hole in the soapstone. It will be seen that the soapstone forms an insulating and protecting base, and further mechanical protection is provided by the iron housing, which is further insulated from the soapstone base by means of mica. This housing has ventilating slots so as to permit a current of air to pass over the soapstone base and carry away any heat that may be generated in the resistance. This construction is not only exceedingly robust mechanically, but it is also absolutely fireproof. We are informed that a burn-out of the resistance in one of these dimmers has never yet occurred, but should such a thing happen, there could be no external fire or spark. The rating of the resistance allows ten seconds to dim (or switch off) and ten seconds to raise (or switch on), with an interval of not less than one minute between each of these operations.

### CAST-IRON DISTRIBUTION BOXES

AMONG new designs of apparatus recently brought out by A. Reyrolle and Co., Ltd. (Hebburn-on-Tyne), is the special form of dustproof distribution box illustrated here. This is contained in a cast-iron case and is provided with the Company's patent self-aligning fuse handles, such as have already been described in our columns (ELECTRICAL ENGINEERING, Oct. 5th, 1911, Exhibition Supplement, p. 56). The arrangement of these is such that they are guided by the



shape of the porcelain handle block carrying the fuse clip direct into the contacts, and by their construction thorough ventilation is secured. These boxes can be equipped for S.P., D.P., or T.P. circuits, and in all cases where fuses of different polarity are put into the same box, substantial insulating fillets are interposed between the poles or phases.



DUST-PROOF DISTRIBUTION BOX.

Insulating screens, as shown in the figure, can be fitted if required, and form an excellent safeguard against accidental shocks and burns. The boxes thus meet all the requirements of the Home Office. A watertight form of this box is also made, and simpler forms of interior, with or without switches inside the box, have been standardised as well. Specially arranged bolts draw up the cover in the watertight pattern, and two patterns of gland are used according as the incoming cable is armoured or not. In the former case provision is made for gripping the armouring so as to ensure electrical continuity for the earth connection.

## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelopes.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,334.

I should be glad if any of your readers would give their experiences of the various kinds of "burglar alarms"—not necessarily confined to the ultimate test—as suited to an occupied house, i.e., where communication with a police station or boy messengers' office is not important. I am aware of the system of "treads" in the floor, working bells and lights by clock-work, which has been satisfactorily tried, but desire to know of any other efficient methods.—"B."

(Replies must be received not later than first post April 17th.)

### ANSWERS TO No. 1,332.

The switch of a 3-phase alternator fitted with discriminating fault protection of the Merz-Price balanced type has been giving considerable trouble by opening repeatedly owing to the action of the relay without apparent cause, as no fault can be discovered in the generator. The relay connections and pilot connections are quite sound and unbroken, and the balance of the current transformers proved sufficiently good right up to short-circuit current, and, indeed, the plant often runs satisfactorily for days without trouble of any kind. The neutral of the alternator, which is in parallel with others, is earthed. "Current" balancing is utilised with a relay across the mid-point of the pilot. The current transformer secondaries are both star-connected and their neutrals earthed, and there are no overload or time-limit fuses. What is the cause of the trouble?—"KINK."

The first award (10s.) is made to "S.F." for the following reply:—

The trouble experienced is doubtless due to the fact that the neutrals of both sets of current-transformer secondaries are earthed instead of one set only, consequently the relay circuit will pick up stray earth currents and operate the oil-switch. The neutral point of one set of transformers will doubtless be connected to the main earth plate, to which all the fault currents of the system will flow, whilst the neutral point of the other set of transformers may be earthed some distance away. There will therefore be a difference of potential between these two points, which will upset the balance in the relay circuit. It must be remembered that the relay is set very light and will operate with a fraction of an ampere, so that even feeble stray currents are sufficient to cause the trouble. Merz-Price relays have also been known to operate when a machine is being synchronised, provided the neutral points of the incoming and running machines are both earthed. Earth cross-currents pass under these conditions, and have the same effect as "fault" currents mentioned above. Fig. 1 shows how the connections should be made with the neutral of the secondaries earthed at one point only, and an insulated copper connection coupling up the neutrals of the two sets of transformers. The latter connection is important, as, if it is deleted, the relay is liable to operate when faults occur external to the generator for the following reasons. (1) In

the event of a fault developing on some part of the system, current will return to the generator by a fourth path, i.e., via the earth connection. (2) With no fourth wire in the secondary circuit the secondary currents are no longer fac-similes of those in the primary, since the sum total of the secondary currents in either direction must be zero at every

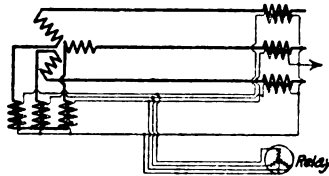


FIG. 1.

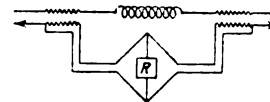


FIG. 2.

instant, whilst this is obviously not the case with the primary currents. As the primary and secondary currents no longer balance, it follows that considerable differences of potential exist at the transformer secondary terminals and consequently between the secondary leads, with the result that the relay operates. Fig. 2 shows single-phase connections with one terminal of each current transformer earthed. It is at once obvious that a portion of the "earth" current would pass through the relay.

The second award (5s.) is made to "M.P.," who writes as follows:—

Your correspondent's trouble is due to the fact that he has the star points of the secondaries of both sets of series transformers earthed. A path is thus laid open for stray earth currents to pass in at one earth connection and out at the other via the series transformers, pilot wires and relays. The effect is more pronounced if the two sets of series transformers are far apart. The earth currents may be due to the system itself or to any other whose route lies across the path of the protective gear. If, therefore, your correspondent will disconnect the earth wire on one of the sets of series transformers, leaving the star point of the other set still earthed, the path will be broken and the trouble overcome. The writer had an almost parallel case with a feeder in the early days of Merz-Price gear.

**The Association of Consulting Engineers.**—We have received a copy of the report of the committee of this association for the year ended December 31st, 1912. The history of the inception of the association, which is familiar to our readers, is outlined, and a list of the committee elected at the first meeting of duly enrolled members, in July, 1912, is given, together with extracts from the draft memorandum and articles of association defining the qualifications and duties of members. The formalities connected with the registration of the association are, however, not yet complete. The Association has been invited to participate in an International Congress of Consulting Engineers and Engineering Experts at Ghent, where the formation of an International Federation of Association of Consulting Engineers will be considered. Up to the present, between eighty and ninety eligible candidates have applied for membership. The committee has already taken action with reference to one or two competitive tenders where the conditions were thought unsatisfactory, and has been giving consideration to the standard clauses of contract prepared by the B.E.A.M.A., but report that they are of opinion that "it is not possible to frame one set of conditions applicable to all contracts, and that it must be left to the independent judgment of individual engineers and their legal advisers to decide what conditions are best suited to any particular contract." With reference to requests that a standard scale of professional fees should be drawn up, the committee express the opinion that "it would not be advisable to attempt to stereotype rates of remuneration." Other matters referred to in the report are the question of Government officials acting as consulting engineers, and the taxing of engineers' fees in law cases. "It cannot," says the report, "be too widely known that the decision of a taxing master is only as between party and party, and that he has no authority to say what the parties shall pay their engineering advisers." A separate pamphlet, entitled "The Professional Rules and Practice of Members of the Association of Consulting Engineers," is being issued.

# "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

## Specifications Published April 3, 1913

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

6,212/12. **Pressure Regulation of Distributing Systems.** B.T.-H. (*G.E.C., U.S.A.*). As applied to a three-wire system each dynamo or balancer has in the field circuit a resistance which is short circuited through a relay controlled by another relay with two balanced windings, one across each outer and the neutral. It is thus arranged that one resistance is in circuit while the other is out, so that rapid following of load variations is possible. One figure.

6,599/12. **Automatic Attachment for Motor Starters.** W. A. CLATWORTHY. To a pivotted lever is attached a weight or spring, and a movable detent. A pivotted quadrant has a notch or projection for engaging the detent, and is attached to the motor-starter, of the ordinary non-automatic kind, by a flexible coupling. A pivotted tripping arm is also provided for tripping and maintaining the detent in its non-engaging position. The pivotted lever and tripping arm are manually operated in one direction only. It is suggested that a suitable application of this gear would be to a hoist operated through fast and loose pulleys, and where the starter may be operated for starting and stopping by unskilled persons from different floors by a rope. Four figures.

10,427/12. **Adjustable Frequency Alternator.** J. G. SHAW and C. R. SHAW (Crypto Elec. Co.) and H. G. SHARP. The windings on adjacent poles are connected in a number of groups. One at least is connected with the energising source through a multiple pole change-over switch, so as to form a number of magnetic fields equal to the number of pole pieces, or to the number of pole pieces divided by the number of groups. The armature winding is also wound after the same manner, together with coils having a larger span connected to a change-over switch, so that they may be connected to the main coils. One figure.

10,996/12. **Starter for Internal Combustion Engines.** B. BROOKS and W. HOLZ. To keep the electric starting motor small it drives a flywheel which is connected to the engine, when this is desired to be started, by a suitable clutch. The flywheel itself may form one member of this. Three figures.

12,594/12. **Laundry Irons.** C. KENRICK. A pair of insulated metal plates (cast iron) clamp the leads in contact with the resistor, which is wound on insulating (mica) formers, and inserted between the plates. This element may be inserted in an ordinary design of iron. Five figures.

17,761/12. **High Pressure Insulators.** W. FELLEBERG. To protect insulators of overhead lines from pressure surges and atmospheric discharges occurring simultaneously metallic rings are embedded in the surface of the insulating material so that arcs are prevented from passing inwardly through the insulator body. Their distances apart are such that arcing across will take place before the insulator is submitted to destructive stress. Six figures.

19,787/12. **Rotary Engine and Electro-magnetic Transmission.** A. BELDIMAN. Radial cylinders rotate about a fixed crankshaft. The support connecting the cylinders together forms the armature core of a dynamo, while the motor field magnet is common to that of the dynamo. Two figures.

486/13. **Railway Track Point Working.** J. S. HOLLIDAY (*U.S.A.*). An A.C. repulsion motor is used to work the points. It has two field windings, both of which are connected to a single-phase supply, but one is disconnected when the movement and locking of the gear have been accomplished, and is then connected to an indicator which is operated by current generated by the continued rotation of the motor running as a single-phase induction motor. One figure.

## Specifications Published To-day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, E.C., at the price of 8d. each, post free.

Names in italics indicate communicators of inventions from abroad. Summaries of some of the more important of these patents will appear in our next issue.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** HANDCOCK, DYKES and DUDDELL [Control of apparatus and signalling over distributing systems] 6,716/12 and 5,307/13; SCHMID [Selectively operating apparatus] 14,121/12; B.T.-H. (*G.E.C., U.S.A.*) [Circuit protection] 16,708/12.

**Dynamos, Motors, and Transformers:** LEBLANC [Vapour apparatus] 6,655/12; DENNY and EDGEcombe [Collectors for slip-rings] 8,640/12; TATTERSALL [Regulating the output of dynamos] 1,205/13; KETTERING [Differential compound dynamos] 5,545/13.

**Electrometallurgy and Electrochemistry:** MORGAN CRUCIBLE CO., DAVISON and HARVEY [Furnaces] 6,808/12; HELFENSTEIN [Induction furnace] 14,164/12.

**Heating:** MANN [Vacuum electric water-heater] 12,367/12.

**Ignition:** THOMPSON [Spark plugs] 20,248/12.

**Switchgear, Fuses and Fittings:** HATFIELD [Time switches] 6,404/12; MOLLER [Automatic circuit-breakers] 6,990/12; TROOD and DALE [Cable connectors] 9,909/12.

**Telephony and Telegraphy:** CHAMBERS [Wireless] 7,242/12; SCHIESSLER [Production of undulatory currents] 18,655/12; THOMPSON (*Cie Universelle de Telegr. & de Teleph. Sans Fil.*) [Production of high-frequency currents] 24,957/12; EVANS [Transmitting orders, &c.] 26,694/12.

**Traction:** MERZ and REDMAN [Protecting railway conductor rails] 7,591/12; WEENEN, STOFFELS and VAN DER SPENKEL [Controlling tramway points and signals] 19,160/12; SIEMENS BROS. & CO. and FERREIRA [Railway-point detectors] 25,159/12.

**Miscellaneous:** RUMOLINO [Transmitting mechanism for marine engine governors] 6,828/12; HALDEN [Photo-copying frames] 10,183/12; IVINSON and BRYANT [Medical apparatus] 12,757/12; FIELDING [Friction clutch gear for boat hoists] 12,892/12; WILSON [Therapeutics] 16,758/12; EDELMANN [Alarm thermometers] 20,342/12; STIMSON [Automatic fans] 23,576/12; LILJEBLAD and ART. ELEVATOR [Automatic lifts] 23,918/12.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** ENTZ [Automobile engine starting and lighting systems] 25,386/12; SIEMENS SCHUCKERT [Circuit protection] 6,164/13.

**Dynamos, Motors, and Transformers:** HARTMANN [Metal vapour rectifiers] 15,937/12; BERGMANN A.-G. [Reversing polyphase commutator motors] 4,691/13.

**Ignition:** BOSCH [Time adjusting] 4,692/13 and 4,693/13.

**Incandescent Lamps:** JUST [Filament manufacture] 4,034/13.

**Storage Batteries:** SABLON [Tight reversible case] 6,066/13.

**Switchgear:** KRUPP A.-G. [Time switches] 3,825/13.

**Telephony and Telegraphy:** CLAUSEN [Telephony] 15,057/12; TELEPHON APPARAT FABRIK ZWIETUSCH [Automatic switch control] 2,700/13.

**Miscellaneous:** KRUPP A.-G. GRUSONWERK [Magnetic separator] 4,595/13; DES ORDONS [Clock synchronising by wireless] 6,192/13; KRAUS [Electrostatic separators] 6,336/13.

## Expiring and Expired Patents

The following Patents expire during the current week, after a life of fourteen years:—

7,525 of April 10th, 1899. **Submarine Telegraphy.** A. MUIRHEAD. The specification states that the invention is for means for re-transmitting signals without local transmitters. Means are also provided to preserve the zero of the organisation and to improve the character of the local contacts. The signal coil or some part of the receiving circuit is automatically "curbed." The means which impart directive force to the recorder coil of a siphon recorder or other part of the receiver actuated by the cable current are utilised to effect the re-translation. A second coil is mounted in connection with the usual coil of a siphon recorder, and supported by it is a loosely mounted contact tongue which plays between the terminals of a split battery, connected to the second cable. Nineteen figures.

7,892 of April 14th, 1899. **Secondary Batteries.** E. W. JUNGER. The active materials remain the same on charge or discharge. The active material of both electrodes consists of finely divided metals insoluble in the electrolyte (alkaline), or oxides of metals which do not give up free hydrogen when the battery is active. Sodium or potassium hydrates and silver and copper are mentioned. The E.M.F. is 0.95 to 1 volt.

The following are the more important Patents that have become void through non-payment of renewal fees.

**Arc Lamps:** SIEMENS & Co., GEB. [Feeding negative electrode in search lamps] 15,338/07.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** J. W. GREENWOOD and D. E. BROWN [Tell-tale for use in vehicle lighting systems] 28,941/06; E. WEIDINGER and H. KAHN [Insulating material] 23,117/07.

**Dynamos and Motors:** B.T.-H. (*G.E.C., U.S.A.*) [Treating carbon for brushes] 28,062/04; [Squirrel-cage induction motor rotors] 26,137/07.

**Ignition:** J. L. LE PONTOIS [System using inductor alternator and transformer] 26,590/05.

**Instruments and Meters:** CIE. POUR LA FABRICATION DES COMPTEURS ET MATERIEL D'USINES A GAZ [Single-phase induction motor meters] 21,208/03; H. A. JONES and A. FARNELL [Speed indicators and revolution counters] 28,139/07.

**Traction:** B.T.-H. (*P. E. Case, U.S.A.*) [Dead man's handle motor controller] 25,448/99.

**Miscellaneous:** A. DENNY and C. H. JOHNSON [Electro-magnetic torsion dynamometer] 27,842/03.



# ADAMS IGRANIC

ELECTRIC MOTOR CONTROL GEAR FOR CAPSTANS.

ADAMS  
M<sup>E</sup>C<sup>O</sup> L<sup>T</sup>D  
BEDFORD  
AND  
LONDON

## DISPUTE BETWEEN SUPPLY COMPANIES

**T**HE appeal by the London Electric Supply Corporation, in the House of Lords, against the Westminster Electric Supply Corporation relating to supply in the Westminster area, has been successful.

In this appeal the London Company sought an injunction to restrain the Westminster Company from conducting the management of the London Company's business in the Westminster area in a way whereby the London Company's business is decreasing in that area. The London Company had deputed the Westminster Company their managers in the Westminster area, under certain conditions, under the powers of the Act of 1909. The first part of the present hearing was reported in *ELECTRICAL ENGINEERING* for Feb. 27th, p. 117, and the process of the case through the Lower Courts may be traced from *ELECTRICAL ENGINEERING*, Vol. VII., pp. 63, 132, 190, and 404.

Sir Robert Finlay, in the course of his speech for the Westminster Company, submitted that under the agreement all old customers of the London Company were secure, but he maintained that no new customer was entitled to demand any special supply of electricity. His contention was that the Westminster Company had become managers, of a very special kind, of the London Company's business in the Westminster area. The London Company supplied alternating current from its mains, and by a Provisional Order obtained in 1908 it could supply direct current, though it had, in effect, only put down machinery for this purpose south of the Thames. By entering into this agreement with the Westminster Company, they were enabled to supply direct current, by purchase from the Westminster Company, as well as alternating current, and since by the same agreement they handed over the management of their business in the Westminster area to the Westminster Company, the latter could supply any consumer in that area, asking the London Company for a supply, with either direct or alternating current as they chose. On his reading of the Act of 1909, a company could take a supply in bulk from another company, who would at the same time act as the distributors of that supply. He also argued that by the Electric Lighting Acts any one resident within 50 yards of a main has a right to apply for a supply, but whether he is supplied from that main or from another rests with the company. On this interpretation the Westminster Company, as representatives of the London Company, were refusing to supply alternating current to consumers demanding it. The Westminster Company admitted that they must fulfil all statutory obligations to the public. They believed that they were doing so at the present time, but if anyone thought otherwise it would be necessary to bring an action against the company through the Public Trustee. The rights of the public did not enter into the present case at all. Mr. Younger, K.C., carried on the argument for the Westminster Company, and Mr. Buckmaster, K.C., replied briefly for the London Company. He confined himself practically to refuting the suggestion made by Sir Robert Finlay that a resident within 50 yards of a main was not entitled to a supply from that main.

The Lord Chancellor, Lord Shaw, and Lord Moulton read judgments in which they traced the progress of the Law on Electric Supply, and showed that the contentions of the Westminster Company were wrong and those of the London Company were right. It was a pity that some of the arguments used in the appeal had not been made in the Lower Courts. It would not, however, be necessary to grant an injunction, as there was no reason to think that the Westminster Company would fail to act in accordance with their obligations now that these were determined. The following were suggested by Lord Moulton:—

(1) That it may be declared that the defendants in managing and working the plaintiffs' undertaking in the Westminster area are bound to do the same with reasonable care and skill and with due regard to the interests of the London company therein.  
(2) That it may be declared that, according to the true construction of the said agreement of May 4th, 1910, the defendants are as between themselves and the plaintiffs bound, if required so to do by the plaintiffs, to supply electric energy by means of the plaintiffs' alternating current to any consumer or proposing consumer in the Westminster area who applies to the plaintiffs for a supply of electric energy and is entitled to receive from them a supply of the same, and whose application is duly forwarded by the plaintiffs to the defendants for execution, and to do and permit to be done all acts and things necessary for furnishing such customer with the plaintiffs' alternating current.

Lord Atkinson concurred.

## PENDING ELECTRICAL LAW SUITS

**D**URING the Easter law sittings, which began on Tuesday last week, a number of cases of considerable interest to the electrical industry will come on for hearing. There is no lamp patent action set down for trial, although several are pending, and will come on later in the year if not settled previously; in the meantime, there are certain to be a number of "interlocutory motions" with regard to evidence, procedure, &c. One of these is Osram Lamp Works, Ltd., v. Gabriel Lamp Co.

An extremely interesting wireless telegraph patent action is likely to be heard shortly; although it is not down on the first list for the Easter sittings, it may come on later, and, at all events, should be down for hearing during the Trinity sittings. It is brought by the Marconi Co. against the Helsby Wireless Telegraph Co., Ltd., alleging infringement of the famous patent 7777/1900. The Helsby Co. are employing the "quenched spark" method (the Lodge-Chambers system), and it appears that the Marconi Co. claim that this infringes their fundamental patent. The defendants will plead that they do not infringe, and will also claim that the patent is invalid for want of novelty, subject-matter and insufficiency of specification. The Council retained in the action are Mr. J. M. Astbury, K.C., Mr. A. J. Walter, K.C., and Mr. J. Hunter Gray for the Marconi Co.; whilst Mr. H. A. Colefax, K.C., Mr. Courtney Terrell and Lord Tiverton will appear for the Helsby Co.

Application is to be made before Mr. Justice Sargant for an extension of term beyond the usual maximum life of fourteen years of patent No. 8961/99, granted to Valdemar Poulsen and assigned to the Telephonograph Corporation (of New York). The patent is for the "telegraphone," which is an instrument for storing telephone or other messages or signals by subjecting moving steel wire to magnetic influences controlled through an electro-magnet by the signalling currents. To reproduce the signals the instrument is put in connection with a telephone receiver, and when the wire is set in motion the message is reproduced by the receiver. The action will not come on before April 14th.

As mentioned in *ELECTRICAL ENGINEERING* for March 20th, p. 165, both the National Telephone Co. and the Post Office are appealing against the award of the Railway and Canal Commissioners as to the value of the former's undertaking taken over by the Post Office. The Post Office are appealing against the cost of obtaining subscribers' agreements and the cost of raising capital being allowed. The National Co. are appealing against the whole award, and in particular against the method adopted in the award of calculating depreciation. Tuesday, April 15th, has been fixed for the hearing of the appeal.

Before the Divisional Court there will be some questions of law argued, arising out of the recent arbitration between the London United Tramways and the London County Council Tramways, for the acquisition of the short length of the Company's lines in the County of London at Hammersmith.

Among other actions likely to be of interest to our readers may be mentioned one by the Western Electric Co. against the Great Eastern Railway Co., which raises an interesting question as regards the insurance of goods carried by railway companies. The Brimsdown Lamp Works are suing Messrs. Halle and Co. for goods sold, and the action *Hurlston v. London Electric Railway Co.* is for personal injuries.

**The Iron and Steel Institute.**—The annual meeting is to be held at the Institution of Mechanical Engineers on May 1st and 2nd, and the annual dinner will take place on May 2nd. Among the papers to be discussed is one on "A new form of electrically-driven, two high continuous-current, reversing mill," by Mr. A. Lamberton. The autumn meeting will be held at Brussels from September 1st to September 5th.



## PHENIX ASSURANCE COMPANY, LIMITED.

ESTABLISHED 1782.

Head Offices: 19 & 70, LOMBARD STREET, LONDON, E.C.

TOTAL FUNDS EXCEED

£15,000,000

CLAIMS PAID EXCEED

£90,000,000

CHAIRMAN: RT. HON. LORD GEORGE HAMILTON, P.C., G.C.S.I.

### FIRE - LIFE - ACCIDENT - MARINE

Loss of Profits following Fire, Workmen's Compensation, Fidelity Guarantee, Burglary, Trustee and Executor, &c.

#### ELECTRIC LIGHTING.

The Company has always encouraged the development of Electricity, and the well-known "Phoenix Fire Office" Rules for Electrical Installations are in use throughout the world. Copies will be supplied free on application to Head Offices.

General Manager: SIR GERALD H. RYAN.

## DON'T MACHINE!—CAST!

The scientific accuracy and perfection of finish that can be secured by

"PRANA"

### DIE FINISHED CASTINGS

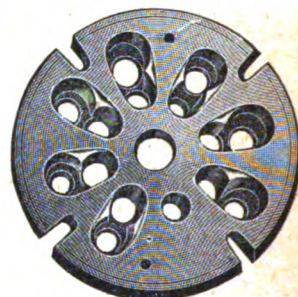
renders unnecessary all expensive and costly machining, and will

#### CUT DOWN COST ON COMPLICATED PARTS

Holes, Slots, Teeth, Notches, Screw Threads accurately cast and finished by the "Prana" process.

Send for booklet E.A., illustrating and describing this money-saving process to:—

AERATORS LIMITED, EDMONTON, LONDON, N.



### ELECTRICAL PORCELAIN

OF  
HIGHEST QUALITY

APPLY TO

JAMES MACINTYRE & CO., LTD.,  
BURSLEM.

TUBES PLATES  
**MICANITE**  
SEGMENTS RINGS  
THE MICANITE & INSULATORS CO. LD  
OFFICES AND WORKS -  
WALTHAMSTOW, LONDON, E.

ONCE  
USED



ALWAYS  
USED

PRICE: ONE SHILLING PER STICK.

Sole Manufacturer—S. W. CUTTRISS, Prudential Buildings, LEEDS.

**STEATITE INSULATORS**  
SUPPLIED  
FOR ALL KINDS OF  
ELECTRICAL WORK  
WILLIAM SUGG & CO. LTD.  
WESTMINSTER.

### TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

The first issue of the *Wireless World*, which is our old friend the *Marconigraph* in altered form, has been sent us. The magazine will be devoted to the advances of the Marconi system throughout the world, and to wireless telegraphy in general, as was its predecessor, but will also make a special feature of encouraging wireless telegraphy for national defence, and, in particular, the training of boy scouts and other boys' brigades, in wireless telegraphy, to further which the Marconi Co. are organising a system of special instruction. Special articles of an elementary nature will appear in connection with this scheme month by month, and the interests of the amateur as well as the professional radio-telegraphist will be studied. In the present issue we may call attention to a special article by Mr. J. S. Stone on "The Practical Aspects of the Propagation of High Frequency Electric Waves along Wires," one by Mr. H. Smith on "The Use of a Condenser as a Shunt to a Telephone," and an illustrated description of the Aden-Berbera wireless stations. The equipment of the iceberg patrol boat *Scotia* is also described. An excellent portrait of Mr. G. Marconi forms the frontispiece.

The New York-San Francisco telephone line referred to in *ELECTRICAL ENGINEERING*, Jan. 23rd, p. 53, will, says the *Hamburger Nachrichten*, run via Denver and then along the Central Pacific Railway. The total cost is estimated at £420,000, and the charge for a one-minute's conversation will be eighteen dollars, or about £3 15s.

The Technical Committee appointed by the Select Committee of the House of Commons in connection with the Imperial wireless telegraph scheme, inspected the Poulsen station at Copenhagen on Friday.

Following the withdrawal of Mr. Harold Smith from the Select Committee of the House of Commons which is inquiring into the Imperial wireless telegraph contract, Mr. Henry Terrell and Mr. Gordon Harvey have also resigned. In the case of Mr. Terrell, however, business reasons have compelled

him to take this step. Sir Frederick Banbury, Mr. J. G. Butcher, K.C., and Sir W. Essex have been nominated to fill the vacancies. Since our last issue evidence has been given before the Committee by stockbrokers. It is expected that the report of the Expert Committee will be presented by the beginning of next month.

In an article in the *General Electric Review* (New York) examples are given of disturbances on residence lighting circuits fed from overhead wires due to induction from neighbouring wireless stations. A number of tests have been made to determine the value of the induced potentials, which in some instances taken from practice amounted to over 500 volts. A number of wires connecting up with fittings, &c., were fused. It was found that by entirely enclosing the wiring in metallic sheathing, earthed at frequent intervals, the trouble was prevented. Alternatively the aluminium cell lightning protector placed across the terminals of the apparatus to be protected, and having short earth connections, was found to be admirable for D.C. circuits, but owing to its short life in A.C. circuits its use is not warranted unless the apparatus to be protected is of considerable value and the arrester is capable of frequent inspection. High non-inductive resistances connected between the line and earth were also tried with some success, but for satisfactory working it was found that the energy loss was considerable. The recently developed vacuum-tube lightning arrester was also successfully used. These arresters consist of a  $\frac{3}{4}$ -in. gap between a disc electrode and the inner wall of an exhausted metal tube. The spark potential is 300 to 550 volts D.C. or 200 to 400 A.C., and on A.C. circuits gives entirely satisfactory protection. A low series resistance should be used or the line fuses between the arrester and source of energy should be omitted, as the dynamic current sometimes follows heavy static discharges for half a cycle.

The Chio-Tenedos cable was down on 1st April, and telegrams for Tenedos and Lemnos, Salonika and district could only be accepted "via Eastern" at sender's risk, and with delay. The Bagdad-Bassorah line was down on the 3rd inst. and up again on the 4th inst., and on the following day the Chio-Tenedos cable was put through again.—Offices have been opened at Adrianople and Baba Eski, and telegrams



are transmitted via Bulgaria. The Djedda-Souakim cable was repaired on the 7th inst., and on the 8th communication was down with Bucio, Balombo, Quimbale, Bailundo and Bihé in Angola.—The Direct United States cable, which has been down some time, is now engaging the attention of a London repairing ship, the *Dacia*, of Silvertown. The break is understood to be in deep water.

## ELECTRIC TRACTION NOTES

Two petrol-electric motor-cars have recently been put in service on the Chicago, Milwaukee & Puget Sound Railway. The cars, 27 ft. 5 in. long, do 70 and 124 miles per day respectively, though much greater distances were covered on test. An eight-cylinder, four-cycle "V" type engine is direct-connected to a 600 volt commutating pole generator. An auxiliary hand-started equipment is also provided to start the main engine, and to run the lighting generator. The petrol tank under the car stores 150 gallons.

The annual report of the Liverpool Corporation Tramways Manager for 1912 shows that, after meeting interest and sinking fund charges, a sum of £66,929 is available for reserve, renewal, and depreciation, and a similar amount has been handed over in relief of rates. The net profit shows an increase of £19,126 over 1911. Satisfaction is expressed in the report on the working of the Stevens petrol-electric omnibuses, which are being used on some of the outlying routes.

The Bournemouth Tramway Manager proposes to run a service of trolley omnibuses along the front from Bournemouth to Boscombe. The estimated cost is £13,800, and a profit of £1,500 per annum is anticipated.

The Chief Railway Commissioner to the Victorian Government has been granted a five months' leave of absence to tour Europe and America to study electric railway work.

It is proposed to substitute storage battery for horse-drawn cars on the Belt Line Railroad of New York.

## LOCAL NOTES

**Aberdeen: Power Supply.**—Mr. J. A. Bell, the City Electrical Engineer, has recommended that a supply of electrical energy for power purposes be given to the Broadford works at the flat rate of  $\frac{1}{4}$ d. per unit. There was considerable discussion at the last meeting of the Electricity Committee when this proposal came up, and eventually a resolution to refer the matter to a sub-committee, with power to call in advice, was carried by 5 votes to 4.

**Accrington: Supply in Rishton.**—The Corporation having received an application for a supply of electrical energy to the works of Messrs. Peebles and Sons in Rishton, it has been decided, owing to the District Council having refused their consent, to apply to the Board of Trade for a license under their Electric Lighting Act of 1909.

**Banbridge: Electricity Supply.**—A Board of Trade inquiry was held last week with regard to an application by the Council for an electric lighting provisional order.

**Coventry: Electricity Extensions.**—In the Corporation's Omnibus Bill, which was before the House of Commons last week, powers were sought to extend the area of electricity supply into a number of surrounding districts. There was, however, opposition by the Warwickshire County Council and the Leicestershire and Warwickshire Electric Power Co., the former in respect of the interference with roads, and the latter on the ground of competition in an area where Parliament had already granted them powers. Eventually the Corporation withdrew a number of the areas, but wished to retain the parish of Stoneleigh, but this concession did not remove the opposition of the Power Co., which, by the way, has recently been taken over by the Tramways, Light and Power Co., the promoters of which are Messrs. Balfour Beatty and Co. The case for the Corporation in reply to this opposition was that the Power Co. have only powers to supply in bulk in this area, and that their power station is many miles away from it, the inference being that it would be many years before the district would receive a supply from the Power Co. The Committee, however, granted the extension to the Corporation with the reservation that the Power Co.

should not have to seek the consent of the Corporation, as is the case in the City of Coventry, before it can make any arrangement to supply in the added area.

**Dublin: Electricity Profits.**—The Electricity Committee has recommended that £1,000 be transferred to the relief of rates from the electric lighting profits, and not £5,000, as was suggested by the Finance Committee.

**Leeds: Motor Hiring.**—At the last meeting of the Council the Tramways and Electricity Committee recommended that the further consideration of the recently proposed scheme for motor hiring should be deferred. An amendment to refer this back, however, was subsequently passed in order to give consideration to a certain letter which, it was stated, contained grave charges against the officials of the Electricity Department, in regard to pushing the sale of certain makes of motors to the prejudice of others. The sub-committee concerned with the question will now investigate these charges.

**Sheffield: Rateable Value System of Charging.**—Mr. S. E. Fedden, the Manager of the Electricity Department, has proposed the adoption of the rateable value system of charging for private house supplies on the basis of a fixed annual charge of 10 per cent. on the assessment, plus  $\frac{1}{4}$ d. per unit.

**Stockton: Bulk Supply.**—Terms have been arranged between the Cleveland and Durham Electric Power Co. for a supply of power between 10 p.m. and 6 a.m., or, alternatively, between 6 p.m. and 6 a.m. The Power Co. will lay the mains within 300 ft. of the Corporation works. The terms are said to be practically equivalent to the Corporation's own works costs, with the advantage that no new plant will have to be installed.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

### Generating Stations, Sub-Stations, Mains, &c.

**Accrington.**—A loan of £2,000 is to be applied for in connection with a supply to Messrs. Peebles' works in Rishton.

**Australia.**—The Melbourne Electric Supply Committee require high-tension alternating-current switchboards. Messrs. Mellwraith, McEachern and Co., Biliter Square, E.C.

**Bradford.**—Three-phase and continuous-current switchgear for two sub-stations. April 17th. City Electrical Engineer. (See advertisement on another page.)

**Bootle.**—A loan of £3,750 is to be applied for in connection with new generating plant.

**Dublin.**—High and low-tension switchgear, cables and accessories. City Electrical Engineer, April 24th. (See advertisement on another page.)

**Earlstown.**—Messrs. McCorquodale and Co. contemplate the installation of a private electricity generating plant.

**Halifax.**—A loan of £18,180 was required into last week. Of this, £5,000 is required for mains.

**Leeds.**—Sanction to a loan of £186,500 is to be applied for. Of this, £38,500 is for additional plant; £100,000 for mains; and £30,000 for sub-stations and equipment.

**Macclesfield.**—The New Macclesfield Electricity Co. has purchased a site for a generating station.

**Manchester.**—Extra high-tension switchgear; low-pressure steam and water pipes, &c.; two 50 h.p. three-phase motors for cooling towers. Chairman of Electricity Committee, April 23rd. (See advertisement on another page.)

**Mexborough.**—An inquiry was held last week concerning a loan of £11,500 for extensions at the electricity works.

**Newcastle-under-Lyme.**—An expenditure of £2,000 is contemplated for mains extensions.

**Newport (Mon.).**—An expenditure of £25,000 is to be incurred on new generating plant.

**Stockton.**—A new rotary-converter is required by the Corporation.

**Stoke-on-Trent.**—A loan of £8,000 is to be taken up for extensions of mains to Fenton.

FOR  
STEAM JOINTS  
USE



JOHN HUDSON & CO.'S SUCCESSORS, Mansell St., London, E.

### Wiring

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Aberdeen.**—New buildings for Technical College, costing £60,000.

**Blackburn.**—New municipal buildings to cost £120,000.

**Coatbridge.**—Cinematograph theatres in Main Street and Bank Street.

**Greenock.**—Cinematograph theatre in Rue End Street.

**Knotty Ash.**—Clerk to Vestry, Brownlow Hill.

**Liverpool.**—Electrical installation at Highfield infirmary.

New public baths costing £70,000.

**London.**—Alterations to Devonshire Club, St. James's Street, costing £7,000.

**Newcastle-on-Tyne.**—Public baths at Benwell, Walker and Heaton. Town Clerk.

**York.**—Elementary school in Campleson Lane. Secretary, Education Offices.

### Miscellaneous

**Bedford.**—A twelve months' supply of carbon and metallic filament lamps. Borough Electrical Engineer. April 23rd. (See advertisement on another page.)

**Tasmania.**—The Post Office authorities require large quantities of telephone material. Specification may be seen at 73 Basinghall Street, E.C.

**York.**—The Local Government Board have sanctioned a loan of £500 for the wiring of premises, repayable in ten years.

### TENDERS RECEIVED AND ACCEPTED

**Colchester.**—The tender of Messrs. Chamberlain and Hookham has been accepted for ordinary and prepayment meters.

**London: Battersea.**—The tender of Messrs. Babcock and Wilcox for a water-tube boiler, superheater, chain-grate stoker, &c., at £1,920, is recommended for acceptance.

**Newport (Mon.).**—An order for the supply of carbon-filament lamps and radiator lamps for the next twelve months has been placed with Siemens Bros. Dynamo Works.

**Walthamstow.**—Orders for meters during the next twelve months have been placed with Messrs. Chamberlain and Hookham and Messrs. Ferranti.

**York.**—The following tenders have been received: two water-tube boilers, superheaters and chain-grate stokers. Messrs. Babcock and Wilcox, £4,219; a 3,500-kw. turbo-alternator with condensing plant, Oerlikon Co., £9,967; storage battery and reversible booster, Tudor Accumulator Co., £3,899, with a maintenance charge of £188 per annum for fifteen years.

Orders have been received by the Mirrlees Watson Co., of Glasgow, for surface condensing plants with Mirrlees-Leblanc or Mirrlees-Edwards' air pumps, from the following: County of London Electric Supply; Aberdeen Corporation; Fleetwood Urban District Council; Lancashire Electric Power Co. A large number of orders have also been received for multi-jet and other forms of condensing plant.

Messrs. Siemens Bros. Dynamo Works have received contracts from Messrs. Balfour Beatty and Co. for a twelve months' supply of Tantalum and Wotan traction lamps for the tramways of Luton, Llanelly, Dartford, Carlisle, Leamington and Warwick, and Nottingham and Derbyshire.

### APPOINTMENTS AND PERSONAL NOTES

Mr. F. W. Purse, Chief Electrical Engineer to the Watford Corporation, has been appointed to a similar post with the Carlisle Corporation in succession to Mr. S. T. Allen, recently appointed to Wolverhampton. In addition to Mr. Furness, the short list of candidates included Mr. T. C. Parsons, late Chief Electrical Engineer, Govan; Mr. H. A. Neville, Chief Electrical Engineer, Wakefield; and Mr. B. Sankey, Borough Electrical Engineer, Whitehaven. The commencing salary is £500 per annum. There were 148 applications.

Mr. W. R. May, at present Chief Assistant Electrical Engineer to the Lowestoft Corporation, has been appointed Borough Electrical and Mechanical Engineer, at a commencing salary of £250 per annum, rising to £280. Mr. H. H. Saunders has been appointed General Manager of the undertaking at a salary of £220, rising to £250 per annum.

Mr. G. A. Bruce, who recently resigned the position of Electrical Engineer and Manager to the Lowestoft Corporation, has been presented with an illuminated address by the staff. Mrs. Bruce has also been presented with a pair of silver vases.

Mr. Thomas D'Arcy Nassau, who is at present Resident Engineer to the Honiton and District Electric Supply Co., Ltd., has been appointed Resident Engineer and Manager to the County of Dorset Electric Supply Co., Ltd.

Mr. H. Gray, Borough Electrical Engineer at Accrington, has been granted £50 in respect of extra services in connection with the recent extensions at the electricity works.—Mr. A. W. Clegg, Chief Assistant Electrical Engineer, has been granted an increase in salary of from £200 to £225, with a further increase of £25 per annum.

Mr. W. Baxter, who, as mentioned in our Business Notes, has left A. Reyrolle and Co., was presented before leaving by Mr. Reyrolle with a handsome filing cabinet, which had been subscribed for by members of the staff.

A sub-station shift engineer is required by the Bristol Corporation. (See advertisement on another page.)

Man required for motor-car electric lighting equipments. (See an advertisement on another page.)

Experienced stores clerk required. (See advertisement on another page.)

### MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. G. Smith and Sons, of 5 Philpot Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night, was £71 10s. to £72. (Last week, £70 to £70 10s.)

**Anderson and Munro.**—We are informed that for the future Mr. Donald Smeaton Munro will carry on the electrical branch of the business, formerly carried on by Anderson and Munro in Edinburgh, under his own name at 11 Randolph Place, Edinburgh.

**Agencies.**—Mr. W. Baxter has resigned his position with A. Reyrolle and Co. and has opened an office at 90 Pilgrim Street, Newcastle-on-Tyne, where he will represent Daniel Adamson and Co.; Eckstein, Heap and Co.; Newton Bros. (Derby), and the St. Helens Cable and Rubber Co.

**Change of Address.**—The Electric Battery Co., of 180 High Holborn, are moving to 62 Eagle Street, High Holborn, W.C., where the manufacture of E.B.C. dynamos for car lighting, accumulators, &c., will be carried on.

**Foster Engineering Co., Ltd.**—Application was made on Tuesday, before Mr. Justice Swinfen Eady, to appoint a liquidator for the Foster Engineering Co., Ltd. It was urged, however, that the Company could meet its liabilities, and stay of execution for a fortnight was granted.

**Lancashire Dynamo and Motor Co.**—There was a net profit of £15,150 for 1912, and a final dividend, making 7½ per cent. for the year, is declared on the ordinary shares, after adding £6,000 to reserve. The Company is issuing the balance of the ordinary capital, amounting to £15,000.

**Large D.C. Generators.**—According to *Power* (New York), the largest D.C. generators ever built have just been installed by the Cleveland Electric Illuminating Co. There are two 275-volt, 3,750-kw. shunt machines driven at 180 r.p.m. through 10 to 1 reduction gears by steam turbines. The gear wheels have 259 and 26 teeth, and the larger is over 8 ft. in diameter.

**Institution of Mechanical Engineers.**—The provisional programme of the arrangements for the Summer Meeting, to be held from July 28th to August 1st at Cambridge, has just been issued. Besides the reading and discussion of Papers, to be announced later, a number of visits have been arranged to the laboratories, works, and other places of interest in Cambridge and Ipswich, as well as to the Queen's Engineering Works (W. H. Allen, Son and Co., Ltd.) at Bedford. Numerous social functions have also been arranged.



# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 329 [VOL. IX., No. 16]  
*All rights reserved.*

THURSDAY, APRIL 17, 1913.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

*The Engineering Journal of the Electrical Industry*

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES AND TECHNICAL COLLEGE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

*Other Advertisement Rates on Application.*

*Latest Time for Receiving*

Letters for Insertion, Tuesday first post.

Small Advertisements and Official Announcements, Wednesday first post.

Displayed Advertisements, Tuesday first post.

Corrections in Standing Advertisements, Monday first post.

All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 208-206, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Cireling, Fleet, London." Telephone No.: 5509 Holborn.

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## CONTENTS

	PAGE
Summary	211
Arrangements for the Week	212
Street Lighting Specifications	213
Electric Supply in London	215
Electricity at the Building Exhibition	215
Electric Signal Boxes, Hot Plates, and Lanterns for the Glasgow Police	216
Questions and Answers by Practical Men	217
A Tungsten Focus Lamp	218
Stage and Theatre Lighting Appliances	218
Catalogues and Pamphlets Received	218
A Train Lighting Dynamo	219
Electric Traction Notes	219
Telephony and Telegraphy (Including Wireless)	219
Patent Record	220
Local Notes	221
Tenders Invited and Prospective Business	221
Tenders Received and Accepted	222
Miscellaneous Business Notes	222
Companies' Meetings, Dividends, Reports, &c.	222

## SUMMARY

THE provisions of the draft street lighting specification which has been drawn up by a joint committee of electrical engineers, gas engineers, surveyors, and others were dealt with in a Paper by Mr. A. P. Trotter discussed on Tuesday at a meeting of the Illuminating Engineering Society. The proposals involve the stipulation of minimum illumination on a horizontal plane 3 ft. from the ground. The representatives of the gas industry argued that direct ray candle-power measurements were preferable. (Page 213.)

THE present position of electric supply in London was dealt with in a recent Paper before the Royal Society of Arts by Mr. Frank Bailey, who advocated

the development of the generating stations already in existence, as he believed that this would be cheaper than the establishment of large stations down the River Thames or in the coalfields. (Page 215.)

ELECTRIC lifts and a few other applications of electric power are exemplified at the Building Exhibition at Olympia, where a series of lectures on illumination has been arranged by the Holophane Co. (Page 215.)

GLASGOW policemen are being provided with electric hot plates in special signal boxes, and electric lanterns in place of "bull's-eyes." The signal boxes are arranged to enable the policemen on duty to telephone to the police office, and also to be summoned to speak to the office on the telephone by means of a system of signalling lamps. (Page 216.)

THE best and safest way to earth an extensive system of electrical distribution in a mine so as to obtain maximum safety is discussed in our "Questions and Answers" columns. (Page 217.)

A TUNGSTEN focus lamp and some stage lighting appliances are referred to on page 218.

AN ingenious train lighting dynamo is described and illustrated. (Page 219.)

A SOMEWHAT serious interruption to the L.C.C. tramway service occurred on Monday, owing to an accident at the Greenwich generating station. (Page 219.)

THE appeal in regard to the Telephone Arbitration is referred to under "Telephony and Telegraphy." The Telephone Co. objected to any appeal being made, but the Court held by a majority that it was allowable. The Telephone Co. are going to the House of Lords on this point. (Page 219.)

THE Specifications published by the Patent Office on Thursday last include one by E. O. Möller, of the British Westinghouse Co., for circuit connections to obtain the quick and certain operation of a circuit-breaker under all conditions. Others by T. W. Tattersall and C. F. Kettering deal with the application of iron wire resistances to variable-speed constant-pressure dynamos. A self-cleaning spark plug is described by J. J. Thompson, of America. The patent for a testing instrument for primers by G. C. Fraser and G. K. B. Elphinstone expires during the current week after a full life. (Page 220.)

SYSTEMS of charging based on rateable value are being adopted at Sheffield and Accrington.—A reduced scale of charges for the hiring of arc lamps is proposed at Hammersmith.—An experimental installation of electric street lighting is to be put down at St. Anne's-on-Sea. (Page 221.)

EXTENSIONS are to be made to the generating station at Swansea; and extensions to the generating plant at Newport (£10,600) are reported as necessary.—Local Government Board inquiries are to be held at Wolverhampton (£22,000); Carlisle (£7,500); and Dundalk (£5,000); and a loan of £1,565 has been sanctioned at Whitehaven. (Page 221.)

## ARRANGEMENTS FOR THE WEEK

FRIDAY, APRIL 18TH.

*Batti-Wallahs Society.*

8 p.m. Smoking Concert at Holborn Restaurant.

MONDAY, APRIL 21ST.

*Institution of Electrical Engineers: Newcastle Section.*

7 p.m. At Armstrong College. "Notes on Gas Engines," by A. P. Pyne.

*Institution of Post Office Electrical Engineers.*

5 p.m. At Institution of Electrical Engineers. Annual general meeting.

WEDNESDAY, APRIL 23RD.

*Institution of Electrical Engineers: Yorkshire Section.*

7 p.m. At the University, Sheffield.

*The 25 Club.*

7.15 p.m. Dinner at Connaught Rooms, Great Queen Street.

THURSDAY, APRIL 24TH

*Institution of Electrical Engineers.*

8 p.m. "On Phase Advancing," by Dr. G. Kapp.

FRIDAY, APRIL 25TH.

*Finsbury Technical College Old Students' Association.*

8 p.m. Smoking Concert at Waldorf Hotel.

## The London Electrical Engineers.

(To-Day) THURSDAY, APRIL 17TH. *C. Company.*—Recruit and Co. Training, 7 to 10 p.m.FRIDAY, APRIL 18TH. *D. Company.*—Co. Training, 7 to 10 p.m.SATURDAY, APRIL 19TH. *Headquarters* open from 10 a.m. till noonMONDAY, APRIL 21ST. *A. Company.*—Recruit Training, 7 to 8 p.m. Hopkinson Cup Competition, 7 to 10 p.m.TUESDAY, APRIL 22ND. *B. Company.*—Recruit Training, 7 to 8 p.m. Hopkinson Cup Competition, 7 to 10 p.m.THURSDAY, APRIL 24TH. *C. Company.*—Recruit Training, 7 to 8 p.m. Hopkinson Cup Competition, 7 to 10 p.m.FRIDAY, APRIL 25TH. *D. Company.*—Recruit Training, 7 to 8 p.m. Hopkinson Cup Competition, 7 to 10 p.m.SATURDAY, APRIL 26TH *Headquarters* open from 10 a.m. till noon.

**Linking up Supply Areas under the Act of 1908.**—Mr. Justice Joyce had before him on April 9th a motion by the Battersea Borough Council to restrain the County of London Electric Lighting Co. from laying mains in the Borough of Battersea to connect up their authorised areas of Southwark and Wandsworth. The Company supplies in Wandsworth, Lambeth, Camberwell, Southwark and Bermondsey, south of the Thames, all of which districts are connected, and in Clerkenwell, north of the Thames. There are generating stations in Clerkenwell and Wandsworth, which are connected by mains

over London Bridge through a sub-station in Southwark. The Company wished to lay further connecting mains between the generating station in Wandsworth and Southwark through Battersea. The Battersea Borough Council objected, and argued that under sec. 4 sub-sec. 2 of the Act of 1908, only one linking-up connection was provided for, and this the Company already had. The section reads as follows: "A Company may also by means of electric mains make a connection between any two or more areas which that Company is authorised to supply or between any such area and a generating station of that Company." The motion was, however, refused. There will probably be an appeal.

**Aberdeen Electrical Wiremen.**—The electrical wiremen in Aberdeen, having asked for a revision of their rates of pay, a conference between the masters and men has resulted in an agreement for the former to pay 8½d. per hour from May 1st, with an increase to 9d. per hour in three months. Foremen will be paid not less than ½d. per hour more than the ordinary rate from May 1st, with a probable increase to 9½d. in three months. Men engaged upon accumulators are to receive one shilling per day extra.

**Johnson Billington Electricity Meters, Ltd., Sued.**—On April 9th and 10th an action was before Mr. Justice Horridge and a common jury in the King's Bench Division by Mr. W. H. Johnson, the inventor and patentee of a meter, against Johnson Billington Electricity Meters, Ltd., to recover about £143 as balance of salary. It appears that Mr. Johnson had an agreement with the company as manager for a period of five years, by which the company could get rid of Mr. Johnson, while on the other hand he was bound to give his whole time and attention to the business of the company. The Meter Company contracted with the Beck Flame Lamp Company to make the meters, but these were never made, and considerable sums of money paid to the Beck Company by the Meter Company were used for other purposes. Some of the directors of the Meter Company were directors of the Beck Company, but it was alleged, among other things, that Mr. Johnson had been negligent in not informing the directors of the Meter Company that the Beck Company was insolvent, though he did not have access to their books. It was also alleged that he had been devoting a large amount of his time to the Beck Company, though it appears he was never paid anything for this and that he did it in his spare time to help that Company to fulfil its lamp contracts with the Sydney and Dublin Corporations. The jury found for Mr. Johnson for the full amount claimed.



## STREET LIGHTING SPECIFICATIONS

A Paper entitled "Standard Clauses for Inclusion in a Specification of Street Lighting," by Mr. A. P. Trotter, formed the basis of a discussion on Tuesday evening at a meeting of the Illuminating Engineering Society. The author referred to the formation of the Joint Committee of four bodies interested in the subject, and outlined the work they had done on the subject. This Committee was constituted as follows:—

*Institution of Electrical Engineers.*—Messrs. W. H. Patchell, Frank Baily, K. Edgecumbe, S. Z. de Ferranti, Haydn T. Harrison, S. L. Pearce, H. Faraday Proctor, A. P. Trotter, and Prof. J. T. Morris.

*Institution of Gas Engineers.*—Messrs. W. Doig Gibb, S. Y. Shoubridge, and R. Watson.

*Institution of Municipal and County Engineers.*—Messrs. E. J. Elford, G. F. Carter, T. W. A. Hayward, E. B. B. Newton, and N. Scorgie.

*Illuminating Engineering Society.*—Prof. S. P. Thompson, Messrs. L. Gaster, F. W. Goodenough, J. W. Ife, and A. H. Seabrook.

Mr. Gibb and Mr. Seabrook afterwards resigned, and Mr. J. W. Bradley was co-opted as an independent member.

This Committee agreed provisionally:—(1) The specification to be based on illumination, the unit to be the foot-candle. (2) The standard of comparison to be the minimum horizontal illumination at a height of 3 ft. 3 in. above the ground level. (3) The maximum horizontal illumination at a height of 3 ft. 3 in. above the ground level shall not be more than — times the minimum. (4) When the horizontal illumination cannot be conveniently measured, or is below the useful range of the instrument available, it may be calculated from observed data.

There was some opposition to the first of these points, and Mr. Trotter devoted a considerable portion of his Paper to the *pros* and *cons* of the illumination rather than the candle-power basis. One of the chief objections from the contractor's point of view to a specified illumination was that it gave a little more trouble in working out the scheme, and this led to the question of how the work of design was to be apportioned between the lighting authority and contractor. Mr. Trotter remarked that: "It seems better that the lighting authorities should settle what it is they want to buy, and, having specified it, to leave details to the competitive skill and wider experience of contractors. What, then, are these authorities 'out to buy'? Not lamps, not candle-power, but illumination."

Another objection to the illumination basis arose from the impression that it was easier to measure candle power than illumination. There were difficulties in direct measurement of very low illuminations and therefore candle-power measurements are proposed in the draft specification where the illumination is under 0.01 candle-foot. In the extreme case of country roads, where the lamps serve really as beacons, candle power must obviously be the basis. For the more brilliant lighting there was no difficulty in measuring the illumination direct; there were several instruments suitable for the purpose, and a more truthful result was obtained as to the resultant effect of several lamps near together; also, less calculation was necessary than with candle-power measurements, and especially where, as is recommended, minimum illumination is to be measured, the labour is much reduced.

With regard to the vexed question of horizontal, vertical or direct-ray measurements, Mr. Trotter sums up the main advantages of the horizontal plane as follows:—

"(1) If the illumination on it is sufficient, that on the other planes must be better; and (2) the illuminations received from all neighbouring lights add themselves together and give one single quantity which may be measured by one single observation. The economy of time and saving of calculation is enormous."

The question of specifying average, maximum or minimum illumination is then discussed. Not only was the average illumination difficult to ascertain with accuracy, but a little consideration shows, writes the author, that, while the mean illumination of a street may be up to a reasonable standard, it may have alternations of dazzling brilliance and dismal darkness. This proposal might, therefore, be discarded.

The most satisfactory test, he continued, appears to be the simple minimum illumination. Any excess of light may be regarded as a voluntary benefaction from the lighting authority or an unavoidable concession by the contractor.

The Paper then deals with the classification of streets. The surveyor members of the Committee drew up a scheme,

dividing them into special thoroughfares, first-rate main lines of thoroughfare, auxiliary roads and relief main roads, and side and unimportant streets. This purely qualitative classification was checked by quantitative measurements made by Mr. K. Edgecumbe, Prof. J. T. Morris and Mr. Trotter, who made a long series of photometric observations, of which most interesting details are given in the Paper. The agreement with the surveyors' classification was wonderfully close, and it was finally recommended to classify all ordinary thoroughfares (that is, excluding those where specially brilliant illumination is required) as follows: Minimum illumination at least (a) 0.01 ft. candle, (b) 0.025 ft. candle, (c) 0.04 ft. candle, (d) 0.06 ft. candle and (e) 0.1 ft. candle. In connection with the first class, a table calculated by Mr. Haydn T. Harrison is given to show the candle power required to produce a minimum illumination of 0.01 ft. candle on a horizontal plane 3 ft. from the ground midway between two lamps of a given distance apart.

The Committee then proceeded to discuss various alternative forms of draft standard clauses and other matters, and finally the draft clauses given below were put forward. These were accepted by the Council of the Institution of Electrical Engineers, and with slight modifications in drafting by the Institution of Municipal and County Engineers. The Illuminating Engineering Society accepted them as a tentative specification and suggested the addition of a supplementary specification defining the conditions to be complied with by street photometers. The Institution of Gas Engineers, however, still refuse to agree to the fundamental principle of stipulation of minimum illumination on a horizontal plane.

### DRAFT STANDARD CLAUSES.

(1) *Intent of Tender.*—The form of tender headed "Lighting of" includes the provision, fixing, connection and maintenance of all lamps necessary for obtaining the illumination specified as Class . . . in and according to the conditions of the standard specification.

(2) *Unit of Measurement.*—This specification is based on illumination, the unit of measurement being one foot-candle.

(3) *Classification of Streets.*—For convenient reference the streets are classified as having a minimum illumination as follows:—

Class A	...	...	...	0.01	foot-candle
" B	...	...	...	0.025	"
" C	...	...	...	0.04	"
" D	...	...	...	0.06	"
" E	...	...	...	0.10	"

Street lighting at a lower minimum illumination than 0.01 candle-power may be specified by the height and distance apart of the lighting units, and the candle-power as measured in the direction of the thoroughfare, at an angle of ten degrees below the horizontal.

(4) *Minimum Illumination.*—The "minimum illumination" of a street means the minimum illumination on a horizontal plane at a height of 3 ft. 3 in. above the ground level, and may be measured by means of:—(a) Any suitable illumination photometer, or (b) Any suitable photometer adapted for use in the street which will measure the candle-power of the lamps in those directions which meet at the point of minimum illuminations. In this case the minimum illumination will be calculated by adding together the values of the illumination received from each lamp that materially contributes to the result.

(5) *Special Illumination.*—The special illumination of certain points indicated on the map, such as the corners of cross streets, may be dealt with by specifying the positions and height of lamps and illumination at those points.

(6) *Type of Photometer.*—The photometer shall be of the . . . type, or of such other type as may be agreed between the parties.

(7) *Position of Lighting Units.*—The approximate positions of the lighting units are indicated on the accompanying map, and are correct within the limits of deviation marked thereon. The contractor shall indicate the positions of all the lighting units, either by completing the said map or by a descriptive schedule accompanying his tender.

(8) *Particulars of Lighting Units.*—Detailed particulars of each type of lighting unit included in the tender must be inserted in the space provided for that purpose in the specification, and must include a statement of the height at which it is proposed to place the centre of light of each type of unit above the street surface, subject to a declared minimum.

(9) *Drawings.*—Drawings of all details as required by the specification shall accompany the tender.

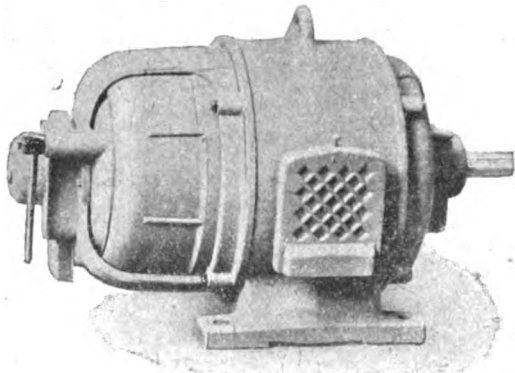
(10) *Samples.*—Samples shall be submitted if required before the acceptance of the tender.

(11) *Number of Lighting Units.*—The number of each type of lighting unit required must be inserted in the tender, with,

## SMALL INDUCTION MOTORS FOR ALL CLASSES OF WORKSHOP DRIVING.

PROMPT DELIVERY IN SIZES FROM  
1/2 TO 10 H.P. AT ALL THE USUAL  
SPEEDS AND PRESSURES.

OPEN, PROTECTED & ENCLOSED TYPES.



HIGHEST GRADE MATERIAL and  
WORKMANSHIP.

**BROWN, BOVERI & CO., Limited**

CAXTON HOUSE, WESTMINSTER, LONDON, S.W.

And at MANCHESTER, GLASGOW,  
and NEWCASTLE.

if called for, a quotation for the provision, fixing, and connection of the necessary apparatus, and the price per annum for maintenance and for . . . hours' lighting, on which the tender is based.

(12) *Additional Lighting Units.*—The contract will provide for additional lighting units if required, such increase not to exceed . . . per cent., and to be paid for at the quoted rate per lighting unit.

(13) *Tests.*—A test of the illumination shall be made under such normal atmospheric conditions as will not appreciably affect the accuracy of the result, and at a fairly selected point not being in the shadow of a mantle, lamp, electrode, lantern bar, post, tree, or other obstruction. When a minimum illumination or candle-power of lighting unit is specified, it shall be held that such minimum is obtained if the average of the measurements of any three minima between consecutive lighting units of the same type does not fall below it.

(14) *Contract to be Signed.*—The tender contains the usual clause that the provisions, conditions, and prices named therein shall form the basis of a contract containing the necessary legal provisions to ensure its fulfilment.

(15) *Heads of Clauses for Contract.*—The contract will also include provisions for:—Ensuring the lighting of all lamps during fog at prices to be quoted. Execution of work in such manner as may be necessary for the convenience and safety of the public. Indemnifying the Council against claims arising out of the execution or maintenance of the work or failure of the lighting. Payment of moneys due for work done. Defining the responsibilities of the contractor, and to enforce the conditions of the specification and tender with due regard to practical difficulties.

Mr. Trotter commenced the meeting with a few remarks, emphasising some of the most important points in his Paper, after which a vote of thanks to the author was proposed by Mr. W. H. Patchell, and seconded by Mr. F. W. Goodenough from the chair.

This discussion was opened by Mr. HAYDN T. HARRISON, who said that the main object was for lighting authorities to settle what it was they wanted to buy, and to reduce its definition to a definite basis. He did not himself object to illumination as illumination being the basis, but objected to minimum horizontal illumination because of the difficulty of its direct measurement when of low value, but as regards the lowest class of street, the objection had been met in the proposed specification by allowing a candle-power measurement at such an angle as would reach the point of minimum illumination. Actually

the amount of illumination of a street often depended really on the expenditure that could be afforded from the rates to pay for it, and the specification facilitated the best results being obtained for the money. The main thing that drivers of motor-vehicles objected to was transition from dark to bright spaces, and the minimum specification helped to get over this difficulty. The matter had been dealt with in some other countries on similar lines. The metre was a very suitable height for making the measurements, and was roughly half-way between the ground level and the pedestrians' faces. If the illumination was satisfactory at that height, it would be even better on the ground. He declared himself perfectly satisfied with the specification, although he had himself been in the habit of making candle-power tests, especially with street lamps of moderate size.

Mr. R. WATSON (Gas Manager, Doncaster), in representing the views of the Institution of Gas Engineers, said that they did not consider that minimum horizontal illumination afforded a true guide in comparing effects of lamps with very different polar distribution curves. He defended specifications of normal or direct-ray candle-power at the point of minimum candle-power, and contended that in enabling us to see objects and avoid collisions, it was the direct-ray illumination. The measurements could be made more accurate where there was diffused and stray light, and he pointed out that the author admitted that with the lowest class of streets, which amounted to 80 per cent. of the whole, illumination could not be used as a basis at all. "Horizontal illumination tests exaggerated the diversity factor."

Mr. J. J. CLARKE (Testing Department, Gas Light and Coke Co.) also defended the candle-power basis as being capable of much more exact definitions. He held that the minimum position was difficult to find, and that a definite position ought to be specified. He was of opinion that the height of the test flame from the ground should have some relation to the height of the lamp if it was to be equally fair to all classes of lighting.

Mr. FRANKLIN T. THORPE, speaking as a gas engineer, also considered the direct-ray test fairer to all classes of lamps, and wished that the character of the spectrum of the light could be taken into account in some way. He thought that Mr. Haydn Harrison's table showing the candle-powers necessary to produce the desired illumination for various heights and distances of lamps was in itself a powerful argument against the minimum horizontal illumination basis, and took examples to show how what he considered an equal effect as measured on the direct-ray basis could be obtained with smaller lamps.

Mr. K. EDGECUMBE (Everett, Edgcombe & Co.) declared himself a "whole-hogger" in favour of minimum horizontal illumination, and said that the close agreement between the surveyors and photometric reports was striking testimony of the minimum horizontal illumination basis; it gave the same result as the physiological effect, and was thus an excellent measure of what was required. Direct measurement of illumination was not insisted upon by the specification, although both Mr. Trotter and he thought that it was much easier than deduction from candle-power observations. He contrasted the complexity of the Westminster specification with that before them.

Mr. J. DARCH regretted that the harmful effects of glare, which often vitiated the effect of illumination, had not been taken into account in the specification, and looked forward to a Utopia where streets would be lighted by indirect illumination reflected from the house fronts.

The discussion was adjourned till April 29th.

**Institution of Electrical Engineers.**—The following is the result of the ballot for new members and transfers from one class to another at the meeting on Thursday:—*Members:* J. F. Martins-Guimarães, S. W. Newington, J. Wayne-Morgan, R. O. Wright. *Associate Members:* P. B. Addison, A. J. Bousfield, J. Braby, H. Bridges, J. R. Brookman, S. Delany, W. H. Duncan, C. D. Falcke, U. A. Farrell, J. Firth, H. V. Hart-Davis, T. H. M. Harvey, E. W. Jackson, T. J. Kendrew, T. E. Lewis, D. McKinlay, S. C. Midwinter, P. W. Milne, G. D. Rogers, H. W. Schilbach, D. S. Strang, R. G. Tolley, A. C. Wampach, W. Weekes, J. White, W. E. Wilde, E. Williams, C. R. M. Young. *Graduates:* H. M. Bamford, T. H. Barr, F. S. Beamish, E. A. Belcher, G. L. Birch, F. Farrar, W. L. Gray, F. G. Heymerdingner, W. G. Kimber, F. E. Lewis, J. H. McClay, T. C. Roberts, R. C. Roy, H. Tabossi, H. C. Turner, G. Verghese, E. Wolf. *Students:* A. G. Akehurst, G. M. Burnand, T. R. Evans, W. E. Gardner, R. E. James, L. B. Maulson, J. D. Ross, P. J. Ryle, C. A. Sutcliffe, A. E. W. Wemyss. *Candidates Transferred:*—*Associate Member to Member:* E. Barrs, J. R. Blaikie, H. L. Dixon, E. Harlow, L. Johnston, G. A. Pearson, P. M. Robinson. *Associate to Member:* J. D. L. Bradwell, F. C. E. Burnett, J. N. A. Houblon. *Associate to Associate Member:* J. Y. Fletcher, J. Murray, J. Scott, T. F. Tate. *Graduate to Associate Member:* W. J. I. Casewell. *Student to Associate Member:* H. Bedson, E. Crawshaw, W. Eccles, P. Furness, S. Johnson, A. Monkhouse, P. Smith, A. M. Willmore. *Student to Graduate:* G. E. Bairsto, A. M. Faulkner, A. V. Ferguson, W. E. Hatfield, H. C. Healey, D. W. McIntyre, A. A. Maytham, A. W. Miller.



## ELECTRIC SUPPLY IN LONDON

MR. FRANK BAILEY read a Paper with this title before the Royal Society of Arts on April 9th, in which, after detailing the progress that has been made since his original Paper on the same subject in 1890, he gives the following figures for the fourteen local authorities who work their own Provisional Orders, for the years ending March 31st, 1912 and 1913:—Capital expended, £6,602,055; units sold, 94,445,100 and 114,708,000; Maximum load (winter, 1912-13), 59,130 units. For the thirteen London companies, in this case up to Dec. 31st., the capital expended is £14,613,196; the units sold, 163,203,264 and 177,323,258; and the maximum load, 103,980 units. The capital expended in both water and gas undertakings is approximately double that expended in electricity supply undertakings. This output includes some supplies given for railway and tramway purposes within the County of London. The total amount of electrical energy used for all purposes may be estimated for the year 1912 as follows:—Railways, 271,600,000 units; tramways, 130,000,000 units; and general supply, 277,500,000 units, making a total of 679,000,000 units. In the year 1906 the electric supply authorities combined to make an exhaustive canvass of all factory power users in London, and ascertained that the total power required in all districts within the County of London was 156,000 kw. The total connection for electric power now amounts to about 135,000 kw., or 86 per cent. of the power required. The average cost per kw. is about £2 15s. 8d. per annum, or £2 1s. 6d. per h.p. per annum. Since 1884, when Sir Charles Parsons constructed his first turbine—in 1888 a turbo-generator giving 75 kw. with a steam consumption of 58 lb. per kw.-hour was considered an achievement—to the present time progress has been rapid, until now Dr. Ferranti anticipates a consumption of 8.5 lb. per kw.-hour with highly superheated steam, and oil-immersed toothed gearing between turbine and generator is being used on a number of plants under construction.

The author then said that it had been suggested that large electric generating stations in the coalfields or down the river would, by superseding all the existing stations, secure some economy in the costs of generation. Such economies could easily be shown on paper, and it could with equal ease be demonstrated that the additional cost of mains and losses in transmission more than counterbalanced any hypothetical economy in generation. London is at present supplied from thirty-eight generating stations. Many of these were equipped with plant of the latest design and had facilities for extension at low capital cost. It would appear to be wiser to convey coal to them rather than to provide expensive copper mains from distant works. Some of the existing works had sites of the utmost value to the future supply of London, and, so long as the centre of gravity of the whole demand fell at a hypothetical point not far from the south side of Blackfriars Bridge, it was clear there was greater economy in developing works on all sides of this point rather than the concentration of the load in a distant region. All the existing works had still some useful life in them, and by a comparatively small expenditure they could be maintained in a high state of efficiency; but many of them were limited in their ultimate resources, and when these were exhausted it might be better to concentrate development on more advantageous sites. Owing to the chance of purchase of the London companies by the L.C.C. in 1931, further works of development would require strict economy, coupled with immediate return of some profit to avoid a loss of capital to those who had encouraged and practically founded a new industry. The system of mains, including design, material and workmanship, adopted throughout London was one of the most perfect examples to be found in any city, although it was not cheapest. Lead-covered cables, insulated with oil-impregnated paper were generally employed, and these actually improved with age so long as the lead sheathing was undamaged.

After reminding his audience of the manifold uses of electricity for domestic purposes, Mr. Bailey urged the more general use of ozonisers—limiting the ozone to one part to a million parts of air, as then there is no unpleasant odour or respiratory irritation—for halls, buildings and houses. At present the health of the workers in our factories received more attention than that of our national representatives and judges. No large city in other countries entrusted its electrical supply to municipal enterprise, and the final question of municipal trading v. controlled monopoly had been settled, with advantage to the municipalities, by allowing them some return on the profits, by limitation of dividends on a sliding scale, and by conditions of tenure. As regards rates of charge,

the average in London for 1910 was 3.42d. for lighting and 1.16d. for power, including meter rents, while in Chicago in 1912 the average prices were about 3d. and 2d., and in Berlin about 4.7d. and 1.88d. plus charges for fixing and hire of meter, cost of house connection, and 4 per cent. on the cost of the installation for the cost of the compulsory inspection of wiring. In Paris the authorised rates of charge are 4.8d. for lighting and 2.9d. for power.

The Discussion was opened by the Chairman (Mr. A. A. Campbell Swinton), who thought that people would cease to find money for investment in a concern liable to be bought up at a very low price in a few years, and in his opinion the last Electric Lighting Act had not adequately provided for this. Mr. J. H. Rosenthal (Babcock and Willcox) was not so pessimistic as Mr. Bailey on the subject of the acquisition of the present stations by the L.C.C. He thought that county councils and municipalities would find it no less difficult to raise money than the companies did, so that very likely the L.C.C. would not take advantage of their purchasing powers. Mr. W. C. P. Tapper (Borough Electrical Engineer, Stepney) did not agree with the view that the whole of the 38 stations should be further developed. A good many, having water facilities, might be so developed, but the six or seven of the better placed stations should be chosen for further development. The steam plant of existing stations could be run at peak load time until such time as it paid to scrap it. Such an arrangement would serve for many years to come, and could easily be handled by a central authority. Mr. A. H. Law (C. A. Parsons and Co.) was in favour of one central generating station carrying the load of 163,000 kw. required for the whole of London. Mr. W. M. Mordey, Mr. Leon Gaster, and Mr. G. W. Mascord also spoke, and the Author replied briefly.

## ELECTRICITY AT THE BUILDING EXHIBITION

ALTHOUGH it could hardly be expected that the Building Trades Exhibition, now being held at Olympia, would contain a very large proportion of exhibits of directly electrical nature, there are several firms connected with electrical engineering who have interesting exhibits, even if no very striking novelty is presented. Electric lighting is of course conspicuous on all the stands, and, especially in the beautiful temples dedicated to the decorators' art and the palaces of the paintmakers, there are some fine examples of up-to-date systems of electrical illumination. Some of the semi-indirect fittings are very handsome, and there are quite a number of examples of the "Indra" system (see ELECTRICAL ENGINEERING, Jan. 30th, p. 64), which was recently introduced by the Electrical Engineering and Equipment Co. (102 New Oxford Street, W.). Electric power is also made extensive use of on the stands, and motors are seen driving such apparatus as concrete mixers, brickmaking, woodworking and paint-grinding machinery.

Perhaps the best represented branch of electrical engineering is that of electric lifts. It almost goes without saying that R. Waygood and Co., Ltd. (Falmouth Road, S.E.), have a good display. On their stand they have erected a full-sized electric lift with car switch control, exemplifying some fine designs of metalwork, and with a beautiful car of light metalwork with glass panels. This is provided with an improved design of combined electrical and mechanical gate lock with several features to recommend it. A model of a push-button lift is also shown. A novelty, which the firm are showing is a system of control of vacuum-cleaner pumps, applicable to electric or hydraulic apparatus, in which a switch or valve is mounted on the actual tool or nozzle handle, so that the motor, even when permanently installed in the basement, need only be kept running when cleaning work is actually being done. Another conspicuous lift exhibit is that of Marryat and Place (28 Hatton Garden, E.C.), who have erected a sort of Eiffel Tower in the body of the hall, which contains an example of their push-button automatic electric passenger-lifts. Among the leading features of this are the arrangements for accurate floor levelling, a two-speed attachment and the gravity self-closing interlocked gates. Some notes on the Marryat and Place automatic lift, which will be remembered at the Electrical Exhibition of 1911, were given in ELECTRICAL ENGINEERING (Oct. 12th, Exhibition Supplement, p. 75). Another lift with several good points that has been described in our columns (see ELECTRICAL ENGINEERING, June 6th, 1912, p. 303) is the Graham lift, of which a beautiful working model is to be seen on the stand of Scholey and Co. (151 Queen Victoria Street, E.C.). A working electric lift is also shown by Medways Safety Lift Co. This, which is distinguished by the particularly fool-proof nature of the reversing gear, is generally similar to lifts previously exhibited by the same firm. Other applications of electric power represented are vacuum cleaning and ventilation. The

former is exemplified by a complete range of electrically-driven vacuum cleaners of all sizes shown by the British Vacuum Cleaner Co., and the latter by the well-arranged display of their well-known specialities by Ozonair, Ltd.

Electric lighting *per se* is not well represented. Here and there we find amongst other machinery an oil-engine driven generating set suitable for a country house, but nowhere a complete equipment. The best show of fittings is that of Osler and Co., but the most energetic exhibitors connected with lighting are the Holophane Co. Not only do they display all their latest designs of reflectors on their stand in the gallery, but through their enterprise lectures are being given at 8.30 every evening on "Illumination Based on Scientific Laws." The well-known "Tubolite" system of lighting is shown by the Linolite Co., who, amongst other things, also demonstrate the Woodhouse metal conduit wiring system.

Electric heating has a solitary exponent in the Carron Co., who not only show some artistic designs of radiators, but also have a complete electric cooking range on view. This is of substantial construction and comprises an enamel-lined oven with glowing heating elements top and bottom, a glass inner door, a well-lagged outer door and a thermometer; a grill, a hot-cupboard and several hot-plates on the top. The oven elements are open wire coils on fire-clay bases, but the heating wires of the hot-plates are of course concealed. Every element has three degrees of heat, and they are controlled by rows of switches on either side of the apparatus, all fitted with indicators to show which degree of heat is on, and with separate cartridge-type fuses.

Among other miscellaneous exhibits it will not be out of place to mention the stand of the India Rubber, Gutta Percha and Telegraph Works Co., Ltd. (Silvertown), who show their patent india-rubber flooring, as well as samples of cables and other of their manufactures. We should also refer to the fine display of varnishes of all kinds by Pinchin, Johnson and Co., Ltd. (26 Bevis Marks, E.C.), who are so well known for their insulating varnishes and compounds. Ladders, scaffolds, &c., in many useful varieties are shown by Heathman and Co. (10 Parsons Green, S.W.), and electric-light casing and other woodwork, joinery, &c., are to be seen in profusion on the stand of C. Jennings and Co. (Pennywell Road, Bristol).

## ELECTRIC SIGNAL BOXES, HOT PLATES, AND LANTERNS FOR THE GLASGOW POLICE

GLASGOW is probably the first city to provide electric heaters for warming food and tea for policemen on night duty. A number of signalling boxes of the latest pattern are being completed for the service of the police at various points in the city, and in addition to the interesting telephone and signalling equipment which is their *raison d'être*, these hot-plates are being provided.

The boxes are roomy structures, 8 ft. high, 3 ft. 4 in. long and 2 ft. 4 in. wide, made in cast-iron sections, bolted together and set on concrete bases placed 6 in. below the ground level, the floor being a couple of inches above to keep out surface-water. A small cast-iron lamp column 3 ft. high, surmounted by a wrought-iron pipe 2 ft. above it, is fixed on the top of the box to take the telephone insulators and in some cases the signal lamp.

Owing to traffic considerations it was not possible to choose the ideal site, viz., in the centre of street crossings, for these boxes, and consequently most of them were put in side streets, and sometimes in out-of-way corners, but all as near as conveniently possible to where two, three or more policemen's beats meet. When a box was hidden in this way the signalling lamp was not placed on the box, but on suitably situated trolley or lamp-posts, or on the corners of buildings, and in some cases two signal lamps were erected to ensure visibility from all the required directions.

Each box is fitted up with a standard post-office telephone, supplied with direct line to the nearest police office. A number of boxes connect two, and sometimes three, police offices. The operation of ringing up a box is effected in the usual way from the police office, and a branch circuit from the telephone in the box is coupled up to a specially constructed relay which switches on the signal lamp; at the same time, the closing of the lamp and relay circuit sends back current to the police office, which rings a bell there to indicate that the signal is given at the box. The official who has rung up the box then withdraws the telephone plug and inserts it into a specially constructed call-bell, which rings

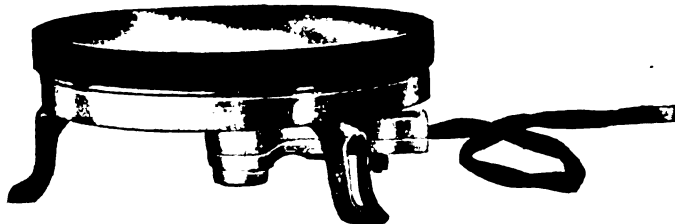
immediately the policeman lifts the receiver off the switch-book.

The policeman, when answering a call, plugs into a jack, which, besides putting the telephone into circuit, disconnects the signal lamp, and the relay resets itself ready for the next call. By plugging through, it is also possible to put the signal boxes in telephonic communication with the post-office telephone system. No meters are fitted; the energy used for the lamp and heater is charged at a fixed rate per annum. A specially designed cut-off switch is operated by the door-sneek, connected so that the electric heater can only be in circuit when the box is occupied and the door is closed by the sneek. In this way the hot-plate cannot be left in circuit even if the policeman omits to turn off the switch when he leaves the box. The hot-plates at present employed are Ferranti's 850-watt make, of the standard design shown in the illustration; these have replaceable heating elements in accordance with Messrs. Ferranti's standard practice.

The total number of police signalling boxes that will be employed in the city area is sixty-nine, including some boxes of older patterns.

Another luxury for the Glasgow policemen is an electric lantern of moderate weight to replace the hot and uncomfortable bulls-eye lantern. It weighs 1 lb. 13 oz. complete with accumulator, and gives light from a 0.6 amp. bulb lamp for about six hours continuous burning. A good bi-convex lens is used, and the circle illuminated is even throughout.

The weight of the lantern is distributed in the best possible manner, and, being carried close to the body, is not appreciable to the same extent as the old type of lamp. In the manufacture of the case projections are reduced to a minimum, the lens, handles and switch being practically flush with the case. The latter is recessed, the object being to guard against accidental switching-on of the lamp when being replaced on the belt. It is so situated that the lamp may be held and the switch operated by the use of one hand only.



The door is hinged at the bottom and is locked to the case proper by two projecting tongues fixed to the back of the lens bezel to prevent unauthorised persons tampering with the interior.

By means of a special key (kept by the lamp-room attendant) these tongues are made to turn in a circle and to lock on to a strip of metal inside the case.

The reflector, which is of spun soft iron and coated with hard, white, washable enamel, is mounted on the metal strip which acts as a hasp to the locking-tongues.

The features of the accumulator are a non-spilling vent plug and non-corrosive terminal connections, which enable repairs to be effected with a minimum of labour. The vent plug is made of two parts, and has a hollow recess filled with cotton-wool. This gives freedom to the exit of any gas generated, and effectually checks the acid from spraying.

We have to thank Mr. W. W. Lackie, the Glasgow City Electrical Engineer, for kindly responding to our request for the information contained in this article.

**The Forthcoming Electrical Exhibition at Glasgow.**—Some further particulars are now available of the Electrical Exhibition which is to be held by the Corporation of Glasgow from October 23rd to November 15th at the Zoo Buildings, New City Road, and applications for space may now be made to Mr. J. A. Freer, General Manager, 38 Bath Street, Glasgow. Arrangements are being made to supply exhibitors, to a reasonable extent, with electricity for power and lighting free. There will be a special cinematograph display demonstrating the latest applications of electricity, and manufacturers are invited to send particulars of any suitable films which they may have. The Corporation will erect the stands and the cost will be included in the charge for space. The exhibits will exemplify electric heating, cooking, and laundry work, generating plant transmission and utilisation of electric power, lifts, fans, smoke-prevention, and shop-window lighting, and the arrangements include lectures and demonstrations.

## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelopes.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,335.

It is proposed to make a purchase of six booster rotary converters and transformers operating from A.C. to D.C. Describe the necessary tests, stating points which should be watched.—"MET."

(Replies must be received not later than first post, April 24th.)

### ANSWERS TO No. 1,333.

In connection with a group of collieries there is a power plant generating about 4,000 kw., voltage 2,500, periodicity 40. At the different pits there are transformers, 2,500 to 500 volts, for supplying current to several motors, also some of the motors are driven direct from the 2,500-volt circuit. At one pit about half a mile from the power station there are several 150-kw. 2,500 to 500 volt transformers. At the generator end the neutral point is not earthed; the electrical rules in mines require all transformers fitted with some arrangement to prevent the low-tension side being charged with H.T. through any leakage, &c. This can be done, of course, by earthing the neutral point of the low-tension side of the transformer. Will it be a suitable and safe arrangement in the circumstances to earth the neutral points on the low-tension side of all the transformers and to connect all the neutrals to two common earth-plates? Supposing also that the neutral points of the generators are connected to earth, are there any objections to connecting the low-tension neutrals from the transformers to the same two earth-plates as the generator neutrals would be connected to? In addition to earthing all neutral points, is it also advisable to connect up all ironwork in connection with plant to the common neutral earth-wires?—ELECTRIC.

The first award (10s.) is made to "ALPH" for this reply:—

If the transformers are not connected in parallel on the low-tension side, the secondary of each transformer with its load forms a separate system, and the neutral points of all the transformers should be earthed. It will be quite satisfactory to do this by connecting the neutrals of all the transformers together and to two common earth plates as suggested. If two or more of the transformers are permanently connected together on the L.T. side and operated as one unit, it will be sufficient to earth the L.T. neutral of only one of these, since the whole will form one 500-volt system, and the Home Office Rules definitely state (Rule 7, c. i.) that "the neutral point of a polyphase system may be earthed at one point only." If two or more transformers are connected so that they may be run either in parallel or separately on the secondary side, the L.T. neutral of each transformer should be connected to the earthing system through an isolating switch, so that while any transformer may be run separately with earthed neutral, one only may be earthed if all are run in parallel. This is contrary to the strict letter of the rules, which forbid the insertion of a switch in the earth conductor, but under the circumstances it will usually be passed as satisfactory. Approval should, however, be obtained from H.M. Inspector of Mines before such an arrangement is installed, as it is possible that, owing to local conditions, it would be preferable to leave the neutrals of all the transformers permanently earthed, whether running

in parallel or not. With modern transformers it is very unlikely that any serious circulating currents would flow between the neutral points under these conditions. Of course, if the transformers are not running in parallel on the L.T. side, there is no possibility of circulating neutral currents.

There is no objection to connecting the generator neutrals to the same earthing system as the L.T. transformer neutrals; in fact, this would be advisable, particularly if the transformer cases were connected, by means of the cable sheathing or otherwise, to the generator earthing system. The following points should, however, be noted: (1) The transformer H.T. neutrals must not be earthed if the generator neutral is earthed. Not only would there be a danger of heavy circulating currents, but also Rule 7, c. i., cited above, would be infringed. (2) Owing to the likelihood of circulating currents (particularly if the generators are not of similar design) and to Rule 7, c. i., the neutral of only one generator should be earthed if two or more are running in parallel. As in the similar case of transformers mentioned above, it will be necessary to obtain approval of the use of isolating switches in the neutral connections to permit of any one machine being earthed when running alone. (3) In the case of a sub-station half a mile distant from the power station, it would certainly be advisable to have a reliable "earth" at both places, even if a common earthing system is used for the two. (4) In order to limit the current rush on a heavy fault, which would otherwise form practically a short-circuit on the phase on which it occurred, it is usual to insert a resistance in the earth connection of a generator or transformer, this resistance being designed to pass sufficient current to operate the overload release of the heaviest feeder with certainty on a fault. All the interconnections of the common earthing system must be on the earth side of these resistances, otherwise there is a danger of a heavy fault causing a dangerous rise of potential on the earth connections, since, under certain conditions, practically the full-phase voltage may exist across the earthing resistance until the automatic switch clears the fault. In reply to the last query, it is advisable to connect the neutral points to the same earthing system as is used for the ironwork, &c., in connection with the plant; in fact, in the official memorandum attached to the Home Office code of rules, it is stated that "the connection (of the neutral) should be made to the earthing system . . . to which the metallic sheathing (if any) of the cables is connected . . . and not to a separate earth plate." The frames of the machines, &c., will, of course, be bonded to the cable sheathing.

The second award (5s.) goes to "POLYPHASE" for the following:—

There is no doubt that in the particular installation cited by "Electric," to conform to the rules for Electricity in Mines in connection with the prevention of an accumulation of high potential on the low-voltage windings of transformers, &c., the very best thing to do is to earth the L.T. neutrals of all the transformers to one or more earth plates depending on the location of the plant; the number of earth plates makes no difference at all, provided a good earth is obtained. This is so because there is always a possibility of the L.T. windings being raised to a high potential by a breakdown between H.T. and L.T., or by a ground on the H.T. line. (In some recent tests as much as normal H.T. volts on L.T. winding.) Thus, earthing the L.T. neutrals will therefore be a safe and practical arrangement, which is cheaper and in many respects better than the use of earth shields between H.T. and L.T. winding or other static earthing devices connected on the L.T. winding. If the motors, &c., operated off the L.T. windings of the transformers are some distance from the transformers, it would seem advisable to earth the neutrals through a resistance so as to limit the current rush in the event of a fault between motor and transformer. There is no objection in connecting the generator neutrals to the same earth plates as the L.T. neutrals of the transformers are connected. No triple frequency current can flow because there is no continuous electrical connection between generator and transformer.

If the 2,500-volt supply is transmitted to the different pits by overhead wire, there seems to be no reason for earthing

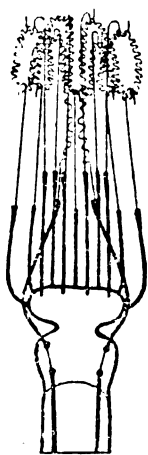
the generator neutrals, since they (the generators) must be designed to withstand the strains due to static disturbances on the overhead line, and the only advantage gained by grounding is the limitation of voltage above earth to 58 per cent. of line volts. Should, however, the supply be by underground cables, it might be advisable to earth the neutral to limit the static capacity to ground, and the fault current by earthing through a resistance. If it is decided to earth the generator neutrals they should preferably be earthed separately through a resistance to the common earth plates, so as to limit any circulating currents between generators due to differences in design of generators and prime movers. It should be noted that when the generator neutrals are earthed the 2,500-volt motors, if star connected, must not have their neutrals earthed, otherwise it is likely trouble may be experienced, due to triple-frequency currents between motor and generator.

It is always advisable and safer to connect up to the common "earth" all metalwork in connection with the plant, as it is quite possible under certain circumstances to detect appreciable electrostatic charges on adjacent metalwork.

With reference to "ALPH's" remarks on the bearing of rules 7 (c, i) and 8 (c), as to switches in earth conductors, it may be pointed out that in reality the difficulty does not exist. Though an earth conductor may not have a "switch, fuse or circuit breaker" (8, c), it may be provided with a link bolted to eyes on the cable, which may be removed when it is desired to disconnect the neutral because the transformers are in parallel for any reason.—[Ed. E.E.]

### A TUNGSTEN FOCUS LAMP

THE British Thomson-Houston Co. (Mazda House, Upper Thames Street, E.C.) have brought out a new concentrated filament Mazda lamp with the object of approximating as closely as possible to a point source of light for focus work.



MAZDA CONCENTRATED FILAMENT FOR FOCUS LAMPS. (Full size.)

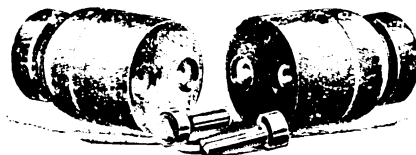
The arrangement of the filament is shown in the illustration. The lamp is made in three sizes—50 watts, 100 watts and 200 watts—and for pressures of 12 volts upwards, but we understand that the 200-volt sizes are not yet stocked. The filament is of drawn tungsten wire wound in a very narrow spiral which is formed into a series of loops bunched closely together. By this means it is possible to get a very high candle-power filament in a small compass. For example, the 100-volt 100-watt lamp (giving approximately 100 c.p.) has a filament which could be contained in a space measuring  $\frac{1}{2}$ -in.  $\times$   $\frac{3}{4}$ -in.  $\times$   $\frac{3}{4}$ -in. This lamp has been designed for use with parabolic reflectors in motor headlights and searchlights, and in magic lanterns, photographic enlarging lanterns and small cinematograph projectors. For these purposes it has all the advantages of the ordinary incandescent electric lamp in regard to cleanliness and safety, in addition to the concentrated light source. Neither gas nor oil lamps, owing to the necessity for ventilation, can be set back in deep reflectors as can be done with the new Mazda lamp with consequent gain in efficiency. The lamp thus provides a very effective light source for all purposes where it is desired to throw a powerful beam of light in one direction.

### STAGE AND THEATRE LIGHTING APPLIANCES

A VERY complete new catalogue of stage and theatre lighting appliances has been issued by the General Electric Co. (67 Queen Victoria Street, E.C.). The firm were about the first to realise the necessity of specialising in theatrical requirements. They were the originators of Lyons' liquid resistance dimmers, they were one of the earliest makers of stage arc lamps, and they manufacture and sell the only arc-lamp carbons made in this country.

Among other appliances described in the list are the following: stage arc lamps and accessories; liquid and metallic dimmers and other resistances; Osram drawn-wire lamps and Robertson lamps; cinematograph arc lamps and projectors; small motors for cinematograph machine work; various types of batten, electric fixtures, motor-generators, &c. An interesting appliance is the "Applebee" patent screen or "Spotlight" shutter, which can be fitted to any stage arc lamp. It is attached to the inside of the lamp and operates

from the back. By its use strong shadows can be avoided and a gradually diminishing light obtained. A clear mica slide which is provided prevents the projection of prismatic colouring upon the focussed object. All the gradation is under perfect control. Attention may also be called to the "Hawkins" and "Morehen" plugs. The feature of the former, which is illustrated, is that by means of detachable pins male or female contact can be made. The latter is



HAWKINS PLUG WITH REMOVABLE PINS.

intended to be fixed under the stage level and provides an easy and safe method of taking temporary leads to portable stage properties. The "Morehen" plug has no projecting pins, and if used as the live end, may even be dropped on a metal floor without danger of short-circuiting. Everything in the new list has been designed to meet the regulations of the London County Council. We also understand that the G.E.C. maintain a special Despatch Dept. to facilitate the prompt delivery of all theatrical material ordered from them.

### CATALOGUES, PAMPHLETS, &c., RECEIVED

**FEED-WATER HEATING AND SOFTENING.**—A booklet from Erith's Engineering Co., Ltd. (70 Gracechurch Street, E.C.). The "recording heater" there described shows the water in fine particles over a series of cataracts, through an oil free steam bath, thus driving off carbonic acid, &c., through a vent pipe, which also provides a free escape of steam when a surplus is admitted. A special weir box is used in connection with the recorder, which works with a float. The apparatus is also combined with softening plant.

*Readers desiring copies of catalogues or pamphlets should apply to the firms in question, referring to the notice in "Electrical Engineering."*

**MAGNETIC TESTING.**—A pamphlet from Siemens Brothers & Co., Ltd. (Woolwich), contains a reprint of an article on magnetic measurements in iron and steel works, and describes apparatus for carrying out tests of bars, bundles of strips, complete uncut sheets by various methods, as well as for testing permanent magnets.

**VACUUM CLEANERS.**—An illustrated booklet from Scholey & Co., Ltd. (151 Queen Victoria Street), draws attention to the Frantz electric suction cleaner, which, although of the self-contained class with motor suction-fan, dust-collector and nozzle all attached to the handle, only weighs 9 lb. complete. A special feature is the revolving brush within the nozzle, which is worked entirely by the passage of the air, and the blast of compressed air from an outlet in front of the nozzle. The apparatus can also be used as a stationary machine, with flexible suction or blowing hose if required.

**Scottish Local Section of the Institution of Electrical Engineers.**—The annual report refers to six meetings that have been held during the session in addition to the summer meeting of the Institution at Glasgow last June, the annual dinner and a smoking concert. The membership of the Section (including forty students and nineteen graduates) is 390. The following are the office-bearers for next session.—Chairman: Mr. J. A. Robertson (Burgh Electrical Engineer, Greenock); Vice-Chairmen: Mr. J. Lowson and Mr. T. B. Murray (Albion Motor Car Co.); Past Chairman (ex-officio members of Committee): Mr. S. Mavor (Mavor & Coulson), Mr. F. A. Newington (City Electrical Engineer, Edinburgh), and Mr. W. M'Whirter; Chairman of Students' Section: Mr. A. Page (Glasgow Electricity Supply Dept.); ordinary members of Committee: Mr. D. A. Starr (General Manager, Clyde Valley Electrical Power Co.), Mr. J. K. Stothert (Babcock & Wilcox), Mr. J. F. Nielson, Mr. W. L. Spence, Mr. M. B. Field (Kelvin & White), Mr. J. H. Bunting (Bruce Peebles & Co.), Mr. J. S. Nicholson (Glasgow University), Mr. E. T. Goslin (Glasgow Corporation Tramways), and Mr. G. Stevenson; Hon. Sec. and Treasurer: Mr. J. E. Sayers (Sayers & Caldwell); Assistant Hon. Sec.: Mr. W. F. Mitchell (Edinburgh Electricity Supply Dept.). It is mentioned in the report that the fortnightly publication of the Institution Journal will commence in January, 1914.



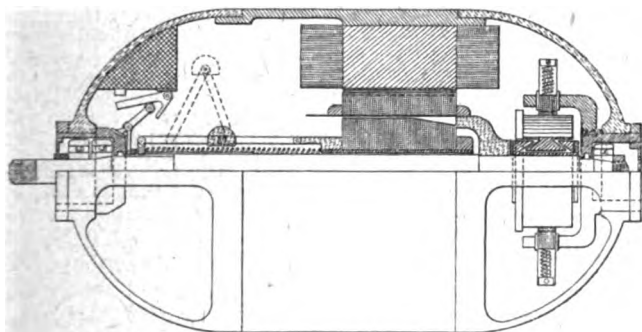
# ADAMS IGRANIC

ELECTRIC MOTOR CONTROL GEAR FOR CAPSTANS.

ADAMS  
M<sup>rs</sup> C<sup>o</sup> L<sup>td</sup>  
BEDFORD  
AND  
LONDON

## A NEW CONSTANT PRESSURE VARIABLE SPEED TRAIN LIGHTING DYNAMO

THE latest train or automobile lighting equipment using a single battery is that due to Gavan Inrig, Ltd. (154 Bishopsgate, E.C.4.), and known as the "Carléon" system, an experimental set which we had the pleasure of witnessing in operation on Tuesday last. However, until the equipment is given a thorough test under the onerous conditions of railway service it is difficult to say exactly how far the system will be able to compete with those already giving satisfactory results. The construction of the dynamo itself is very ingenious. Briefly, one may say the armature winding is supported on an iron tube fixed to one end of the field magnet casting, while a cone-shaped laminated core can slide in and out under the coils. One end of this is attached to a Pickering governor co-axial with the armature shaft. The other end of the governor is attached to a projection which, as the speed of the armature increases, is drawn in by the governor, and at a predetermined time closes the dynamo



circuit through a very ingenious Q.B. switch. This end of the governor then comes in contact with a stop on the shaft and the other end acts on the coned core, drawing it out of the armature and thereby increasing the armature reluctance, so that the dynamo pressure is kept constant. On the speed decreasing, the same operations are reversed. The illustration shows a section through the dynamo, which weighs about 135 lb. for an output of 30 amperes at 25 volts. It should be mentioned, however, that the switch there shown was not satisfactory, and is not now used. It is proposed to adopt a short chain drive, except for automobile work, in certain cases. Over a speed range of 6 to 1, or 500 r.p.m. to 3,000 r.p.m., the pressure of the system appears to vary about 3 volts or so, but, as stated above, a more complete test under service conditions must be made, when it will be seen whether the dynamo can keep the battery in good condition. There are no external switches or regulators, so that the connections are as simple as possible. The design of the dynamo is covered by Patents noticed in the ELECTRICAL ENGINEERING Patent Record, Vol. VIII., p. 390, July 4th, 1912, and p. 724, Dec. 26th, 1912.

**Finsbury Technical College O.S.A.**—The seventh annual smoking concert will be held at the Waldorf Hotel (Aldwych, W.C.) on Friday, April 25th, at 8 p.m., when the Chair will be taken by the President, Mr. Julian L. Baker. Early application for tickets, price 1s. each is requested to Mr. R. W. Clarke (Avon House, Prince's Road, Buckhurst Hill, Essex).

**Claim for Payment for Metal Filaments.**—On April 10th a King's Bench action by the Brimsdown Lamp Works, Ltd., to recover about £113 for tungsten colloid filaments supplied to the firm of Halé & Co. was heard by Mr. Justice Rowlatt and a common jury. The chief point in the action was whether the filaments were supplied by Mr. Scharrer, late general manager to the Brimsdown Company, in a private capacity or in his capacity as representative of the Brimsdown Company. None of the correspondence, including invoices, &c., apparently bore the Brimsdown Company's address nor contained any reference to that company, but it was proved that Mr. Halé had been on several occasions to the works. Judgment was given for the Brimsdown Company.

## ELECTRIC TRACTION NOTES

Another, and we trust the last, of an unfortunate series of breakdowns occurred at the Greenwich power-house of the L.C.C. tramways at about 9 a.m. on Monday. The piston of one of the vertical cylinders of one of the large reciprocating sets was forced through the cylinder cover, and one of the pieces fell on to the alternator. Fortunately no one was injured. The resultant short-circuit burst a trifurcating box on one of the switchboard circuits. All the machines were running, and the damage done by the arc (which was nearly 12 ft. long) was serious. It took about two hours to clear up and get the station running again.—At the meeting of the London County Council on Tuesday evening a report was presented on the previous accidents, full particulars of which were published in our columns at the time, and a brief statement was also made as to last Monday's breakdown. In the course of the debate, Sir Edward White, Chairman of the Highways Committee, said that in addition to their resources at Greenwich, they had a contract with the Metropolitan Electric Tramways, Ltd., to supply them with a certain amount of power, and under that contract power was being supplied to them now. They had also a contract with one of the public authorities, and cables were being laid down in order to give them a third string to their bow.

A tramway collision occurred early on Tuesday morning in Seven Sisters Road, in which four persons were injured. It appears that one car for some reason got out of control and, gaining speed, crashed into the back of another car and, becoming derailed, mounted the pavement and dashed into a shop-front.

It is stated that in order to meet, to some extent, the reduced traffic receipts on the L.C.C. tramways, the Council is making an application to the various authorities through whose areas their tramways run to reduce the assessments.

A House of Commons Committee has passed that portion of the Southport Corporation Bill which gives powers to run trolley omnibuses along the esplanade and promenade.

## TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

The appeals by the Post Office and the cross-appeals by the National Telephone Co. against the award of the Railway and Canal Commissioners as to the purchase-price of the Company's undertaking, came before the Master of the Rolls and Lords Justices Buckley and Kennedy on Tuesday and Wednesday last. Mr. Danckwerts, K.C., for the Company, took a preliminary objection that there was no appeal from the award of the Railway and Canal Commissioners, who were acting as "contractual arbitrators" between the parties. The Attorney-General, for the Post Office, argued that the award was made under the "jurisdiction of the Court of the Railway and Canal Commission," and therefore points of law arising from the award were appealable. The Master of the Rolls and Lord Justice Kennedy read the law as giving a right of appeal in this case, but Lord Justice Buckley took the opposite view. Right to appeal was therefore given by a majority of the Court. Sir Alfred Cripps, K.C., then asked for the appeal to be held over till this point was decided by the House of Lords, and the Attorney-General agreed. The appeal to the House of Lords will be made at once, and may be quickly decided, but it is hardly probable that, in the event of their upholding the decision of the Court of Appeal, the points of law on the award will be argued until after Whitsun.

The week's "sensation" in the Marconi Inquiry was a reference, in the course of the evidence of Mr. Godfrey Isaacs (Managing Director of the Marconi Co.), to "rumours" that the attack on Cabinet Ministers had been organised by a group of people with the definite object of promoting the Poulsen

# "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

## Specifications Published April 10, 1913

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

6,404/12. **Time Switches.** H. S. HATFIELD (Germany). To make or break a circuit after fixed intervals a fluid is enclosed in a tube of special shape, in which is a porous plug through which the fluid can escape from one part to another. This action may cause the tube to move, and so control a circuit, or a conducting fluid may be used which will short-circuit the terminals of a circuit inserted in the tube, or this may be effected by a liquid like mercury, which is acted on by the fluid. Various means may be used to reset the switches. Their use in prepayment meters, where they are reset by the insertion of a coin, is contemplated. Five figures.

6,990/12. **Circuit Breakers.** E. O. MÖLLER (British Westinghouse). To ensure that the circuit shall be opened under any of the usual conditions certain connections through resistances and shunts are made. For overload and reverse there is a shunt in the main circuit. The trip coil in series with a comparatively big resistance is connected from one end of the shunt to the opposite pole, while another resistance is connected to this pole from the other end of the shunt. Resistances and a hot wire relay, controlling the circuit-breaker coil and the main shunt from the secondary of a transformer, whose primary is in the main circuit, and from the secondary of another transformer whose primary is in shunt to the main circuit, may be used for A.C. circuits. Modifications are made for other forms of protection. Seven figures.

7,242/12. **Wireless.** F. J. CHAMBERS. Polarised waves of audible frequency are emitted from long conductors laid parallel to, and insulated from, the earth. A parallel conductor may also be embedded in the earth, laid on its surface, or insulated from it. Condensers connect the two conductors, by which the natural frequency is adjusted. Inductances may also be inserted. If continuous radiation is employed a Morse key can be used for transmitting, but if impulsive excitation is used two different frequencies are used. Five figures.

8,640/12. **Instrument and Machine Slip-ring Collectors.** A. DENNY and F. T. EDGEcombe. A spring-controlled plunger is connected to a semi-elliptic conducting leaf spring by an adjustable catch. Two figures.

12,367/12. **Vacuum Electric Water-Heaters.** T. MANN. The resistor is carried on the water tubes, and is surrounded by a vacuum. (See ELECTRICAL ENGINEERING, Vol. VIII., p. 480, August 29th, 1912.)

16,708/12. **Telephone Lightning Protectors.** B. T.-H. (G.E.C., U.S.A.). Metal and oxidised non-metal blocks are arranged alternately, separated by spark-gaps. Alternatively oxidised metal blocks and refractory blocks may be used. Aluminium and graphite are proposed. Three figures.

20,248/12. **Self-Cleaning Spark Plugs.** J. J. THOMPSON (U.S.A.). The insulating material is inserted from the bottom to prevent escape of gas, and to adjust the gap one terminal is provided by the bushing nut, which is threaded on the lower end of the plug. To prevent it getting fouled by oil or carbon the lower electrode is made in the form of a cage, within which is a free metal ball. Six figures.

1,205/13. **Variable Speed Dynamos.** T. W. TATTERSALL. To regulate the output of an automobile axle-driven dynamo three field windings are provided, viz.: shunt and series windings and a balancing series winding, which is in series with an iron wire or other resistance having a high positive temperature coefficient. One figure.

5,545/13. **Variable Speed Differential Dynamos.** C. F. KETTERING (U.S.A.). So that the machine may build up rapidly there is in parallel with the series winding an iron wire resistance so that initially the series field is short-circuited, but as the current increases so does the resistance of the iron, and more current passes through the series coil. One figure.

## Specifications Published To-day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, E.C., at the price of 8d. each, post free.

Names in italics indicate communicators of inventions from abroad. Summaries of some of the more important of these patents will appear in our next issue.

**Arc Lamps:** B.T.-H. (G.E.C., U.S.A.) [Electrodes] 13,375/12.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** B.T.-H. and WEDMORE [Distributing] 28,868/11; DUBILIER [Utilisation of transformed and primary currents] 6,909/12; SUNDERLAND and PILLINGER [Automatic control of engines, dynamos, and batteries] 7,375/12; HEPBURN [Continuity joint for cable armouring] 13,171/12; WINSCH [Contact box for motor-mains connection] 18,992/12.

**Dynamos and Motors:** BROWN, BOVERI [Brush-holders] 7,577/12.

**Electrometallurgy and Electrochemistry:** KENNEDY and BRITISH ARC WELDING Co. [Welding] 8,987/12; DU PONT [Obtaining oxides of nitrogen from the air] 17,038/12.

**Ignition:** KETTERING, 29,091/12.

**Instruments and Meters:** WHITIE and LANGLEY [Recording coal supplied to boilers] 7,885/12; BAUER [H.P. electrometers] 25,101/12.

**Storage Batteries:** CLARK [Corrugated boxes] 10,766/12.

**Switchgear, Fuses, and Fittings:** B.T.-H. (G.E.C., U.S.A.) [Relays for control systems] 7,014/12; [Motor control] 8,611/12; BEUTTELL and MANNERS-SMITH [Reflectors for linear light sources] 14,719/12; KLING and HORTON [Switches] 16,229/12; MOFFETT & ROSHER [Motor-starters and controllers] 20,113/12; TASSO [Fuse] 21,540/12.

**Telephony and Telegraphy:** MELLINGER [Telephony] 7,100/12; GRISSINGER [Telephony] 7,482/12; [Repeater circuits] 2,929/13; [Lines] 2,931/13; [Receivers] 3,587/13; [Substation circuits] 3,780/12; LAGUS [Telephones] 11,578/12; POPE [Telegraph apparatus] 11,605/12; THOMPSON (Ges. für Drahtlose Telegr.) [Producing oscillations] 16,827/12; SIEMENS BROS. & Co. (Siemens & Halske) [Electro-magnetic telegraphic perforator] 26,306/12.

**Traction:** KETTERING [Starting systems for internal combustion engines] 28,903/11 and 29,071/12; CROMPTON & Co., MACFARLANE and BURGE [Motor control] 4,995/12.

**Miscellaneous:** JAMES and SMITH [Protecting submerged structures from barnacles, &c.] 7,317/12; SIBLEY [Piano-players] 7,370/12; B.T.-H. (G.E.C., U.S.A.) [Dash-pots] 15,070/12; WORTMANN [Tilling machines] 15,638/12; SOU [Blasting detonators] 16,963/12; BATES, KELLY and CORBIN [Cinematograph targets] 17,536/12; "VULKAN" MASCHINENFABRIKS [Clutches] 20,922/12; BIGGE and BUTTE [X-ray photography] 28,677/12.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Distributing Systems, Insulating Materials, Cables and Wires, &c.:** BROWN, BOVERI [Conductors] 6,036/13.

**Electrometallurgy and Electrochemistry:** PERREUR, LLOYD [Electrolytic production of copper] 6,897/13.

**Ignition:** RUYSSENAERS [Regulating] 6,544/13.

**Incandescent Lamps:** KREMENEZKY [Manufacture of ductile tungsten filaments] 3,112/13.

**Switchgear, Fuses and Fittings:** SIEMENS, SCHUCKERT [Sockets] 5,903/13; [Fuse] 6,880/13; POLLAK [Interrupters] 6,122/13.

**Telephony and Telegraphy:** HILL [Selective signalling] 2,612/13; SOLDATENCOW [Electro-magnetic perforator] 5,352/13; BETULANDER [Selectors for automatic telephony] 6,465/13; SIEMENS & HALSKE [Semi-automatic telephony] 6,664/13; [Registering subscribers' calls] 6,936/13.

**Miscellaneous:** MARELLI & Co. [Oscillating fans] 6,496/13; HARTMANN & BRAUN [Gyro-compasses] 6,570/13; A.E.G. [Clock control] 6,934/13.

The following Amended Specification may now be obtained.

**Traction:** S. ARNOLD [Luggage transporter] 22,406/11.

## Expiring and Expired Patents

The following Patent expires during the current week, after a life of fourteen years:—

8,223 of April 19th, 1899. **Testing Primers and Batteries.** G. C. FRASER and G. K. B. ELPHINSTONE. To test firing primers and batteries, a dead-beat ammeter movement and an adjustable rheostat of about 50 ohms are contained in a portable case. Marking the dial to obtain direct readings for resistance values is claimed.

The following are the more important Patents that have become void through non-payment of renewal fees.

**Distributing Systems, &c.:** ATELIERS THOMSON-HOUSTON [Induction motor control with subsidiary motor] 25,979/06.

**Dynamos, Motors and Transformers:** R. H. BARBOUR [Flexible copper brushes wholly or partly encircling the collector ring] 28,482/07; MATHER & PLATT (E. Rosenberg, Berlin) [Motor-generators and rotary converters] 28,530/07.

**Electrochemistry:** J. Y. JOHNSON (Badische Anilin und Soda Fabrik, Germany) [Chromic acid by electrolysis] 27,009/05; M. RUTHENBURG [Electrolysis of brine] 29,655/06.

**Incandescent Lamps:** A. G. BLOXAM (J. Luz, Vienna) [Manufacture of tungsten filaments] 27,002/05.

**Storage Batteries:** A. J. BOULT (E. F. Stebbins, U.S.A.) [Adding barium or strontium sulphate to active material] 26,876/05.

**Switchgear, Fuses and Fittings:** J. GUNNING [Time switch] 25,567/99; A. P. and G. C. LUNDBERG [Fixing tumbler switch covers to base] 25,622/99; W. W. STRODE and G. H. WHITE [Flush pattern tumbler switches, wall plugs, &c.] 28,252/04.

interests by preventing the ratification of the Marconi agreement. No evidence was given, however, to prove that these rumours were founded on fact. Mr. Isaacs also showed a draft prospectus of a Poulsen system, containing a report by Mr. A. A. Campbell Swinton; he maintained that, if Sir Henry Norman knew that Mr. Swinton had reported in a prospectus in favour of the Poulsen system, he should not have recommended him to the Committee as an independent expert. A large blue-book is now available containing the full report of the proceedings before the Committee up to February 12th last.

Communication between Pahang and Malacca was restored some time ago, as well as with Bucoio, Quimball, Bailundo, Balombo and Bihé, in Angola, on the 10th inst.—The Compagnie Francaise des Cables Télégraphiques has again suffered a breakdown of their cable between Paramaribo and Cayenne, thus cutting off their route to French Guiana and Brazil.—Also all communication was cut off between Saigon and Bangkok from the 11th to 12th inst.—The cable between Tokio and Guam was repaired on the 13th inst.—Some repairs are also being undertaken to cables between Key West and Havana.

### LOCAL NOTES

**Accrington: Rateable Value System of Charging.**—The Council has approved a proposal of the Electricity Committee to have an optional tariff on the basis of 12½ per cent. on the net rateable value of the house, plus ½d. per unit for all energy consumed.

**Colwyn Bay: Supply in Bulk.**—The North Wales Power Co. have suggested a supply in bulk to the Council as a possible way to obviate the need for an expenditure of £5,000 upon enlarging the municipal electricity works. The matter has been referred to a special committee.

**London: Hammersmith: Hiring of Arc Lamps.**—A reduced scale of charges for the hiring out of arc lamps is recommended by the Electricity Committee. Considerable reductions will be obtainable on a four years' contract.

**Lytham: Electric Supply.**—The Board of Trade has granted an electric lighting provisional order to the Council. At the recent local inquiry, the St. Anne's-on-Sea Council also made an application for an order for Lytham.

**Portrush: Electric Lighting Scheme.**—A Board of Trade inquiry is being held in regard to an electric lighting scheme for this district.

**Reading: Change of Frequency.**—For many years the Reading Electric Supply Co. has been generating single-phase alternating current at the unusual periodicity of 67 periods per second, which obviously has made it more difficult for their consumers to obtain electrical apparatus. The Company now proposes to adopt the standard frequency of 50 periods per second, and a favourable report upon the proposal has been made by the General Manager and Engineer of the Corporation Tramways Department.

**St. Andrews: Street Lighting.**—The Council has approved of the Electric Supply Corporation putting down an experimental installation of street electric lighting.

**Scarborough: Purchase of Local Supply Co.**—The Corporation having under consideration the possibility of purchasing the undertaking of the Scarborough Electric Supply Co., permission has been asked of the Company to an examination of its plant by a consulting electrical engineer.

**Sheffield: Rateable Value System of Charging.**—The proposal of Mr. S. F. Fedden, Manager of the Electricity Department, to adopt the rateable value system of charging on the basis of a fixed annual charge of 10 per cent. on the assessment, plus ½d. per unit for all consumption, has been passed by the Corporation.

**Stoke-on-Trent: The New Power House.**—The new power house, which was described in last week's ELECTRICAL ENGINEERING, was formally inaugurated on Thursday last by Alder-

man Leese, Chairman of the Electricity Committee, in the presence of a large gathering.

**Waterford: Electric Supply.**—As we recently announced, the Waterford Gas Co. has received a report from Mr. C. H. Wordingham upon the question of an electric supply undertaking in the town, and, acting upon the advice in this report, notice has now been given to the Corporation of the Gas Company's intention of applying for an electric lighting provisional order.

### TENDERS INVITED AND PROSPECTIVE BUSINESS

#### Generating Stations, Sub-Stations, Mains, &c.

**Birmingham.**—After careful consideration, the Electric Supply Committee have decided not to instal gas engines for the first portion of the large extension scheme, but to adopt steam turbines. This decision has been come to on the advice of Mr. R. A. Chattock, the City Electrical Engineer, and a detailed report will now be presented to the Corporation.

**Carlisle.**—A loan of £7,500 for additional plant is to be applied for.

**Dublin.**—E.H.T. sub-station switchboard and accessories. Also alteration to existing E.H.T. switchboard. (Chairman, Electricity Committee, Cork Hill. May 1st. (See an advertisement on another page.)

**Dundalk.**—A Local Government Board inquiry is to be held into an application for a loan of £5,000 for electric light extensions.

**Grimsby.**—The Council have decided to make application to the Local Government Board for sanction for the following loans: turbine and condensing plant, £7,500; switchboard and cable, £300; pipework, £600; foundations, £250; additional feeder panel, £100; extension of cooling tower, £200; oil separator, £150; and contingencies, £200.

**King's Lynn.**—Tenders are invited for one 400-kw. steam dynamo with condensing plant and pipework. May 5th. (See advertisement on another page.)

**London: Bermondsey.**—A loan of £1,500 for the electricity undertaking has been sanctioned by the London County Council.

**Newport (Mon.).**—At the last meeting of the Council the Chairman of the Electricity Committee stated that in order to keep the capacity of the power station up sufficiently to meet the prospective demand, an expenditure of £10,600 would be necessary.

**Swansea.**—The Electrical Engineer has prepared plans and specifications for extensions at the generating station.

**Whitehaven.**—The Local Government Board has sanctioned loans of £665, £300 and £600 for excess expenditure on plant, mains extensions and house services respectively.

**Wolverhampton.**—The Electricity Committee recommend that application be made to the Local Government Board for a further loan of £15,000 for mains extensions; £5,000 for sub-station equipment; and £2,000 for E.H.T. switchgear.

#### Wiring

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Batley.**—Villa residence, Grange Estate. Architects, W. Hanstock and Sons. April 8th.

**Hull.**—Electric lighting of Saner Street school. Chairman, Education Committee, Town Hall. April 24th.—Electric lighting of Stepney Lane and Cleveland Street workshops and stables. City Engineer, April 23rd.

**London.**—New fire station at St. John's Wood.

**Sheffield.**—Institution for crippled children. A. W. Kenyon, 8A George Street.

**Swansea.**—Cinematograph theatre, Oxford Street. Architect, C. T. Ruthen, Bank Chambers, Heathfield.

**York.**—Knavesmire elementary school. Education Offices.

#### Miscellaneous

**Australia.**—1,600 incandescent lamps. Specification, 72 Victoria Street, S.W., or 73 Basinghall Street, E.C.

**Durban.**—The Corporation require a complete electric meter-testing equipment. Town Clerk. May 28th. Specification, &c., at 73 Basinghall Street, E.C.

### THE RECORD ELECTRICAL Co., Ltd.

LONDON OFFICE:  
CAXTON HOUSE,  
WESTMINSTER, S.W.  
Telephone:  
3007 Victoria.

MEASURING  
INSTRUMENTS.  
RECORD'S PATENT.

WORKS:  
BROADHEATH,  
MANCHESTER.  
Telephone:  
164 Altrincham.  
Telegrams & Cablegrams:  
"Infusion,"  
Altrincham.

Telegrams & Cablegrams:  
"Infusion,"  
London.

Write for Prices & Particulars.

## TENDERS RECEIVED AND ACCEPTED

**Dublin.**—The Electricity Committee recommend the acceptance of the following tenders, which are the lowest in each case received:—Babcock & Wilcox, boiler plant, £11,024; Worthington Pump Co., circulating water pipes, £1,346; British Reinforced Concrete Engineering Co., £5,929; The New Conveyor Co., £6,302.

**Halifax.**—The tender of Chamberlain and Hookham for meters has been accepted.

**London: L.C.C. Tramways.**—The tender of the British Electric Transformer Co. for transformers for the Shoreditch tramway sub-station has been accepted at £4,380. Three other tenders were received, and the accepted tender was not the lowest.

**Battersea.**—The tender of Babcock and Wilcox for a water-tube boiler, &c. (£1,920), has been accepted, and that of Callender's Cable and Construction Co. for troughing and bends for cables, &c.

**Manchester.**—The following tenders have been accepted by the Electricity Committee:—Callender's Cable & Construction Co. for twelve-months' requirements of low-tension distribution cables; Electrical Engineering & Equipment Co. for paper insulated cable; and Liverpool Electric Cable Co. for rubber insulated cable. The Education Department have accepted the tender of Messrs. T. Anderson, Ltd., for the electric wiring and fitting of the new municipal school in George Leigh Street.

**Southend.**—Venner Time Switches, Ltd., have been awarded a two years' contract for demand limiters.

**West Hartlepool.**—The Bastian Meter Company's tender has been accepted for the supply of 2½ and 5 ampere meters.

**Wolverhampton.**—A contract for a twelve-months' supply of traction-type Tantalum lamps has been placed with Messrs. Siemens Bros. Dynamo Works.

Messrs. Siemens Bros. Dynamo Works have received further contracts for the supply of Tantalum traction lamps from two of the largest Corporation tramway undertakings in Yorkshire. In addition, they have also received a contract for the supply of Wotan lamps for shed and general tramway lighting other than cars.

## APPOINTMENTS AND PERSONAL NOTES

The following were selected for the first short list for the appointment of Chief Engineer and Manager of the Hampstead Council's electricity undertaking: H. Richardson, Chief Electrical Engineer, Dundee; T. C. Parsons, late Chief Engineer, Govan; W. Wyld, Chief Electrical Engineer, Birkenhead; G. R. Spurr, Electrical and Tramways Engineer, Walthamstow; F. W. Purse, Chief Electrical Engineer, Watford (who has since been appointed to the vacancy at Carlisle); and J. H. Bolam, Chief Electrical Engineer, Weymouth. The Electricity Committee selected the first four of the above-named for the Council to make its final selection this (Thursday) evening, but we learn that Mr. Richardson has withdrawn his application, so that Mr. Parsons, Mr. Wyld, and Mr. Spurr are the final candidates.

Mr. C. M. Davis, of Bristol, has been recommended by the Hampstead Committee for the vacancy of Consumers' Engineer recently advertised. The recommendation will come formally before the Council to-day fortnight.

In consequence of Mr. H. H. Saunders, who, as we announced last week, has been appointed General Manager to the Lowestoft Corporation, having to relinquish certain private work under the new arrangement, his salary is to commence at £250 per annum instead of £220, and will rise to £280 by yearly increments of £10.

Mr. E. J. Cochrane, Chief Assistant Engineer to the Sydney Corporation, is to be sent on a trip to Europe and America in order to study methods of electric generation.

The Dublin Port and Docks Board are recommended to appoint an electrical engineer in view of the growing importance of the electrical equipment of the Port.

A shift engineer is required at Heywood, at a salary of 26s. per week.

## MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. G. Smith and Son, of 5 Philpot Lane, E.C. inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night, was £72 to £72 10s. (Last week, £71 10s. to £72.)

**Simplex Heating and Cooking Apparatus.**—In order to differentiate their various electrically-heated appliances from their other manufactures, Simplex Conduits, Ltd. (116 Charing Cross Road, W.C.), have registered as a descriptive mark the

name *jeleXaim*

**Concert.**—The Fourth Annual Bohemian Concert of the Athletic Club of Electrical Installations, Ltd. (27 Martin's Lane, Cannon Street), was held at the Oval Hall, Kennington, on April 9th. Mr. S. C. Russ opened the proceedings with a short speech, and an excellent programme was given.

**The Adams Manufacturing Co.**—An order was made on Saturday last by Mr. Justice Swinfen Eady, appointing Mr. Lewis Hardy Receiver and Manager on behalf of the debenture holders of this Company. No interruption will be caused in carrying on the business, as the Receiver, under leave of the judge, is to continue its business. Arrangements for the reconstruction of the Company are in process of being made.

**Van Horse Parade.**—Siemens Bros. Dynamo Works, Ltd., Tyssen Street, Dalston, have been given both first and second prizes at the recent London Van Horse Parade in Regent's Park.

**Plant for Sale.**—The whole of the machinery and plant, including Diesel engines and generators, at the Yardley generating station of the Birmingham Tramways Department, is for sale on account of the closing down of this station. (See advertisement on another page.)

**Liquidations.**—The Directors recommend the winding-up of the Electrolytic Alkali Co., and that Mr. W. H. Alexander be appointed liquidator.

## COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &amp;c.

**South Wales Electrical Power Distribution Co.**—At the annual meeting last week it was stated that in order to meet the increased demand, an additional 5,000 kw. generating set, with boilers, &c., has had to be installed. The chairman expressed the opinion that at no very distant date the company would be able to resume payment of the interest on the old debenture stock.

**Bromley Electric Light Co.**—At the meeting last week a dividend at the rate of 8 per cent. for the second half-year, making a total of 6 per cent. for the year, was declared, with £4,000 carried to reserve, and £1,544 carried forward. Although there had been a very fair increase in the lamp connections, the revenue had hardly gone up in proportion.

**A New Osram Lamp.**—As will be seen from an announcement in our advertisement columns, the General Electric Co., Ltd. (67 Queen Victoria Street, E.C.) are putting on the market a smaller size of 200/260-volt, drawn-wire Osram lamp than they have produced before. The new lamp, which should have a considerable field of utility on account of its economy in current consumption, takes only 15 watts, and is rated at 11 British candle power.

**Obituary.**—The death, on April 6th, of Prof. A. Slaby, at the age of sixty-four, is announced from Charlottenburg. Prof. Slaby, who will be chiefly remembered in connection with his pioneer work in wireless telegraphy, was one of the chief lecturers at the Technische Hochschule, Berlin.

We regret to record the death of Mr. E. B. Bright on Monday last, at the age of eighty-two. Mr. Bright did a considerable amount of pioneering work in telegraphy, and in particular he will be remembered in connection with the laying of some 5,000 miles of submarine cables in the West Indies during 1869-1872. He was a brother of the late Sir Charles Bright.



# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

NO. 330 [VOL. IX., NO. 17]  
*All rights reserved.*

THURSDAY, APRIL 24, 1913.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES and TECHNICAL COLLEGE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

*Other Advertisement Rates on Application.*

*Latest Time for Receiving*

*Letters for Insertion, Tuesday first post.*

*Small Advertisements and Official Announcements, Wednesday first post.*

*Displayed Advertisements, Tuesday first post.*

*Corrections in Standing Advertisements, Monday first post.*

All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 208-206, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Circling, Fleet, London." Telephone No.: 5509 Holborn.

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## CONTENTS

	PAGE
Summary	220
Arrangements for the Week	224
The I.E.E. Council Election	224
Correspondence	224
Self-Synchronising Machines	225
Electrical Regulations for Factories	227
Works Driving	228
Interpoles	228
The Electrical Trades' Benevolent Institution	228
Questions and Answers by Practical Men	229
Brighton Street Lighting	230
The Carléon Train Lighting Equipment	230
Sealing-Wax Heaters	230
Annual Patents Report	231
Catalogues and Pamphlets Received	231
Telephony and Telegraphy (Including Wireless)	231
Patent Record	232
Electric Traction Notes	233
Local Notes	235
Tenders Invited and Prospective Business	235
Tenders Received and Accepted	235
Miscellaneous Business Notes	236
Companies' Meetings, Dividends, Reports, &c.	236

## SUMMARY

MONDAY was the last day for nominating candidates for the Institution of Electrical Engineers' Council election. Only one has been added to the nominations published in our issue of April 3rd, viz., Mr. R. A. Chattock, of Birmingham. (Page 224.)

A LETTER from M. Latour refers to the patent position regarding single-phase motors in Germany. (Page 224.)

In a Paper by Dr. E. Rosenberg, read and discussed before the Institution of Electrical Engineers in London, Birmingham, and Manchester, on self-

synchronising machines, the various methods of starting were dealt with, and a new method, using a small A.C. motor in series with the synchronous motor or rotary, due to the author, in which rapid starting is obtained, while sparking and current rushes are avoided, was described. (Page 225.)

It was held on Appeal at the Middlesex Quarter Sessions on Monday that the North Metropolitan Electric Power Supply Co. had not infringed the Home Office Regulations by employing a youth under 21 for cleaning work in a sub-station; as he was properly trained and competent he was an "authorised person" under Regulation 28. The youth in question had been killed by touching a live conductor on a section of the switchboard adjacent to the dead one, upon which he had been working, but separated from it by a 2 ft. 6 in. gangway. This gangway, however, was not considered by the magistrates to be a "division" under Regulation 18, but the fine for infringement of this regulation was reduced from £25 to £10 10s. (Page 227.)

A PAPER by Mr. W. E. Milns, read recently before the Birmingham Local Section of the Institution of Electrical Engineers, dealt with a number of points tending towards the successful installation of electric power equipments in works. (Page 228.)

A PAPER by Mr. R. G. Allen on interpoles was read at a recent meeting of the Dublin Local Section of the Institution of Electrical Engineers. (Page 228.)

At the annual festival dinner of the Electrical Trades Benevolent Institution over £800 was collected, and we hope that many more will add their help when they realise the good work the Institution is doing. (Page 228.)

The arrangement of burglar alarms is discussed in our Questions and Answers columns. (Page 229.)

THE "Brighton" series system of incandescent street lighting is briefly described on page 230.

SOME additional notes on the Carléon train lighting equipment are given on page 230.

Two new forms of electric sealing-wax heaters are described and illustrated. (Page 230.)

THE annual report of the Comptroller-General of Patents for the year 1912 states that there was an increase in the total number of applications for patents during that year. The tendency to file Complete specifications with the application is becoming very marked. (Page 231.)

THE evidence before the Marconi Inquiry Committee during the week has dealt mainly with personal matters. A demonstration of the Poulsen system has been made before their Technical Committee. The Postmaster-General has announced that certain privileges are to be granted to the electrical staff taken over from the National Telephone Co. (Page 231.)

THE Telegraph Patent taken out by V. Poulsen in 1899 would expire on the 28th of this month if the petition for prolongation were not granted. The

petition is in the lists for to-day, and we understand that it is practically unopposed. Among the specifications published by the Patent Office on Thursday last is one for a system of keeping the power developed by a motor constant by automatically varying the torque inversely as the speed, this specification being in the names of Crompton & Co., J. C. Macfarlane, and H. Burge. Some mechanical details of a motor controller are also protected by F. J. Moffett and N. B. Rosher. (Page 232.)

A NUMBER of Bills relating to electric traction matters have been before Committees of Parliament during the week.—The proposal of the Hastings Tramways Co. to abandon the Dolter surface contact system along the sea front has been rejected.—The question of contributions towards the maintenance of roads in respect of the running of trolley 'buses and motor 'buses has been discussed before a House of Commons Committee, which is considering a number of these bills, and the principle has been laid down that at the end of three years an arbitration shall be held to determine whether there has been "extraordinary" traffic, if so, an amount of compensation payable by the traffic authority is to be fixed.—An extension of time has been granted for the construction of the Wimbledon and Sutton electric railway. (Page 233.)

THE Dundee Corporation have a Bill in Parliament for the annexation of Broughty Ferry.—An electrical exhibition is to be held in Southampton.—The Walthamstow Council are to supply in Woodford.—Mr. H. R. Hooper, a Local Government Board inspector, made some strong comments at Coventry last week with regard to the application of profits to relief of rates. (Page 235.)

EXTENSIONS are contemplated at Grimsby, £17,800; Lincoln, £12,500; Bridlington, £5,000; and Long Eaton, £10,000.—Two 6,000 kw. turbines are required at Christiania, and two 5,000 kw. three-phase generators and water turbines are required at Winnipeg. (Page 235.)

A DIVIDEND of 9 per cent. is declared on the ordinary shares of Babcock & Wilcox, and a satisfactory year's working is reported by the Lancashire Electric Power Co.; North Metropolitan Electric Power Supply Co. (on the ordinary shares of which 6 per cent. is paid with a bonus of 8s.), and the Midland Electric Corporation for Power Distribution.—Messrs. Johnson & Phillips show a balance of £3,315 after meeting depreciation, &c., but no dividend is paid on the ordinary shares. (Page 236.)

## CORRESPONDENCE

### SINGLE-PHASE MOTOR PATENTS.

To the Editor of ELECTRICAL ENGINEERING.

SIR,—Referring to your statement in your issue of April 3rd inst. (page 113) concerning the German patent No. 153,730/01, I trust you will allow me to observe that the E.T.Z. has pointed out nothing whatever as regards the validity or purport of the said patent. The E.T.Z. has simply published in its issue No. 12 of the current year both a letter addressed to them by Mr. F. Eichberg, and at the same time my own answer to that very letter of Mr. Eichberg's.

I am not acquainted with the decision of the German Patent Office to which Mr. Eichberg referred in his letter to the E.T.Z.; but I do know that there is no patent of Messrs. Winter & Eichberg allowing them to confiscate for their own benefit my essential work on the compensation and commutation of commutator motors, which works have become the basis of the modern conception of such machines.

Believe me, Sir, yours truly,

MARIUS LATOUR.

22 Rue de Toqueville, Paris,  
April 21st, 1913.

## THE INSTITUTION COUNCIL ELECTION

BALLOTING papers for the election of members to fill vacancies on the Council of the Institution of Electrical Engineers will probably be sent out to-morrow. A list of the nominations made by the Council itself appeared in our issue of April 3rd, and other nominations by the membership could be made up to Monday last. Only one other candidate has been proposed, however, namely, Mr. R. A. Chattock (City Electrical Engineer, Birmingham), who, we understand, is being supported by a number of municipal electrical engineers.

There is only one vacancy for ordinary members of Council, and there are now three candidates, Mr. A. L. C. Fell and Mr. G. S. Ram, proposed by the Council, and Mr. Chattock.

Mr. Duddell as President, and Sir Charles Parsons and Mr. J. F. C. Snell to fill the two vacancies as Vice-Presidents, are unopposed.

For the three associate members of Council choice will have to be made from four names, Mr. F. E. Berry, Captain Henrici, Mr. A. W. Martin, and Mr. S. W. Melsom. And for the two vacancies as associates on the Council, there are three candidates, namely, Mr. E. Russel Clarke, Mr. Francis Ince, and Mr. A. M. J. Ogilvie.

We have received the following letter from Mr. W. B. Woodhouse, Manager and Chief Engineer of the Yorkshire Electric Power Co.:—

TO THE EDITOR OF "ELECTRICAL ENGINEERING."

SIR,—Many members of the Institution will, I believe, be disappointed with the Council's nominations to fill the vacancies on the Council. This for two reasons: that the constitution of the Council seems tending to become official rather than commercial; that the local sections have insufficient representation.

The renewed interest in the affairs of the Institution which has shown itself since Dr. Ferranti's presidency, has been due, I think, to the feeling that the programme of development which he outlined would be followed, and that the Institution would become of real practical assistance to the industry. To this end should we not have a greater proportion of business men on the Council?

On the present Council the local sections have, in addition to their special representatives, Messrs. Dickinson, Faraday Proctor, Pearce, and R. K. Morcom. All these gentlemen retire, and the Council's nominees, worthy of the highest honour though they may be, do not represent the provinces in the same direct manner. The local sections want binding closer to headquarters. I believe this can be attained by fuller representation.

Yours faithfully,

W. B. WOODHOUSE.

Thornhill, Dewsbury.

April 15th, 1913.

## ARRANGEMENTS FOR THE WEEK

(TO-DAY) THURSDAY, APRIL 24TH.

*Institution of Electrical Engineers.*

8 p.m. "On Phase Advancing," by Dr. G. Kapp.

FRIDAY, APRIL 25TH.

*Finsbury Technical College Old Students' Association.*

8 p.m. Smoking Concert at Waldorf Hotel.

SATURDAY, APRIL 26TH.

*Association of Mining Electrical Engineers.*

5.30 p.m. Warwickshire and S. Staffs Branch. At Imperial Hotel, Temple Street, Birmingham. "Automatic Voltage Regulation," by W. J. Belsey.

MONDAY, APRIL 28TH.

*Institution of Electrical Engineers: Newcastle Students' Section.*

7.30 p.m. At Armstrong College. "Cascade Connections," by H. V. Henniker.

*Institution of Civil Engineers: Students' Section.*

8 p.m. At Institution of Mechanical Engineers. Special Lecture on "Law Relating to Engineering."

TUESDAY, APRIL 29TH.

*Illuminating Engineering Society.*

7.30 p.m. At Royal Society of Arts. Resumed discussion on Mr. A. P. Trotter's Paper on "The Specification of Street Lighting."

*Institution of Civil Engineers.*

8 p.m. Annual General Meeting at Institution of Mechanical Engineers.

## The London Electrical Engineers.

(TO-DAY) THURSDAY, APRIL 24TH. *C. Company.*—Recruit Training, 7 to 8 p.m. Hopkinson Cup Competition, 7 to 10 p.m.

FRIDAY, APRIL 25TH. *D. Company.*—Recruit Training, 7 to 8 p.m. Hopkinson Cup Competition, 7 to 10 p.m.

SATURDAY, APRIL 26TH. *Headquarters* open from 10 a.m. till noon.

MONDAY, APRIL 28TH. *A. Company.*—Recruit Training, 7 to 8 p.m. Co. Training, 7 to 10 p.m.

TUESDAY, APRIL 29TH. *B. Company.*—Recruit Training, 7 to 8 p.m. Co. Training, 7 to 10 p.m.

## SELF-SYNCHRONISING MACHINES

A Paper by Dr. E. Rosenberg (British Westinghouse Electric and Manufacturing Co.), bearing the above title and dealing with self-starting synchronous motors and rotary converters, was read and discussed at the Institution of Electrical Engineers on Thursday last, at the Manchester Section on April 1st, and at the Birmingham Section on April 9th.

It is far cheaper, from the point of view of general economy, said the author, to make the machines in the power station and the cables big enough to carry the magnetising current in addition to the watt current, and to let the power factor look after itself. If, however, opportunity arises of replacing large motors of bad power factor by synchronous motors, which may be made to take a leading current, then it may be a decided gain and far outweigh the additional complication involved. One of the most useful applications of the self-starting synchronous motor is for motor-generators, as the starting torque is usually only small. The synchronous motor works as an induction motor during starting, but in order to obtain stability and overload capacity the motor must be primarily a synchronous machine, though modified induction motors may be used; but in any case heavy damping windings, to prevent hunting, must be used. These should be either squirrel-cage or at least two-phase closed windings. Instances are given in the Paper of two 800-kw. frequency changers, built by the British Westinghouse Electric and Manufacturing Co., Ltd., each consisting of a 14-pole motor for 60 cycles, coupled to a 6-pole generator for 25.7 cycles. The rotor of the 60-cycle motor has laminated poles fitted with a squirrel-cage, while the 25.7-cycle generator has solid cast-steel poles and no other damper. Tests have shown, however, that the set can be readily started up from either side with the field coils open or short-circuited, the action of the dampers reducing the open-circuited field pressure as low as a fourth of that calculated on the ratio of the number of turns, but a quicker start can be obtained with the field coils open-circuited. Due to the heavy pulsations of speed immediately before synchronism and to the nearly momentary reversal of the magnetism of each pole when one is slipped just before slipping into synchronism, violent oscillations can be seen on an ammeter in the field circuit.

The short-circuited field winding represents practically a second squirrel-cage, incomplete because it is a "single axis" (single-phase) winding, and because it is shaded to a great extent and only traversed by a part of the flux. But it will reduce the starting torque in the same way as a reduction in the resistance of the main squirrel cage, and also a reduction of torque when passing through half synchronous speed. On the other hand, the machine can approach nearer to synchronous speed as an induction motor, though the theory of the induction motor is no longer applicable; but the squirrel cage must bring the rotor up to a speed near enough to synchronous to enable the synchronising power of the machine to accelerate the rotor from this point to synchronous speed. It is then shown that for a smooth, cylindrical, laminated rotor with distributed winding, and excited with direct current, the limiting condition for pulling into synchronism is that the amplitude of the superimposed speed oscillation  $s_1$  should be equal to the average slip  $s$ , or the limiting value of  $s_1 = s = \frac{L_{sc}}{L_{sc} + (89.2 \times n \cdot s \cdot M r^2)}$ , where  $L_{sc}$  is the average value of the synchronising power in kilowatts,  $n$  is the supply frequency,  $M$  is the mass of the flywheel in kilograms, and  $r$  the linear speed of its radius of gyration at synchronous speed in metres per second. This calculation is based on the assumption that the machine is not loaded at all, when it is only theoretically necessary to pull the rotor up just before it actually gets into direct opposition to the supply. If, however, the machine is loaded and is brought up to speed by a squirrel cage, the limit of slip which still allows pulling into synchronism is nearly the same as in an unloaded machine with no squirrel cage, which is brought up to the same slip by an external motor. The limit of the starting torque for which a self-starting synchronous motor can be used is, as a rule, not the torque required for starting from rest, but the torque which can be overcome for pulling into synchronism.

For unexcited machines with salient poles, however, due to the very high reluctance of the gaps between the poles, the magnetic field in the rotor will be so tied to the pole pieces that the magnetic axis of each pole for the greater part of each half period will only move slightly to either side of the geometrical centre of the pole. If the residual

magnetism in the poles is small, the rotor will hang on to the stator field till it lags approximately half the length of one pole, then the lines of force snap and the rotor will slip into the field of the next stator pole and hang on to this. During the moment of snapping there is practically no rotor field to balance the pressure applied to the stator. The stator must therefore at this moment create its field outside. The wattless current in the stator will be very high, and the leakage field so increased as to keep the applied pressure balanced. If there is resistance or reactance in the machine circuit, this will at the moment reduce the terminal pressure. In a machine excited by direct current a considerable drop in terminal pressure may be caused by resistance or reactance in certain cases.

Rotary converters are frequently started, like squirrel-cage motors, from low voltageappings on transformers. In general, the procedure is the same as that described for synchronous motors, but there are two or three aggravating conditions. There is a commutator with brushes always short-circuiting a certain part of the armature, and the field winding is not excited from an outside source, but generally from the D.C. brushes of the rotary. Commutating poles are frequently added, and are not fitted with dampers like the main poles. The short-circuiting of one part of the armature winding will naturally reduce the torque for a given starting current. It also causes sparking during the starting period. To overcome the tendency of such a machine to run at half speed, the commutating pole windings are generally short-circuited during starting. To overcome the trouble of brush sparking during starting, as a rule brush lifting is resorted to, and only one + and one - brush are left on the commutator, so as to enable the operator to recognise the polarity to which the machine excites itself and to change it by pole slipping if necessary.

A new method introduced by the author allows self-synchronising of the rotary with small armature current, prevents sparking on the brushes, and prevents reversal of the field. A starting motor is connected in series with the slip-rings of the rotary. This motor generally is an ordinary squirrel-cage polyphase machine, but the explanation of the method is perhaps simplest by assuming a single-phase rotary and a single-phase commutator motor for starting, as in Fig. 1.

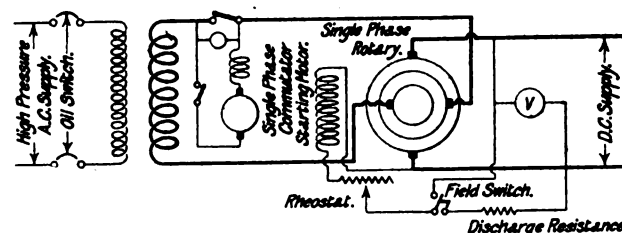


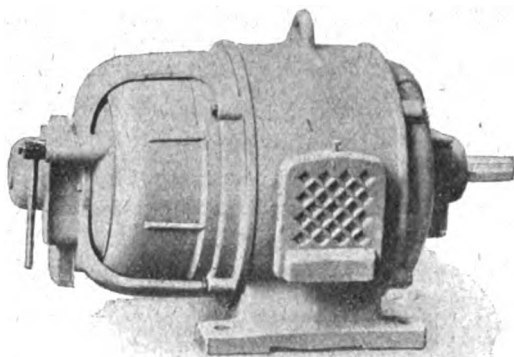
FIG. 1.—CONNECTIONS OF SELF-SYNCHRONISING SINGLE-PHASE ROTARY WITH STARTING MOTOR.

There are no starting tappings on the main transformer. The small switch in series with the single-phase motor is not essential. If the high-pressure switch of the transformer and the switch of the starting motor are closed, the main low-pressure switch being open, the current will flow through the starting motor into the rotary, but is limited to a fraction of the full-load current of the rotary. The rotary armature represents very little impedance. Assuming, for instance, that for full-load current in the rotary the pressure across the slip-rings would be 20 per cent. of the normal pressure, then, if the starting motor is designed to allow 30 per cent. of full-load current to pass through the rotary, the slip-ring pressure will be reduced to 6 per cent. of the full-load pressure. The starting motor takes practically the full transformer pressure, and as with a properly designed rotor this current of 80 per cent. can produce a torque far in excess of the starting friction, it will, without any barring, start and bring the rotary up to speed very quickly. A current of this value is, as experience has shown, not sufficient to destroy the residual magnetism of the rotary, which represents nearly 1 to 2 per cent. of the field ampere-turns. The field circuit of the rotary remains connected across the D.C. brushes, and the rheostat is preferably put into such a position as to reduce the inserted resistance slightly below the value required for normal no-load excitation, as is done with ordinary D.C. shunt-wound

## SMALL INDUCTION MOTORS FOR ALL CLASSES OF WORKSHOP DRIVING.

PROMPT DELIVERY IN SIZES FROM  
1/2 TO 10 H.P. AT ALL THE USUAL  
SPEEDS AND PRESSURES.

OPEN, PROTECTED & ENCLOSED TYPES.



HIGHEST GRADE MATERIAL and  
WORKMANSHIP.

**BROWN, BOVERI & CO., Limited**

CAXTON HOUSE, WESTMINSTER, LONDON, S.W.

And at MANCHESTER, GLASGOW,  
and NEWCASTLE.

machines to allow quick excitation. As soon as it approaches synchronism, the machine will therefore readily excite itself like any other D.C. machine. This gives on the slip-rings an alternating current of a frequency which at first is slightly different from the transformer frequency. Assuming that the rotary has excited itself to full pressure, then immediately before slipping into synchronism the pressure on the starting

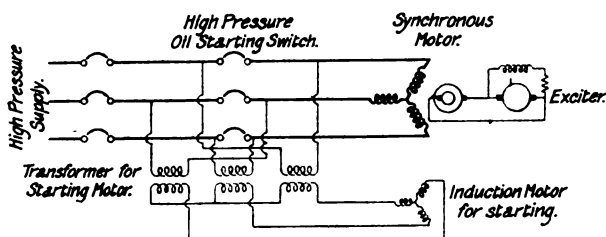


FIG. 2.—DIAGRAM OF CONNECTIONS OF SELF-SYNCHRONISING HIGH-PRESSURE THREE-PHASE MOTOR, WITH STARTING MOTOR.

motor will vary from zero to double slip-ring pressure. Immediately the rotary has slipped into synchronism the voltmeter will be steady; the pressure can then be adjusted and the S.P. main switch short-circuiting the starting motor can be closed. This causes neither a heavy current rush nor sparking at the commutator. No reversal of field polarity takes place. The usual time for starting and synchronising is 30 to 50 seconds. Momentary pressure surges and current rushes occur in the end turns of the windings of the synchronous motor when the full pressure is switched on, but by the arrangement shown in Fig. 2 these can be taken up by the transformer windings.

If a rotary is fitted with an A.C. booster, it is possible to provide the booster with a separate starting winding of many turns of comparatively thin wire, and, leading these to separate slip-rings or terminals, use the booster like a squirrel-cage starting motor with the same number of poles as the rotary. This method can be used in special cases.

By adjusting the excitation of the synchronous machine

the losses and work done may be divided between it and the starting motor in almost any proportion. This is clearly shown in Fig. 3, which gives the test results of a six-phase

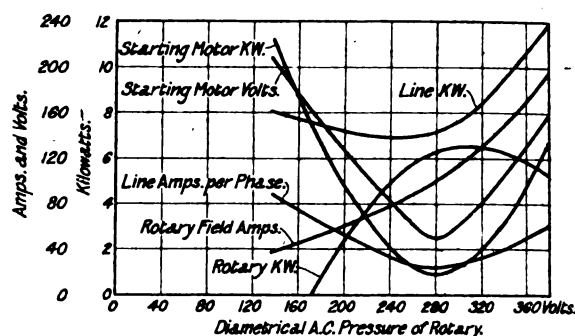


FIG. 3.—VARIATION OF CURRENT, PRESSURE DISTRIBUTION, AND INPUT, WITH CHANGE OF ROTARY EXCITATION. LINE PRESSURE CONSTANT AT 320 VOLTS.

1,000-kw. 12-pole 500-volt rotary coupled to a 10-pole starting motor.

### DISCUSSION IN LONDON.

Mr. R. ORSETTICH (Chief Engineer, G.E.C. Witton Works) thought that the reason why rotary condensers had been so largely used for improving the power factor of a system was because they could then be run at very high speeds and the starting was easy. He was surprised that only two out of the five usual methods of starting had been mentioned. The A.C. method was used extensively in America, and no trouble was experienced. Brush raising presented no difficulty. He would like to ask the Author what would happen in his system if the starting motor got out of order, as there was no synchronising gear on the A.C. side, and if it had to be installed the simplicity claimed for the system would vanish. If in a six-phase rotary the neutral point was earthed, it would be necessary to provide a switch so that it could be disconnected during starting.

Mr. A. H. SEABROOK (Engineer and Manager, Marylebone Electricity Supply) said that the British Westinghouse Co. should be congratulated on the publicity they gave to new methods. It was his opinion that all substations should be operated by the cheapest-class of labour possible, and the new method set out in the Paper provided for this. He had just ordered four of these sets, of 1,000 kw. capacity, with power-factor correctors.

Professor MILES WALKER (Manchester Municipal School of Technology) pointed out that none of the ordinary methods of starting were satisfactory under all conditions. With a separate starting motor it was difficult to get started after a shut-down, while the A.C. method, using a low pressure on the slip rings, was not satisfactory for ordinary working, owing to the large current taken. He took great exception to the way some vector diagrams and symbols had been used in the Paper, complaining that the Author, in common with many others, did not explain his diagrams sufficiently, or even draw them correctly.

Mr. F. P. WHITTAKER (B.T.H. Design Department, Rugby) then read a long contribution, from which it appeared that certain investigations of his in general corroborated those of the Author with regard to the behaviour of rotaries during starting. Referring to the curves shown in Fig. 3, he pointed out that coincidence of phase and equality of voltage could not be obtained with the same field.

Mr. H. W. BOSWORTH (Lancashire Dynamo and Motor Co., Ltd.) was directly opposed to the Author as to the best type of winding for synchronous motors. He preferred the cylindrical rotor with distributed winding, which could run at very high speeds. His experience was that a single-phase winding was sufficient in almost all cases, and the additional expense of a three-phase rotor was not warranted. In the ordinary way of A.C. starting, if the machine, as is general, is to run at about 0.8 leading power factor, the air gap may be decreased sufficiently to allow starting without an auto-transformer. He did not think that, by using standard machines as Dr. Rosenberg did, it was possible to obtain the best results.

Dr. S. P. SMITH (City and Guilds Engineering College) thought the first part of the Paper the more valuable. Surging would still be obtained with the new method of starting, and the only way to avoid this was to synchronise properly. He had found that by closing the field switch very slowly when a rotary was up to speed the right polarity was always obtained.

Mr. W. E. BURNAND (Sheffield) wished to know if, by using the two windings, a large rotary could be started up as a repulsion motor. He described a spring clutch arrangement which acts as a mechanical damper.

Dr. E. ROSENBERG replied to some of the points raised.

### DISCUSSION IN BIRMINGHAM.

Mr. FORREST (Birmingham Corporation) considered that the phase advancer was more suitable for improving the power



factor of a system than was the synchronous motor. The trouble due to shock on the end coils of induction machines at starting did not occur with synchronous machines. He considered that the H.P. star-delta switch was an inherent weakness. In plant with which he had to deal all rotary converters could be started either by an induction motor or from the D.C. side by inserting a temporary resistance across one of the S.P. switches. He considered that the extra complications of the author's system were scarcely warranted by the advantages obtained, and if the motor failed the set could not be started.

Dr. M. L. KAHN (G.E.C., Witton Works) thought that, as the starting motor had a certain pressure at, say, 50 cycles impressed on it, while the frequency of the pressure induced in the synchronous motor had a different value, trouble would result. Further, wide variations in the pressure available at the starting motor terminals occurred, and the action of the latter would be thus much affected.

Mr. F. J. MOFFETT (Moffett & Rosher) said that a short time ago he had seen one of the self-starting, self-synchronising rotary converters in operation, and was struck by the simplicity obtained owing to the absence of starting motor, synchronising apparatus and exciter. The machine started up with 40 per cent. of the A.C. supply voltage, and the sparking during the starting period was reasonable. Twice the polarity built up wrongly, but at the third attempt came up correctly.

Dr. W. E. SUMPNER (Municipal Technical School, Birmingham) suggested combining the starting motor with the rotary so as to start up by means of induced eddy currents; in fact, synchronous machines had been known to start up and run their engines by being connected on to the mains in error.

Mr. W. E. MILNS (Supply Department, Birmingham Corporation) also spoke, and the Chairman, Mr. A. M. Taylor, added some remarks.

Dr. ROSENBERG, in reply, said that on the whole his system involved the use of rather less gear than those with ordinary synchronising apparatus. Operators' mistakes were likely to cause trouble with any system, and we must depend, to some extent, on automatic protective devices. It would not be a difficult matter for the station engineer to include a synchroscope and thus provide a second method of starting. In answer to Dr. Kahn, a large variation in the pressure on the starting motor was immaterial when the synchronous machine was near synchronism, since its power of pulling in was vastly in excess of the power developed by the small motor. In reply to a question by Mr. Bentham, he said that he advocated the use of the half pressure transformer tapping for machines up to 500 kw. on 25 cycles and 300 kw. on 50 cycles, the frequency being an important factor, since sparking was proportional to the ratio of brush thickness to arm pitch and the latter varied with the frequency.

#### DISCUSSION AT MANCHESTER.

Prof. MILES WALKER said that at the present time quite 60 per cent. of the D.C. converted from A.C. passed through rotaries, and he thought it would shortly be increased to at least 90 per cent. The importance of Dr. Rosenberg's development was the greater since the use of D.C. was rapidly increasing, while A.C. generation was the recognised thing.

Mr. A. E. MCKENZIE (Electricity Department, Manchester Corporation) spoke as to the practical success of the new methods outlined. He had seen large rotaries started and ready for switching on the 'bus-bars in 30 seconds, while in the ordinary way at least 5 to 15 minutes would be required.

Mr. K. M. FAYE-HANSEN (British Westinghouse Co.) pointed out the considerable increase in K.V.A. required to improve the power factor of a machine when nearly at unity. For instance, to improve a synchronous motor from 0.97 to unity required as many K.V.A. as to improve an induction motor from 0.7 to 0.8.

Mr. J. S. PECK (British Westinghouse Co.) thought that all new machines should be submitted to a council of engineers before being put on the market. As there was no such impartial body, he hoped that the new method described would be considered by station engineers to see if it was sufficiently an advance to justify its adoption generally. All the initial difficulties had been overcome, and the system was now, he thought, perfect.

Mr. E. M. HOLLINGWORTH thought the greatest field for the machines described was in the private sub-stations of works, &c.

Messrs. G. D. SEATON, R. G. CUNLIFFE, and WM. CRAMP also spoke.

Dr. E. ROSENBERG (in reply) said he considered that above 2,000-kw. A.C. turbo-generators and rotaries were more economical than D.C. turbos, but for small sizes the D.C. turbo was good. Dealing with the cost of the apparatus described, a 50-h.p. motor with apparatus cost approximately 50 per cent. more than the ordinary motors, but for motors of 300 h.p. and over there was practically no increase in cost.

**Batti-Wallahs' Society.**—At the last smoking concert of the season on Friday last there was an excellent muster. The oldest Batti-Wallah, in the person of Mr. Berry, late of Berry, Harrison & Co., now of California, was present, and at the request of the Chairman gave two songs.

## ELECTRICAL REGULATIONS FOR FACTORIES AN IMPORTANT DECISION

AN appeal to the Middlesex Quarter Sessions by the North Metropolitan Electric Power Supply Co. against a conviction for alleged infringement of the Home Office Regulations for the Use of Electricity in Factories, has been successful. Consequent upon a fatal accident in a sub-station, the Home Office prosecuted the company and obtained a verdict against them in the Highgate Police Court last June (*ELECTRICAL ENGINEERING*, Vol. VIII., p. 386, July 4th, 1912). A youth named A. R. Shapcott, about 18 years of age, had been killed by a 10,000 volt electric shock from a current transformer coupling while cleaning a Brazil excess pressure discharger in the North Finchley sub-station. The switchboard (a scale model of which was exhibited in court) can be made dead in sections, and one section is separated by a passage-way 2 ft. 6 in. wide from the next. The company's practice is not to box in all apparatus, but to teach the employees that "every main is alive unless known to be dead." Shapcott could have done the cleaning work in question without leaving the dead section, but must have crossed over deliberately, either by getting down from where he was, crossing over the 2 ft. 6 in. space, and getting up the other side, or else by crouching down to a height of 3 ft. 2 in. and stepping across. His arm then came in contact with a coupling insulated with Empire tape on a current transformer. This could have been made dead by opening a feeder isolating switch had it been considered necessary or expedient to do so.

Mr. J. Hunter-Gray represented the Home Office and Mr. Bodkin the company. Evidence was given for the Home Office by Mr. T. G. Styles (charge attendant to the company) and by Mr. G. Scott Ram (H.M. Electrical Inspector of Factories), while witnesses for the company included Mr. P. M. Hunt (one of the company's charge engineers), Mr. A. H. Pott (Chief Engineer, Metropolitan Electric Tramways), and Mr. E. T. Ruthven-Murray (Engineer-in-Chief to the Supply Co.). Mr. C. P. Sparks was present to give evidence on behalf of the company also, but was not called. The questions at issue arose only on Nos. 18 and 28 of the Electricity Regulations, which read as follows:—

(18) In every switchboard for high-pressure or extra high-pressure:— (d) When work has to be done on any switchboard, then, unless the switchboard be otherwise so arranged as to secure that the work may be carried out without danger, either (i) the switchboard shall be made dead, or (ii) if the said switchboard be so arranged that the conductors thereof can be made dead in sections, and so separated by permanent or removable divisions or screens from all adjoining sections of which the conductors are live, that work on any section may be carried out without danger, that section on which work has to be done shall be made dead.

(28) No person except an authorised person or a competent person acting under his immediate supervision shall undertake any work where technical knowledge or experience is required in order adequately to avoid danger; and no person shall work alone in any case in which the Secretary of State directs that he shall not. No person except an authorised person, or a competent person over 21 years of age acting under his immediate supervision, shall undertake any repair, alteration, extension, cleaning, or such work where technical knowledge or experience is required in order to avoid danger, and no one shall do such work unaccompanied.

The definition of an authorised person is:—

"Authorised person" means (a) the occupier, or (b) a contractor for the time being under contract with the occupier, or (c) a person employed, appointed, or selected by the occupier, or by a contractor as aforesaid, to carry out certain duties incidental to the generation, transformation, distribution, or use of electrical energy, such occupier, contractor, or person being a person who is competent for the purposes of the regulation in which the term is used.

The Company had been fined £25 for breach of Regulation 18, and £2 for breach of No. 28.

The Home Office contended that the whole switchboard should have been made dead under Regulation 18 (d), by means of the isolating switch; but the company contended that the alternative (ii.) applied as the passage-way was a "division." As regards Regulation 28, the Home Office contended that Shapcott was not an "authorised person," and that, as he was only about 18, he was not "a competent person over 21 years of age," so that they said the work should not have been entrusted to him. It appears that he had three terms of technical training at the Tottenham Polytechnic, and that he had worked in the company's sub-stations at Hendon and Edmonton for about ten months. He was considered by the company's officials as quite

competent for his job, and was designated by Mr. Styles, under whom he worked, as "very cute" and "keen on his work." It was contended by the company that it was quite an everyday practice to employ properly trained youths for work such as this and that he was quite competent to do it; there was, they submitted, nothing in the Regulations to prevent one authorised person working under another, and in fact every assistant in a sub-station who had been instructed in his duties was an "authorised person." If the Regulation was interpreted in the sense the Home Office claimed, it would be impossible to train the rising generation in the work.

After the hearing of evidence and addresses by counsel, the Bench deliberated for a few minutes, and the Chairman (Mr. Montague Sharpe) announced that they were unanimous in allowing the appeal as regards Regulation 28, as they considered Shapcott an "authorised person." They considered, however, that there had been an infringement of Regulation 18, but reduced the fine in this case to £10 10s.

### WORKS DRIVING

A PAPER entitled "Economies in the Use of Electric Power," by Mr. W. E. Milns, was recently read before the Birmingham Local Section of the Institution of Electrical Engineers. The author emphasised the necessity for technical knowledge for electric power canvassers, and pointed out that reduced cost of power was by no means the most powerful argument in favour of changing over to electric drive. Often the reduced cost of labour and increase of output formed the greater economy. He gave a warning that the most efficient mechanical arrangements should not be installed regardless of cost. It was sometimes cheaper in the end to consume a little more current and save capital outlay than to introduce expensive mechanical alterations. Each case must be decided on its own merits. Many comparisons of estimated costs of steam or gas and electric driving were quite incorrect, as they failed to take into account the variable nature of the load. Some examples of the magnitude of the load taken in various trades were given and an interesting series of actual results of savings by conversion to electric drive. Thus, in a 1,387-h.p. installation when driven by steam, conversion to electric driving reduced the annual power cost from £6,000 to £4,000, and for two other cases of 200 and 80 h.p. the reductions were from £1,680 to £1,476, and from £750 to £504 respectively. Similarly in a 25-h.p. town gas-driven plant the cost was reduced from £130 to £104, and in a 40-h.p. suction gas plant from £156 to £144. There are various other considerations that should be pointed out to the manufacturer who is asked to consider electric driving, such as the superior constancy of speed obtainable (in connection with which it should be pointed out that the steam engine falls to its lowest speed just at the money-earning period), the saving of floor space and the incidental convenience of electricity for small portable apparatus. Again, the conditions of labour and employment in electrically-equipped factories are usually far superior to those found in works utilising any other form of power.

In the discussion, Mr. Fennell said he thought a point of great importance in prospecting for customers was to offer a free trial wherever possible, even if only on a small scale. Mr. N. B. Rosher mentioned a method adopted by a certain firm for checking the power costs by taking them as a ratio of the total sales; thus in 1907, when the works were gas-engine driven, the ratio was 0.83, but in 1910, with electric motors, the ratio was 0.74, showing a saving due to electricity of approximately 12 per cent. A very striking instance of saving in a steam-driven rolling mill recently electrified was that the whole of the new plan will have paid for itself in two years. Mr. Foster (Siemens Bros. Dynamo Works) believed that, with the exception of flour milling, all trades in Birmingham were adaptable to the electric drive. The author, in the course of his reply, said, in reference to Mr. Fennell's remarks, that a trial was often not practicable, for the reason that a gas-engine bed-plate was frequently not the place to put an electric motor to secure an efficient drive.

**Investigation of the Cause of an Explosion.**—A curious explosion which occurred at Hebburn-on-Tyne on March 30th, causing the death of two persons, was inquired into at an inquest which was resumed in the presence of several gas and electrical experts last week. It appears that smoke was seen coming through the skirting board of the room in question shortly before the explosion, and a smell similar to that of burning insulation was reported, as well as a smell of gas. A failure of the electric lighting in adjoining premises also occurred just before the explosion. The inquest was further adjourned till to-day for examination of the cables and gas mains to be made.

### INTERPOLES

A PAPER on "Interpoles, Their Design and Use," was read by Mr. R. G. Allen, at the Dublin Local Section of the Institution of Electrical Engineers, on April 11th. The author stated that the use of interpoles had made the use of high speed D.C. machines possible, and there was a growing tendency on the part of some manufacturers to employ interpoles on low-speed generators and motors also. The chief functions of interpoles were: (1) to neutralise armature reactions upon the field, and (2) to effect straight-line commutation, i.e., to neutralise the inductive effect of that portion of the armature winding which was short-circuited at the moment of commutation.

In order to effect (1), the ampere-turns on the interpoles must be sufficient to counterbalance the distortion of the field due to the armature current. In a non-interpole machine extra ampere-turns had to be allowed to compensate for the demagnetisation and distortion due to armature reaction.

As a consequence, on interpole machines a smaller root-density could be used, thereby effecting an economy of ampere-turns in the main field. Also, and chiefly, a considerably smaller air-gap was possible. The practical effect was a saving of 35 per cent. of ampere-turns, against which, however, must be set the cost of the copper on the interpoles.

Summarising the advantages of interpoles, Mr. Allen claimed that a wave-winding could be used for almost any output; the number of turns per commutator-segment could be increased, and thus the number of segments required could be reduced; forced ventilation could be used, and thus greater densities of flux and current might be employed, and the efficiency curve at light loads was improved. On the other hand, the disadvantages arising from the use of interpoles were that the natural ventilation was impeded owing to the blocking of the spaces between the field magnets by the insertion of the auxiliary poles; and also, it had been observed that interpole machines did not always work well in parallel with those without interpoles.

Owing to the lateness of the hour the discussion was postponed to the next ordinary meeting.

### THE ELECTRICAL TRADES' BENEVOLENT INSTITUTION

THE Annual Festival Dinner of the Electrical Trades' Benevolent Institution was held at the Trocadero Restaurant on Wednesday last week. In proposing the toast of the evening, the Chairman, Mr. George Sutton, said that the funds of the Institution only amounted to about £4,000, which was not worthy of a great industry in a country famous for its energy in philanthropic channels. In his appeal for funds he was ably supported by an eloquent speech by Mr. A. Bruce Anderson, and £854 6s. was collected (about double the amount of last year). Mr. E. Byng then offered a donation of £100 if nine others would subscribe a similar amount within three months. Mr. Sutton and Mr. Hugo Hirst each promised to subscribe £100 on these conditions, and it is to be hoped that the seven more similar donations will be made.

Contributions to the funds are urgently needed to enable the Benevolent Institution to carry out the charitable purposes for which it is formed, namely, to relieve cases of poverty and distress among those connected with the electrical industry. The £854 collected at the dinner being, as it is, double the amount collected last year, shows some advance, but far, far more than this is needed. The enormous development of the electrical industry in this country must necessarily bring in its train cases which should appeal to the benevolence of those more fortunately situated. Every one of the workers in the electrical field should contribute according to his means, or according to the degree of success he has himself attained, to a fund destined to give a helping hand to those who have been less prosperous. Small contributions are welcome, as well as large ones, and should be sent to the Secretary, Mr. F. B. O. Hawes, 18 Park Mansions, Vauxhall Park, South Lambeth Road, London, S.W.

**The Northampton Institute Magazine.**—The April number of the magazine conducted by the Day Students' Union of the Northampton Polytechnic Institute contains, among other items, some notes on the theory and practice of illumination, by Mr. J. G. Gerritz; the continuation of an article by Mr. F. M. Denton on the Homopolar Generator; and an article by Mr. N. E. Paine on the motor converter.

## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelopes.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,336.

Please give the best method of semi-indirect lighting of offices arranged as follows:—Room, 63 ft. by 23 ft. by 14 ft. high; six double desks across the room, each at present with six 32-c.p. tantalum lamps; height of lights over desks are 2 ft. Desk centres, 3 ft. 9 in.; height, 3 ft. 6 in.; lengths, 19 ft.; passage down one side, 4 ft.; ceiling whitewashed; end walls dark green; large windows at each side of room. There are no obstructions such as pillars. Compare cost of installing and current consumption with B.O.T. unit at 1d.—"MAN."

(Replies must be received not later than first post May 1st.)

### ANSWERS TO No. 1,334.

I should be glad if any of your readers would give their experiences of the various kinds of "burglar alarms"—not necessarily confined to the ultimate test—as suited to an occupied house, i.e., where communication with a police station or boy messengers' office is not important. I am aware of the system of "treads" in the floor, working bells and lights by clock-work, which has been satisfactorily tried, but desire to know of any other efficient methods.—"B."

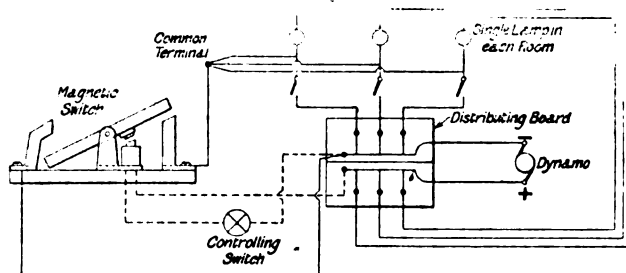
The first award (10s.) is made to C. O. PEAKE for the following reply:—

With reference to the above, I should like to say that a system of burglar alarms with which I have had to do has given every satisfaction for a number of years, and has the advantage of being comparatively cheap to instal and, further, to require almost nothing in the way of expense or attention for upkeep. All doors on ground level have let into the woodwork near the (upper) hinge a brass plate, from which a small brass knob protrudes, this being forced back flush with the plate, when the door is closed, by means of a disc (similar to a brass carpet-tack) attached to the edge of the door itself. Each window, also, in a position which might attract the prospective burglar has a similar fitting let into the woodwork. Each of these fittings is, of course, merely a S.P. switch, contact being made when the brass ball comes out beyond the level of the plate. All these switches are wired up in parallel with each other in the usual way, and in circuit with three or four large Leclanché cells and a fair-sized electric trembler bell possessing a special feature, to wit, when once the switch circuit has been completed and the bell thus set working, a string must be pulled in order to stop the latter, in addition to opening the bell switch. As practically arranged in, say, a large private house, for example, the bell would be on one of the upper bedroom floors and, near by, a small switch would be placed, thus enabling doors and windows being open during the daytime. The switch would then be closed by the last person retiring to bed at night-time.

The second award (5s.) is made to "ALARM," who writes as follows:—

In reply to this question, the writer has installed several arrangements of burglar alarms, specially adapted and installed

in country mansions. As "B" points out, he is aware of the system of treads and working of bells, &c. The following arrangement (see diagram), however, may be of use to him, and is one which is not, I think, usually installed. Furthermore, it will be quite easy to see that it could be adapted to automatically communicate with the local police station, gardener's cottage, &c., at the same time illuminating the mansion and immediate surroundings. From the diagram it will be noticed that one lamp is arranged to be switched on in each room immediately occasion arises. The control or controlling switch could be arranged to automatically work on the opening of a door, or may be placed in convenient



position, usually in the proprietor's and butler's bedrooms, landings, &c., and controlled by hand. The control switch operates a magnetic switch, which in turn closes the necessary circuits. It will further be seen that by this arrangement the single lamps in each room may also be operated in conjunction with the other lamps without interfering with the special circuit. The magnetic switch could be designed to break the circuit automatically after use. Bells can be rung at the same time, thus calling attention that the alarm switch had been closed.

With regard to the question of treads; this system the writer has found unsatisfactory, as at times the springs become weak, and very often refuse to act efficiently.

**Condensing Plant at Leeds.**—A repeat order for a large surface condensing plant for the Leeds Corporation Electricity Works, capable of dealing with 130,000 lb. of steam per hour, has been received by the Mirreles, Watson Co., Ltd. (Scotland Street, Glasgow). The plant will be connected to a turbo-alternator, for which Messrs. Willans & Robinson have just received the order. The condenser of this installation is generally similar to the one described in *ELECTRICAL ENGINEERING*, June 13th, 1912, page 317, and was specially designed to suit the conditions of dirty water from the River Aire, which contains a large amount of woollen material, which, along with mud, soon clogs up the ordinary type of condenser. All the tubes can be cleaned out whilst the plant is in operation, and the flow of the cooling water can be reversed without interfering with the running of the plant. The condenser is of the vertical pattern, having 24,800 sq. ft. cooling surface. The total height of the condenser is 28 ft., and it weighs 85 tons.

**I.E.E. Qualifying Examinations for Admission as Student.**—The Institution of Electrical Engineers does not hold a qualifying examination for admission as student, but on and after June 1st all candidates for election to the class of students will be required to have passed one of the examinations contained in the following list, which has just been circulated:—(1) The Matriculation Examination of any University in the British Empire; or the Responsions Examination of the University of Oxford; or the Previous Examination of the University of Cambridge. (2) The Studentship Examination of the Institution of Civil Engineers. (3) The School-leaving Examination for the Scottish Education Department. (4) The Naval Cadet Passing-out Examination. (5) The Entrance Examinations for Woolwich and Sandhurst. (6) The School Examination (for School-leaving Certificate) or the Senior School Examination of the University of London. (7) The Oxford or Cambridge Local Examination. (A Senior Certificate, provided it covers English and Elementary Mathematics.) (8) The Oxford and Cambridge Higher Certificate (provided it covers English and Elementary Mathematics.) (9) The Abiturienten Examination of any German or Austrian Secondary School, or the corresponding examination of similar schools in other countries. (10) The Certificate of any other Educational Authority which may be recognised by the Council of the Institution as equivalent for the purpose of admission to the class of Students.

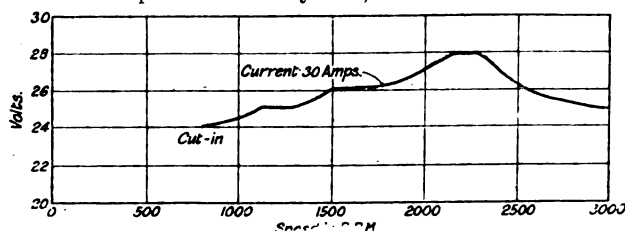
## THE "BRIGHTON" SYSTEM OF STREET LIGHTING

MESSRS. SIEMENS BROS. DYNAMO WORKS, LTD. (Tyssen Street, Dalston) have sent us some particulars of their series system for street lighting, in which low-voltage high candle-power tungsten lamps in suitable fittings are directly substituted for arc lamps. In Brighton, where the system is employed, 46-volt 400 candle-power "Wotan" lamps, taking about 8 amperes, are replacing the former 8-ampere arc lamps, connected five in series on the 230-volt mains. The existing substitutional resistances and automatic cut-outs for cutting in the resistance when a lamp fails are being utilised, we understand, without alteration. For longer series of lamps, simple short-circuiting cut-outs are employed, which are contained in the lampholder itself; these simply short-circuit the terminals of any lamp which burns out, as the increased voltage divided over a large number of lamps is not serious. In the simplest form, the short-circuiting device consists of a film of colodion between two plates of easily fusible metal. This is a non-conductor at 50 to 100 volts, but when the lamp burns out the whole pressure of the series occurs between the two plates and sparks through, short-circuiting them. Another device, which is already in use, is a small electromagnetic short-circuiting switch, also placed in the lampholder; its coil is in shunt with the lamp terminals, but the ordinary lamp voltage is not sufficient to actuate it. As soon as the voltage rises, owing to the lamp burning out, the coil acts and short-circuits the lamp.

Messrs. Siemens inform us that the services of their special staff are at the disposal of any members of the trade to co-operate with them in connection with any scheme they may have on hand.

## THE CARLEON TRAIN LIGHTING EQUIPMENT

TESTS on the Carleon system of train or automobile lighting, described in ELECTRICAL ENGINEERING last week, page 219, have given the results shown in the curve here reproduced. The pressure variation, it will be seen, is about 12 per cent. up and 4 per cent. down in the present state of development of the system, which will doubtless be



improved on. By an unaccountable error our description of this machine last week read: "The armature winding is supported on an iron tube fixed to one end of the field magnet casting. . . ." This is obviously impossible, and the sentence should read: "Is fixed to one end of a bronze casting keyed to the shaft."

## CATALOGUES, PAMPHLETS, &c., RECEIVED

**VACUUM CLEANERS.**—A leaflet from the General Electric Co., Ltd. (67 Queen Victoria Street, E.C.), describes the several types of vacuum cleaner. The smallest is the "Little Briton" pattern, which is fitted with two pairs of bellows actuated by a 1/10th-h.p. motor enclosed in a polished oak case. The weight of this is 45 lb. More powerful bellows models are "Rapid," with three bellows, and the "Express," with six. For stationary plants of greater capacity there is also the "Turbine" equipment, with a vertical multistage centrifugal suction fans driven by a 3-h.p. motor mounted on the top. Another machine dealt with is the well-known "Magic" cleaner, in which the motor, fan and dust receiver are all mounted on one handle. A very complete series of accessories is included for all these machines.

**LIFTS.**—A pamphlet from Scholey & Co., Ltd. (151 Queen Victoria Street, E.C.), points out the much smaller cost of working electric lifts than hydraulic lifts.

**ELECTRICITY IN THE CEMENT INDUSTRY.**—A fine illustrated pamphlet (in German) from the Allgemeine Elektrizitäts Gesellschaft deals very fully with the applications of electric power in the cement industry.

**Crystal Palace School of Practical Engineering.**—The 121st awards of certificates was made by the Earl of Plymouth last Thursday, and opportunity was afforded for visitors to inspect the school.

## SEALING WAX HEATERS

TWO new types of electric sealing wax heaters have just been put on the market by Simplex Conduits, Ltd. (116 Charing Cross Road, W.C.). The use of such appliances has great advantages over flame-heated apparatus from a fire risk point of view. In the type of heater shown in Fig. 1, which is for use in factories where a large amount of packing and paper parcelling is done, such as in the tobacco trade, the sealing wax is placed in the inner receptacle, and is allowed to run over the two slopes at either end, which are also heated to prevent the wax from cooling down, and

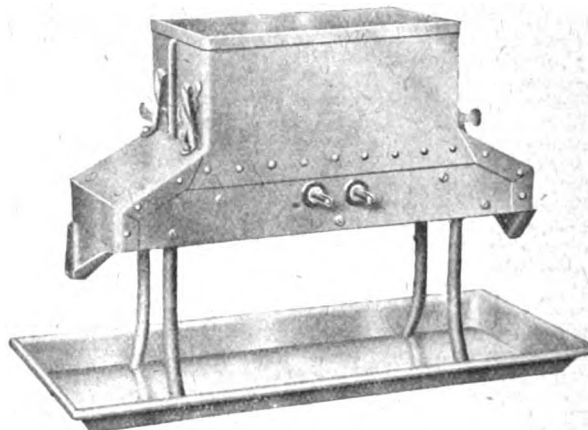


FIG. 1.—"PLEXSIM" SEALING WAX HEATER.

can be picked up by the flaps of the parcels to be sealed. Where it is required to make use of an ordinary seal impress, the wax can be allowed to run down the slopes, which are specially shaped at the bottom to allow the wax to drop off. The amount flowing out of the central chamber can be accurately regulated by opening or closing the two apertures with the small shutters provided. Any excess wax is caught in the tray upon which the heater stands and used again, thereby guarding against waste. The appliance is substantially constructed in black enamelled iron, and, being double ended, allows two persons to work with it at the same time.

The heater shown in Fig. 2 is intended for chemists, and other trades where a large quantity of small packages require sealing. It is suitable for fixing to the wall, and for use with the ordinary sealing wax supplied in sticks. The latter is pressed on to the heated cast-iron point, which is so shaped as to allow the melted wax to fall off the point



FIG. 2.—WALL PATTERN SEALING WAX HEATER.

in the form of small drops suitable for receiving the impress. The heated portions are insulated and ventilated from the base, which always remains cool. The heater is ready for use in three or four minutes from switching on. The consumption is so low, however, that it may be kept continuously on circuit. The heated point is of cast-iron, as is also the base; the barrel containing the heating element is nickel-plated, and the whole is mounted on an ebonised wood block.

**Electric Ambulances.**—At an inquest at Southwark on the death of a man who was found unconscious in the street, the Coroner (Dr. Waldo) referred to the advantage of the City system of electric ambulances, one of which had been called in this case. He said that the case furnished strong proof of the necessity of having electric ambulances all over the metropolis. This view was unanimously endorsed by the jury in a rider to their verdict.



## ANNUAL PATENTS' REPORT

THE annual report of the Comptroller-General of Patents for the year 1912 states that the motor-car and allied industries are responsible for the most prominent group of inventions, over 1,200 inventions relating to internal-combustion engines being received. A considerable increase occurred in the construction of small dynamos for lighting motor-cars. The loss of the *Titanic* was responsible for many patents for arrangements to enable a wireless distress signal to be received, even though the operator is off duty. Now that the first automatic telephone exchange for public use in this country has been opened, much inventive ingenuity is being devoted to the subject, more particularly to the difficult problems of junction and trunk line working, and to semi-automatic and other methods for facilitating the gradual introduction of automatic systems. Compared with the year 1911, the number of applications accompanied by provisional specifications rose from 19,524 to 19,825, an increase of 1.5 per cent., and those accompanied by complete specifications from 9,829 to 10,264, an increase of 4.4 per cent.—by far the highest number on record for any one year. The total number of applications rose from 29,353 to 30,089, an increase of 2.5 per cent. The total number of complete specifications received was 18,853, compared with 18,662, an increase of 1 per cent. The number of applications filed has remained fairly constant during the last ten years, but the tendency to file a complete rather than a provisional specification upon application becomes more marked every year, the proportion of complete to provisional specifications filed on application being now nearly 52 per cent., as compared with 48 per cent. in 1907, and 30 per cent. in 1903. The total number of specifications (provisional and complete) received was 38,678, as compared with 38,186, an increase of 492, or 1.3 per cent.

The largest number of applications made on any one day was 159—on April 4th, and the smallest 48—on August 17th. It appears that 1,188 of the complete specifications filed upon applications made in the year 1911 were reported as wholly anticipated, 10,193 as partly anticipated, and 5,294 as not anticipated. Of those anticipated, 10,295 were amended without a hearing taking place, and 677 after a hearing and decision. In 302 cases a reference to a previous specification was inserted. There was an increase in the number of applications received in 1912, as compared with 1911, from all parts of the United Kingdom except the Isle of Man, and also a small increase in those received from Canada, India and the West Indies. On the other hand, there was a considerable decrease in the numbers received from the Australian Commonwealth, New Zealand and the South African Union. There was an increase in the number received from China, Japan, the United States, and some other countries, and a decrease in those from Belgium, France, Germany, Hungary, Russia and Sweden.

There were 42 applications for restoration of patents lapsed due to the non-payment of renewal fees. 27 patents were restored, two applications were withdrawn, and the remaining 13 are pending. There were five patents revoked during the year. No extensions of term beyond the usual maximum life of fourteen years were made, so that there are only three patents with extended lives now in force.

The names of twelve patent agents were added to the Register during the year, the total number on the Register on December 31st being 272.

**Osram Lamp Patents.**—Messrs. Ehrlich & Graetz and Messrs. Krupka & Jacoby, as announced in an advertisement on another page, have admitted the validity of Letters Patent 23,899/04, and other Letters Patent owned by the Osram Lamp Works, Ltd., and have agreed to cease importing or selling any lamps that infringe these patents.

**Silica Lamp Laboratory Outfits.**—The Westinghouse Cooper Hewitt Co., Ltd., have lately placed on the market a special laboratory outfit for investigating and applying to commercial purposes the properties of ultra-violet rays. They may be used for testing the fastness of colours and the quality of dyes. We are informed that many firms manufacturing high-grade carpets are using these quartz lamps to obtain comparative tests with a minimum of time and expense. The application to sterilisation is another interesting development which provides for a tremendous range of work. To protect the eyes and skin of the user of these lamps from their rays the lamps are screened with a sheet of commercial glass.

**Indirect Lighting at Cinematograph Theatres.**—The British Thomson-Houston Co., Ltd. (Mazda House, Upper Thames Street, E.C.), have sent us some particulars of the lighting of the Holderness Hall cinematograph theatre at Hull, which is carried out on their "Eye-rest" indirect system. The advantages of this now well-known system have often been pointed out in our columns, and only recently we referred to its adoption at a picture theatre in Liverpool. In the present case, in which there is complete harmony between the architectural and illumination schemes, the equipment consists of one 14-in. and four 30-in. fittings in the main hall, two 30-in., three 18-in., and one 14-in. fitting over the gallery, and four 24-in. fittings under the gallery. The entrance hall and lounge is lighted by four 14-in. fittings.

TELEPHONY AND TELEGRAPHY  
(INCLUDING WIRELESS)

In reply to a question asked in the House of Commons by Mr. Joynson-Hicks regarding the case of the electrical staff transferred from the National Telephone Co., on Thursday last, the Postmaster-General said that he had now secured the consent of the Treasury to the creation of a considerable number of additional established posts and to grant to those who do not secure certain privileges attendant upon "establishment" a special allowance of 1s. per week. In a printed reply to a question by Mr. Goldman, he gave last week some figures of the increase of telephone stations during the last five years. Whereas in 1907 there were 138,697 stations in London and 349,685, these figures were now 227,213 and 452,839 respectively. The rate of increase each year, however, was declining in both cases.

It is reported that at the tests of the Poulsen system between Lyngby (near Copenhagen) and Cullercoats, before the Technical Committee, in connection with the Marconi inquiry, messages were received at the rate of 100 words per minute at the request of the Committee, although 300 to 400 words per minute had been previously attained. It is stated that a regular Transatlantic service by the Poulsen system will be commenced next autumn.

Last week, before the Marconi Inquiry Committee, Sir Henry Norman repudiated the suggestions that he was in any way connected with the Poulsen Co., and the examination of Mr. Godfrey Isaacs, which had lasted four days, was concluded. Evidence of some stockbrokers was then taken, and on Monday the interest centred chiefly round the examination of Mr. H. Rose, solicitor to the Poulsen interests in England, who refuted the allegation that he started rumours to destroy the reputation of Ministers to gain his clients' ends, and described the issuing of the Poulsen prospectus, which was in no way secret, and the steps that were taken to assert the claims of the company, which he thought had not been fairly treated. His cross-examination was taken yesterday.

In reply to a question in the House of Commons asked by Captain Jessel, the Postmaster-General states that the automatic telephone exchanges installed at Munich have been inspected by the officers of the Post Office, and he hopes shortly to be in a position to proceed with a trial installation of the type of equipment in use in that city. Other types had already been tested with satisfactory results. We understand that in Munich 10,000 out of a total of 45,000 lines are worked automatically.

According to their annual report, although the installation of the plant has been considerably delayed by the war, a good deal of construction work has already been done by the Constantinople Telephone Co. Practically all the underground piping is finished, and over 26 kilometres of cable have been placed in position. The erection of poles on the outlying routes is in progress, and the three principal exchanges, Stamboul, Pera, and Kadiköy, are well advanced.

According to the *Elektrotechnische Zeitschrift*, the Hochfrequenz-Maschinen A.G. of Berlin (owning the patents of Dr. Goldschmidt for high-frequency generators for wireless telegraphy) is erecting in Eilvese, Hanover, and on Hickory Island, New Jersey, respectively, two large wireless stations for Transatlantic telegraphy. The steel towers are over 800 feet high.

At the meeting last week of the Automatic Telephone Manufacturing Co., the report and accounts were adopted, and a profit of £13,498 on the first year's working was reported. Reference was made to the order placed by the Post Office for an automatic exchange of 6,800 lines at Leeds, but work has not yet been commenced on the site. An order has also been received for an automatic exchange at Cordoba (Argentina).

Automatic telephone working is to be adopted at several suburban exchanges in Sydney and at Perth, Australia.

The cable between Duala and Fernando-Po was down on April 10th, but was repaired on the 18th.—The Oran-Tangier cable was restored to working order on 18th inst., and the Bagdad-Bassorah line failed on 19th inst., and was put through again on the 21st.—The Italian Administration notifies that the wireless service to ships by the Cataldo (Bari) station has been suspended.—The cable between Perim and Djibouti failed on the 21st inst., while on the 22nd the Compagnie Française Télégraphiques succeeded in again repairing their Paramaribo-Cayenne cable.

## "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

### Specifications Published April 17, 1913

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

Names in italics indicate communicators of inventions from abroad.

28,868/11. **Protective Gear for A.-C. Distributing Systems.** B.T.-H. (*G.E.C., U.S.A.*). A pair of relays for parallel feeders, each having a working coil excited from a current transformer in the feeder, and a restraining coil. The restraining coil of one relay is excited from the protective transformer of the other feeder. The arrangement may consist of a balance contact arm, which may be mechanically biased, controlled by the two coils. The arrangement may be used in the method described in Patent No. 11,979/08. Two figures.

4,995/12. **Motor Control.** CROMPTON & Co., J. C. MACFARLANE, and H. BURGE. In a system where an auxiliary motor rotating in the same speed ratio as the main motor, and developing an opposing E.M.F. to the supply is used, a fine wire winding on the main motor is connected across a source of constant pressure, is arranged in series with the auxiliary motor, while a field winding on the auxiliary motor is in series with the main motor armature. By this means the power developed is kept constant, as the torque is varied inversely as the speed. Two figures.

7,014/12. **Control of Contactor Switches.** B.T.-H. (*G.E.C., U.S.A.*). This specification covers some improvements in the construction of contactor switches or relays, so as to obtain with more accuracy a varying current limit to suit varying conditions of service. On the relay there are series coils which hold the relay open until the current decreases to a certain point. This coil can be set to hold at a high current, so that the car will mount grades, and yet this high current will not occur on the level. The plunger of the relay coil has a dashpot, whose descent is retarded in accordance with the current in the series coil by magnetically acting on the plunger by means of the series coil in opposition to the downward pull due to gravity. Adjustability is obtained by movable cores in the series coils, and by an adjustable stop in the upper end of the relay spool, which varies the vertical play of the movable cores or plunger of the relay. Three figures.

13,375/12. **Arc Lamp Electrodes.** B.T.-H. (*G.E.C., U.S.A.*). Instead of making "non-consuming" negative electrodes of a magnetite mixture, they are made of an alloy of copper and aluminium in the proportions of about 92 to eight. It is claimed that with this alloy the arc keeps steady. One figure.

16,827/12. **Wireless Telegraphy.** W. P. THOMPSON (*Ges. für Drahtlose Teleg.*). An auxiliary discharge-starter called an "ignition" arrangement is used to bridge over the working spark gap in a low pressure quenched spark system. The "ignition" is effected by a high frequency discharge from an auxiliary circuit, the capacity of which is smaller than that of the condenser circuit. By this arrangement the "ignition" energy is reduced to a small fraction of the working energy. Five figures.

26,113/12. **Motor Controllers.** F. J. MOFFETT and N. B. ROSHER. An improved construction for switches having two or more positions, in which a contact arm is rotated step by step by a ratchet wheel, is described. A hand lever engages with a longitudinally sliding bar carrying a pawl, which engages with a ratchet wheel to rotate it one tooth at a time. The return movement of the ratchet wheel is prevented by a pawl connected to a hand-operated releasing gear for allowing the switch arm (connected to the ratchet wheel) to be returned to its "off" position by means of a spring. The return movement of the bar is controlled by a dashpot. One figure.

### Specifications Published To-day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, E.C., at the price of 8d. each, post free.

Summaries of some of the more important of these patents will appear in our next issue.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** MARKS (*Brown, Boveri*) [Generator load equalising] 29,178/11; LEITNER [Regulating dynamos] 7,776/12; MÜLLER [Insulators] 7,972/12; CALLENDER'S CABLE CO. and PIPKIN [Armoured cables] 14,157/12.

**Dynamos, Motors, and Transformers:** VANDERVELL and MIDGLEY [Dynamos] 8,040/12; HEWITT [Vapour rectifiers] 22,246/12; SPINELLI [Static transformation of three-phase current to single-phase: frequency multiplied by three] 2,471/13.

**Electrochemistry:** HELBRONNER, VON RECKLINGHAUSEN and HENRI [Sterilisation of milk] 14,958/12.

**Ignition:** KETTERING [Engine starting] 29,085/11, 29,344/11, 29,070/12, 29,083/12, and 504/13.

**Switchgear, Fuses, and Fittings:** OLMSTED [Pressure regulators for dynamos] 8,063/12; B.T.-H. (*G.E.C., U.S.A.*) [Control systems] 11,466/12; LIDDLE (*Gordon Elec. & Mfg. Co.*) [Switches] 24,932/12; DE FRETES [Sign flasher contact gear] 3,006/13; GRUBER [Mercury switches] 4,297/13.

**Telephony and Telegraphy:** HEURTLEY [Telegraphy] 7,786/12; PEDERSEN [Relays, microphones, &c.] 7,888/12; DUBILIER [High-frequency apparatus] 8,196/12; RAYMOND-BARKER [Telegraph transmitters] 8,352/12; HUNTER and SHAND [Simultaneous transmission of telephonic, telegraphic, and signalling current over power lines] 13,355/12; SIEMENS BROS. & Co. (*Siemens & Halske*) [Automatic telephony] 18,356/12; BAUMANN [Telephony] 18,676/12; KESSELS [Printing telegraphs] 21,332/12; BRITISH L. M. ERICSSON and BROOKES [Telephone receivers] 22,252/12; SORET [Audophones] 22,613/12; ROTTGARDT [Production of high-frequency oscillations] 22,875/12; JENSEN and PRIDHAM [Telephones] 25,896/12; KRAUSE [Production of oscillations] 28,595/12; BLOCK [Disinfecting telephones] 609/13; ROUZET [Wireless for air-craft] 947/13; EGERTON [Telephone transmission circuit] 2,749/13; MAXWELL [Telephone receiver supports] 5,802/13.

**Traction:** SAMALA [Automatic tramway signalling] 10,434/12; PARKER and SMITH [Trolley heads] 15,022/12.

**Miscellaneous:** HADDAN (*Nat. Cash Register*) [Distant indicators for cash registers] 7,494/12; DICKSON and CLARK [Gate fastenings: relief and signals] 8,307/12; RIDER [Adaptable trolley] 10,383/12; SZÉK [Primary batteries] 18,404/12.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Arc Lamps:** GEB. SIEMENS & Co. [Electrodes] 7,108/13.

**Electrochemistry:** NODON [Treatment of cellulose] 6,668/13.

**Incandescent Lamps:** VOIGTLÄNDER [Process for manufacturing articles of tungsten] 6,911/13.

**Switchgear, Fuses, and Fittings:** ABBATECOLA [Current limiter] 25,542/13; YOUNG [Switches] 5,321/13.

**Telephony and Telegraphy:** SAHULKA [Wireless transmitters] 6,479/13; SIEMENS & HALSKE [Junction line—selecting switch engaged signal] 7,130/13; [Automatic telephone number impulse transmitters] 7,530/13.

### Application for Restoration of Lapsed Patent

22,819/08. **Electric Clocks.** T. J. MURDAY. The patent, which is for a means and mechanism for indicating time from the motion of an electric pendulum as described in specification No. 15,644/01, expired on October 27th, 1912, owing to the non-payment of the renewal fee. Application has now been made by E. R. T. Clarkson for restoration of this patent. Objections must be lodged before June 16th.

### Application for Extension of Term of Patent

8,961/99. **The Telegraphone.** V. POULSEN. Owing to difficulties in collecting the necessary evidence in the application for extension of term beyond the customary 14 years (ELECTRICAL ENGINEERING, Vol. VIII., p. 600, October 31st, 1912), this petition has been delayed. It has, however, been ordered that the petition be in the list for to-day. The patent will expire, unless the petition is granted, on Monday next.

### Opposition entered to Grant of Patent

**Telephony and Telegraphy:** H. LENCH [Manufacture of foot-steps for poles] 10,600/12.

### Expired Patents

The following are the more important Patents that have become void through non-payment of renewal fees.

**Arc Lamps:** O. SCHAEFFER [Suspension gear] 260/06.

**Distributing Systems, &c.:** J. H. HOLMES & Co. [Push-button control of rotary web printing presses] 27,242/05.

**Electrochemistry and Electrometallurgy:** A. HORTH [Induction furnace with spiral smelting channel] 28,542/07.

**Incandescent Lamps:** B.T.-H. (*G.E.C., U.S.A.*) [Connecting metal filaments to leading-in wires] 155/07.

**Switchgear, Fuses, and Fittings:** C. E. PETTIT [Pressure regulator for calcium carbide furnace] 131/06; T. J. and E. RORKE [Electromagnetically-operated switches] 12,175/08.

**Telephony and Telegraphy:** C. M. JACOBS and A. H. NICHOLSON [Selective party line signalling] 146/02; I. KITSEE [Submarine telegraph repeater] 28,690/07; G. A. CARDWELL [Page printing telegraphs] 28,736/07; A. H. NICHOLSON [Polarised relay for selective signalling] 220/08.

**Traction:** B.T.-H. (*A. H. Armstrong, U.S.A.*) [Minimising self-induction of steel rails in three-rail system by special connections through transformers from the feeders] 25,748/99; SIEMENS BROS. & Co. and L. M. G. FERRIERA [Electromagnets for operating railway points, signals, &c.] 70/03.

# ADAMS IGRANIC

ELECTRIC CONTROL GEAR FOR NEWSPAPER PRESSES.

ADAMS  
M<sup>rs</sup> C<sup>o</sup> L<sup>td</sup>  
BEDFORD  
AND  
LONDON

## ELECTRIC TRACTION NOTES

A House of Commons Committee, presided over by Sir Ivor Herbert, has commenced consideration of a long list of Bills dealing with trolley 'buses and motor-'buses, and for the first time a principle has been laid down as regards maintenance of the roads over which these vehicles run. This, of course, in the case of municipalities only applies when the vehicles run outside the municipal boundaries, and the first decision, in the case of the Chesterfield Corporation, is one of this sort. How the Committee will deal with the proposals by companies remains to be seen. In the case of the Chesterfield Corporation half a dozen routes were scheduled, most of them running well outside the city and on to the main roads of the Derbyshire County Council, who opposed on the ground that the Corporation should pay for the necessary widenings and also towards the maintenance. So far there has been no case in which a Parliamentary Committee has put such conditions upon the promoters of a trolley omnibus or motor-'bus Bill, although in the case of Rottingdean, the Brighton, Preston and Hove Omnibus Co. agreed to pay the Sussex County Council a contribution towards road maintenance on a car-mile basis. Recently, in the case of Coventry, the Corporation withdrew certain motor-'bus proposals outside the city, owing to an indication by the Committee that it thought that something should be paid towards road maintenance. In the case of the Chesterfield scheme, it has been decided that the trolley 'buses and 'buses may not run on any road until it has been widened to 17 ft. with a 4-ft. footpath, and, as regards maintenance, there is to be an arbitration every three years to determine whether the traffic of the trolley 'buses and 'buses has caused wear on the county roads which can come within the definition of "extraordinary" traffic under the common law appertaining to highways. If it is so determined, then a money value will be placed upon such wear. The same Committee is now considering the Rhondda Railless Traction Bill.

Last week Lord Sanderson's Select Committee of the House of Lords on the Metropolitan Railway Bill decided that the Bill might proceed as regards the extension of the Great Northern and City Railway from Moorgate to Lothbury, but they did not consider that the preamble had been proved as regards the connection with the Waterloo and City Railway. The plans for linking up the Great Northern and City Railway with the Metropolitan Railway at Liverpool Street, so as to admit of through running from Finsbury Park to New Cross, have been withdrawn. It is understood that a better scheme with this object in view may be promoted next session embracing the through running of Great Northern trains. The same Committee has since considered the City and South London Railway Bill for enlarging their tunnels from 10 ft. 2 in. to the usual "tube" size of 11 ft. 8½ in., so as to admit of through running. It was proposed by the Charing Cross, Euston and Hampstead Railway to construct a line from Camden Town Station to Euston, and there to connect with the City and South London. The Committee found the preamble proved, but decided that the clauses, including one for compensation by the Great Northern Railway, should be considered later in conjunction with those of the Metropolitan Railway. The new arrangements would enable some forty trains an hour to be run, with about three times the present seating capacity. It is interesting to note in this connection that on Monday the number of trains per hour was increased from 24 to 30.

Another London electric proposal, in the Wimbledon and Sutton Railway Bill, was passed by the House of Lords Committee, presided over by Lord Sanderson, on Tuesday. The line was sanctioned a few years ago as an independent undertaking, and since then an arrangement has been made for the District Company to take it over and work it as part of the London electric railway system. The proposal now was to extend the time for the construction of the line and to increase the capital from £455,000 to £715,000. It may be mentioned that local landowners have agreed to guarantee

4½ per cent. on the capital for ten years, in order to get the line built at the earliest possible moment.

The Bill of the Hastings Tramways Company, in which they seek powers to use an overhead system along the front in place of the Dolter surface contact system has also been engaging the attention of a Select Committee of the House of Lords during the past week. There has been a large amount of opposition, including that of a number of frontagers. It is said that the majority of the residents are opposed to trams being allowed along the front at all. The overhead system, it is also said, would detract from the beauty of the front, but there are many obstructions in the way of signs, posters, &c., already there. Among the many suggestions made were the use of a conduit or some other surface contact system. It was, however, pointed out by experts that, apart from capital cost, the conduit system is undesirable owing to the front sometimes being flooded with sea-water. The Committee on Tuesday decided not to pass the Bill.

According to a report of the Finance Committee of the London County Council, the gross surplus on the working of the L.C.C. tramways for the year amounted to £934,212, after taking into account the deficiency of £11,966 on the horse traction account. After deducting all proper charges, the net surplus was £222,703, of which £138,152 was carried to renewals fund, and the balance of £84,551 to the general reserve fund. It is pointed out that the average receipts per car mile have declined from 11'95d. in 1907 to 10'98d. for the year under review. The accounts, however, show that, notwithstanding these decreases, there is an increase in each successive year in the final surplus.

The directors of the Metropolitan Electric Tramways, Ltd., recommend a dividend of 5½ per cent. for the year with £10,000 to reserve and £604 carried forward. The profits from tramway working have declined by £24,347, due to motor-'bus competition. To meet this the car services have been increased, but although the receipts have been maintained, the expenses are higher. Improvement is, however, expected now that the Company have entered into an alliance with the London General Omnibus Co. Under the scheme for the consolidation of the Company's interests with those of the London United Tramways Co., the Company has sold to the London and Suburban Co. the whole of its interest in the Tramways (M.E.T. Omnibus Co., Ltd.). The Company is promoting a Bill for a railless traction service between Tottenham and Walthamstow.

The Rochdale Tramways net profits for the year amount to £7,423, as compared with £6,486 last year. It is proposed to allocate £2,327 to rate relief—this being the first contribution the department has made for this purpose—and to carry £5,096 to renewals fund. Last year's working of the Bury tramway sections shows a profit of £9,572, and it is proposed to allocate £5,000 to relief of the rates. There is a loss of £809 on the Heywood tramways undertaking during the past year, as compared with a loss of £742 last year.

The receipts of the Swansea Improvements and Tramways Co. have increased by £1,030, and a 5 per cent. dividend is recommended.

The directors of the Oldham, Ashton and Hyde Electric Tramways Co. report a net profit for the year of £6,788, and out of an available balance of £6,968 they propose to pay a dividend on ordinary shares at the rate of 7 per cent. per annum for the six months ending December 31st (making 6 per cent. for the year), to place £1,250 to reserve, and to carry forward £218.

A Bill is now before the Canadian Legislature to authorise the purchases by the municipality of the Toronto Street Railway Company and the Toronto Electric Light Company. If the Bill is passed, the city will have a complete monopoly of the electric lighting and surface transportation.

**I.E.E. Students' Section.**—The annual general meeting has been postponed from April 30th until May 7th. A Paper will then be read by Messrs. E. A. Richards and D. Dunham, entitled "Single-Phase Commutator Motors." There are five extra-collegiate vacancies occurring on the students' committee. Nominations should be sent to the hon. secretary, Mr. E. T. Driver (24 Bradgate Road, Catford, S.E.), as early as possible.

**FARADAY HOUSE.**

ESTABLISHED 1889.

(Proprietors: The SYNDICATE OF ELECTRICAL ENGINEERS, Ltd.)

**Breakdown Voltage**

(Up to 50,000).

Faraday House tests every kind of Electrical Machinery and Instrument, and all Apparatus and Materials used by the Electrical and Allied Industries.

Scale of fees will be sent on application to the Secretary,

**THE ELECTRICAL STANDARDIZING  
AND TESTING INSTITUTION.**

62-70, Southampton Row, London, W.C.

Telep. No.: 9999 Central.

Teleg.: "Standardizing, Westcent. London."

**FARADAY HOUSE.****DON'T MACHINE!—CAST!**

The scientific accuracy and perfection of finish that can be secured by

**"PRANA"**

**DIE FINISHED CASTINGS**

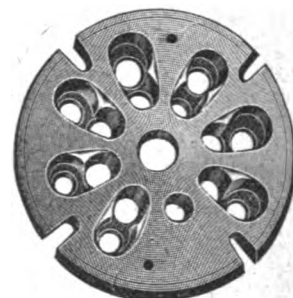
renders unnecessary all expensive and costly machining, and will

**CUT DOWN COST ON  
COMPLICATED PARTS**

Holes, Slots, Teeth, Notches, Screw Threads accurately cast and finished by the "Prana" process.

Send for booklet E.A., illustrating and describing this money-saving process to:—

**AERATORS LIMITED, EDMONTON, LONDON, N.**

**ELECTRICAL PORCELAIN**

OF

**HIGHEST QUALITY**

APPLY TO

**JAMES MACINTYRE & CO., LTD.,**  
BURSLEM.

MICA MICANITE FIBRE.  
OILED FABRICS LEATHEROID

**INSULATION**

The Micanite & Insulators Co., Ltd.  
Walthamstow, London, E.

ONCE  
USED

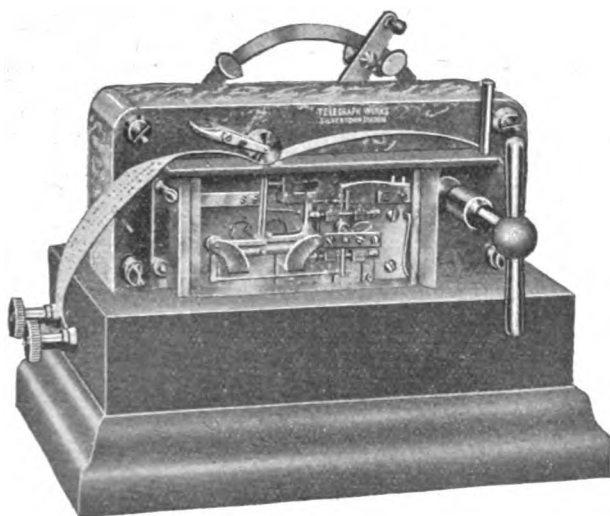


ALWAYS  
USED

PRICE: ONE SHILLING PER STICK.

Sole Manufacturer—**S. W. CUTTRISS, Prudential Buildings, LEEDS.**

**STEATITE  
INSULATORS**  
SUPPLIED  
FOR ALL KINDS OF  
ELECTRICAL WORK  
**WILLIAM SUGG & CO. LTD.**  
WESTMINSTER.

**SILVERTOWN INSTRUMENTS****WHEATSTONE  
Automatic Apparatus**

**Transmitters & Receivers**  
**Working up to 400 words**  
**per minute**

PRICES ON APPLICATION

**The India Rubber, Gutta Percha and Telegraph Works Co., Ltd.**

Head Offices:

106, Cannon Street, London, E.C.

Works:

Silvertown, London, E.

WHEN CORRESPONDING WITH ADVERTISERS, PLEASE MENTION "ELECTRICAL ENGINEERING."



## LOCAL NOTES

**Barton:** *Electric Supply.*—The Barton-on-Humber Electric Supply Co. has been incorporated with a capital of £20,000 to take over electric lighting powers owned by Mr. F. Hopper. A contract for works and equipment has been entered into at a cost of £10,270, and the erection of the generating station has been commenced.

**Blackburn:** *New Plant.*—The extensions have been opened by the Mayoress and Mrs. Brodie, wife of the Chairman of the Electricity Committee. A demonstration of electric heating and cooking was given during the afternoon.

*New Generating Station.*—The scheme of Mr. P. P. Wheelwright, Borough Electrical Engineer, for a new £10,000 kw. generating station at Greenbank, at an estimated cost of £75,800, has been adopted by the Council.

**Coventry:** *A Local Government Board Inspector's remarks.*—During an inquiry into an application for a loan of £20,000 for the electricity undertaking last week Mr. H. R. Hooper made some strong remarks against application of profits in relief of rates while there was a mass of outstanding capital.

**Dundee:** *Annexation of Broughty Ferry and Monifieth.*—In giving evidence before an inquiry regarding the proposed annexation of these districts, Mr. H. Richardson, the City Electrical Engineer, remarked that if these districts were brought into the Dundee area of supply, the charge for lighting would be reduced from 5d. to 1'56d., and for power from 3d. to prices ranging from 1½d. to less than ½d. per unit.

**Hazel Grove:** *Provisional Order.*—The Board of Trade has made and issued a provisional order to the Hazel Grove and Bramhall Urban District Council, authorising them to supply electrical energy for all public and private purposes within the urban district.

**Lossiemouth:** *Provisional Order.*—The Board of Trade has granted a provisional order for the electric lighting scheme.

**Manchester:** *Progress of Electricity Undertaking.*—Notwithstanding the increased cost of coal and materials, an even rate of progress is more than maintained, and during the past twelve months 104,000,000 units have been consumed, as against 93,000,000 units for the previous year. The Electricity Committee, in considering the estimates a few days since, allocated £28,500 to the relief of rates.

**Richmond:** *Supply from Lots Road.*—The Standing Orders Committee of the House of Lords have consented to suspend the standing orders to allow a Bill to be introduced after the proper time to empower the Richmond Electric Light Co. and the Corporation of Richmond to take a supply in bulk from the Lots Road Station of the London Electric Railways and from the County of London Electric Supply Co. upon certain conditions. The company undertake to remove the existing chimney shaft of their present station. The period after which the Corporation of Richmond have power to purchase the undertaking is extended by thirty years, making the year 1951.

**Southampton:** *Electrical Exhibition.*—Acting on a suggestion of the Borough Electrical Engineer, a sub-committee has been formed to make arrangements for holding an electrical exhibition.

**Woodford:** *Electric Supply.*—An agreement is being drawn up for a supply of energy in Woodford by the Walthamstow Council. The price for private lighting is not to exceed 4d. per unit, whilst for domestic purposes it will be 1d. per unit.

**York:** *Reduced Lighting Tariff.*—It has been decided to reduce the flat rate for energy for lighting purposes from 4½d. to 3½d. per unit.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

## Generating Stations, Sub-Stations, Mains, &amp;c.

**Belfast:**—Circulating pump. City Electrical Engineer. May 19th. (See an advertisement on another page.)

**Bridlington:**—A Local Government Board inquiry was held last week regarding a loan of £5,000 for extensions to the electricity works.

**Canada:**—Two 5,000-kw. three-phase generators and water

turbines. Chairman, Board of Control, Winnipeg. May 15th. Specification, &c., at 78 Basinghall Street, E.C.

**Fleetwood:**—The Local Government Board has sanctioned the following loans for the electricity works: £5,240 for 17 years; £1,410 for 15 years, and £500 for 30 years.

**Glasgow:**—Tenders are invited for twelve months' supply of cables, meters, and arc lamp carbons. (See an advertisement.)

**Grimsby:**—A Local Government Board inquiry has been held into an application for a loan of £17,300 for extensions.

**Ireland:**—Board of Trade inquiries into applications for provisional orders have been made at Dromore and Banbridge.

**Lincoln:**—A Local Government Board inquiry has been held into an application for a loan of £12,500.

**London:** *L.C.C.*—Twenty-ton overhead hand-crane for Shoreditch sub-station. Clerk to Council. May 13th. (See advertisement on another page.)

**Long Eaton:**—Extensions to the electricity works are to be put in hand at a cost of £10,000.

**Norway:**—Tenders are invited for centrifugal pumps, condensing plant for two 6,000-kw. turbines, at Christiania. Provision is also made for the following expenditure for the electricity works: extensions of plant, £50,000; extensions of boiler house, £4,700; cables, £27,400. Particulars from Board of Trade, 73 Basinghall Street.

**Stockport:**—Mr. R. H. Hooper held a Local Government Board inquiry last week into an application for sanction to borrow £24,500 for the electricity undertaking.

## Wiring

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Barrow-in-Furness:**—Tenders are invited by May 7th for electric light installation at Roose. H. T. Fowler, architect, Cornwallis Street, Barrow.

**Birmingham:**—Fire station at Aston. City Engineer.

**Bradford:**—Cinematograph theatre.

**Bridgend:**—Additions to workhouse.

**Chester:**—Extensions to County Asylum at Upton.

**Glasgow:**—Zoological Garden in Rouken Glen Park.

**Hornsey:**—New secondary school.

**Knaresborough:**—School. Education architect, County Hall, Wakefield.

**London:** *Hammersmith.*—Enlargement to town hall.

*Hackney.*—Tenders are invited for installation at elementary school at Wilton Road. (See an advertisement.)

*Holloway.*—Tenders are invited for installation at special school at Elthorpe Road. (See an advertisement.)

*Marylebone.*—New Town Hall in Marylebone Road.

**Manchester:**—Freemasons' hall to cost £25,000.

Extensions to Royal Exchange.

**Middlesborough:**—Tuberculosis hospital. S. E. Burgess, Borough Engineer.

**Padiham:**—Territorial Headquarters. Surveyor, East Lancs. Association, Town Hall Chambers, Ashton-under-Lyne.

**Spennymoor:**—Public hall and Council offices. Architect, G. T. Wellburn, 115 Albert Road, Middlesborough.

**Stirling:**—New station buildings, Caledonian Railway. J. Blackburn, Secretary, Caledonian Railway, 302 Buchanan Street, Glasgow.

## TENDERS RECEIVED AND ACCEPTED

**Chiswick:**—An order has been placed with Messrs. Lassen and Hjort for water-softening plant to deal with 24,000 gallons per day.

**Edinburgh:**—The Bastian Meter Co.'s tender for 2½-ampere meters has again been accepted.

**London:** *L.C.C.*—The Fire Brigade Committee propose that the tender of "Cedes" Electric Traction, Ltd., for two electrically-driven escape vans be accepted at £1,668. The

FOR  
**STEAM JOINTS**  
USE



JOHN HUDSON & CO.'S SUCCESSORS, Mansell St., London, E.

contract for the batteries would be sub-let to the Tudor Accumulator Co.—The tender of Newton Bros., Derby (£7,987 10s.) for rewinding seventeen 300-kw. and three 500-kw. motor-generators at tramway sub-stations has been accepted. Four tenders had been received, the highest of which is nearly three times that of the accepted one.

**Swinton.**—Erection and equipment of Broad Oak Park sub-station:—Building, Messrs. W. Farnworth & Son, £48 10s.; switchgear, General Electric Co., £119; provision and laying supply mains, General Cable Manufacturing Co., £205.

Among recent contracts for Tantalum lamps for traction purposes received by Siemens Bros. Dynamo Works, are twelve months' supply for Dundee and Croydon tramways. In the latter case Wotan lamps are to be employed for the depot lighting, and another large contract for these has been placed by the Government of the Union of South Africa.

## APPOINTMENTS AND PERSONAL NOTES

The Hampstead Borough Council at its meeting last Thursday appointed Mr. William Wyld, Electrical Engineer and Tramways Manager to the Birkenhead Corporation, as Chief Electrical Engineer and Manager to the Borough of Hampstead.

The appointment of Mr. C. M. Davies, of Bristol, as consumers' engineer has been confirmed by the Council.

We regret to record the death of Mr. R. Coates, Manager of the Ystradgynlais electric light works, who was caught in a flywheel on the works and terribly mutilated.

Mr. Dacre Helme, who has been Tramways Manager and Electrical Engineer at Nelson since 1906, died last Friday in his fortieth year.

Mr. S. L. Pearce has been elected President of the Manchester Association of Students in connection with the Institution of Civil Engineers.

Mr. C. N. Hefford, who has been managing the Leeds electricity undertaking temporarily since the appointment of Mr. H. Dickinson to Liverpool, is recommended by the Tramways and Electricity Committee as permanent manager of the undertaking. The commencing salary is to be £600 per annum. Mr. Hefford has been in the Leeds electricity department since 1904 as engineering assistant.

An experienced designer of electrical machines and apparatus is required by a large shipbuilding and engineering firm. (See an advertisement.)

Jointer required for East of Scotland. (See an advertisement on another page.)

## MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. G. Smith & Son, of 5 Philpot Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night, was £72 to £72 10s. (last week the same).

**Business for Sale.**—An established electrical contracting business in London is for sale. (See an advertisement.)

**Agency.**—H. W. Butler & Co. (Craven House, Kingsway, W.C.) have been appointed agents for London and district for James Macintyre & Co., Ltd., of Burslem, makers of electrical porcelain.

**Strike at Dick, Kerr's Works.**—A strike of some 245 labourers and semi-skilled workers employed at the works of Dick, Kerr & Co., Ltd., at Preston, has been settled. It appears that under a recent agreement certain advances in wages were due to some of the men on April 5th, and to others on April 12th, but owing to a departmental error the wages of the men were made up on the old scale, and the mistake was not discovered in time to remedy it until the evening of April 12th. The men do not appear to have trusted the company and to have gone on strike; however, the dispute is now settled. Under the agreement all labourers over 21 will be paid 20s. per week, and semi-skilled men receiving up to 27s. are to have an advance of 1s. from April 12th, and a further advance in October; labourers put on semi-skilled work are to get an advance of 1s. after three months, and a further 1s. after nine months, with further increases depending on proficiency.

## COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &c.

**Lancashire Electric Power Co.**—At the meeting last week, Dr. H. F. Parshall referred to the contract for the bulk supply to Salford and Hindley and to the electrified section of the Lancashire and Yorkshire Railway between Bury and Holcombe Brook. The trading profit amounted to £14,617 and would have been higher if it had not been for the coal and textile strikes. The whole debit balance had now been written off, and £3,137 carried forward. An issue of £100,000 five per cent. prior lien bonds is proposed to pay for plant extensions, which will enable increased profits to be made.

**North Metropolitan Electric Power Supply Co.**—The report states that the revenue and expenditure have both increased by about £10,000 since the previous year. Out of a total credit balance of £80,773, after providing for debenture and other interest, reserve (£2,000), depreciation (£25,000), and preference dividends, a 6 per cent. dividend on the ordinary shares and a bonus of 8s. per share is recommended, with £1,820 carried forward. A further issue of 5 per cent. mortgage debentures is to be made at an early date. The extensions at Brimsdown are nearly completed, and extensions are also in hand at Willesden. The Hertford station is shortly to be extended. Supply has been commenced at Hadley and will be extended this year to East Barnet. The meeting will be held on April 23rd.

**Babcock & Wilcox.**—The report to be submitted at the meeting on April 24th records a net profit of £426,146. The directors recommend a dividend of 3 per cent. on the preference shares, and 9 per cent. on the ordinary shares, with £150,000 placed to reserve, and a balance of £64,013 carried forward. The volume of business done during the year shows an increase over any previous period, and to cope with further business the directors recommend an issue of £200,000 5 per cent. cumulative second preference shares.

**Johnson & Phillips.**—At the meeting to be held on April 24th a report will be submitted showing a profit of £28,324. After deducting directors' fees, interest, depreciation, and other charges, a balance of £3,315 remains to be carried forward.

**Midland Electric Corporation for Power Distribution.**—The result of last year's working is a balance of £12,843, and after making provision for debenture guarantee premium, writing off expenses of issue of debentures and ordinary shares, and transferring £2,899 to depreciation, a sum of £6,250 is carried forward. An additional 3,000 kw. turbo-alternator was installed during the year.

**Brentford Electric Supply Co.**—At the meeting on April 5th it was announced that the first year's working of this company, which takes supply in bulk from the Metropolitan Electric Supply Co., had resulted in a net balance of £112, which is carried forward. £3,956 has been spent on mains, services, &c.

**Cork Electric Tramways & Lighting Co.**—This company reports receipts £1,238 in excess of those in the previous year, notwithstanding the adverse affect of the extended use of metal filament lamps. The expenses, however, have increased by £2,270, owing mainly to the increased price of coal and heavy maintenance charges for cables. A 3 per cent. dividend on the ordinary shares is recommended.

**Staff Dinner of the Metropolitan Electric Supply Co.**—The annual staff dinner of this company was held on Wednesday of last week at the Trocadero, with Mr. J. S. Highfield (Chief Engineer) in the chair. The speakers included Mr. F. W. Goodenough, Mr. D. Sinclair, Mr. Roger T. Smith, Mr. E. Cunliffe Owen, and others. The chairman paid a tribute to the loyalty of the staff, especially during the hard time which had preceded their present condition of increasing prosperity, and Mr. Roger T. Smith referred to the existence of negotiations between the company and the Great Western Railway.

**Manchester Local Section of the Institution of Electrical Engineers.**—At the annual meeting on April 8th the following officers and committee were elected for the forthcoming session: *Chairman*, Prof. E. W. Marchant (Liverpool University); *Vice-Chairman*, Dr. Rosenberg (British Westinghouse Co.) and Mr. P. P. Wheelwright (Borough Electrical Engineers, Blackburn); *Committee Members*, Prof. Miles Walker (Municipal School of Technology), Messrs. F. A. Whysall (Manchester Electricity Dept.), E. R. Hollingsworth (Borough Electrical Engineer, St. Helens), B. Welbourn (British Insulated & Helsby Cables), G. Layton (British Westinghouse Co.), K. M. Faye-Hansen (British Westinghouse Co.), A. E. McKenzie (Manchester Electricity Dept.), H. J. Hawkins (Borough Electrical Engineer, Salford), C. C. Atchison (Borough Electrical Engineer, Rochdale), C. J. Beaver, E. L. Hill (Siemens Brothers Dynamo Works), and Bertram Thomas; *Secretary*, Mr. J. Frith. An increase of 28 members of the section was reported since last year.

# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 331 [Vol. IX., No. 18]

*All rights reserved.*

THURSDAY, MAY 1, 1913.

[PRICE ONE PENNY.

*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

*The Engineering Journal of the Electrical Industry*

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES and TECHNICAL COLLEGE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

*Other Advertisement Rates on Application.*

*Latest Time for Receiving*

*Letters for Insertion, Tuesday first post.*

*Small Advertisements and Official Announcements, Wednesday first post.*

*Displayed Advertisements, Tuesday first post.*

*Corrections in Standing Advertisements, Monday first post.*

All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 208-206, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Circling, Fleet, London." Telephone No.: 5509 Holborn.

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

THE commercial aspect of phase advancing has been discussed by the Institution of Electrical Engineers in London and Birmingham, after the reading of a Paper on the subject by Dr. G. Kapp, who treated of dynamic phase advancers, and showed that a large saving would result; the amount, however, was challenged by several speakers in the discussions. Mr. W. M. Mordey and Mr. A. W. Ashton thought that the static condenser should be a very serious rival to the dynamic advancers, though it appears that the Kapp "Vibrator" is probably the cheapest apparatus of all. (Page 239.)

THERE was an interesting discussion at a recent meeting of the Western Local Section of the Institution of Electrical Engineers on the possibility of applying the Thury system to mines, which was suggested by Mr. S. F. Walker. Although some of the advantages of the system were admitted, it was generally felt that the insulation of the motors presented great difficulties under mining conditions. (Page 241.)

SOME notes on the uses of electricity in the tin-plate industry were contained in a Paper read recently by Mr. H. Spence Thomas before the South Wales Institute of Engineers. (Page 242.)

A GATE end box for mines is described on page 243.

THE Specifications published by the Patent Office during April of particular interest to mining electrical engineers and metallurgists include one for a connector for the metallic armouring of cables by A. Hepburn, two relating to electric furnaces, and one covering certain arrangements for the electrolysis of scrap-iron by G. Tischenko. (Page 244.)

THE full text of objections to the draft general regulations made by the Home Office, under the Coal Mines Act, 1911, has now been issued. An amendment to give greater freedom in the use of electric safety lamps and some objections to the telephonic regulations are included. (Page 243.)

RECEPTION tests for rotary converters are discussed in our "Questions and Answers" columns. (Page 245.)

Two new turbo-generators were officially started up last week at Blackpool. (Page 246.)

At a meeting of the "Point Fives" at Bradford, Mr. T. Roles outlined the progress of electric heating and cooking in that city. The association is issuing its own designs of posters, &c., and will hold an open meeting during the convention of the I.M.E.A. (Page 246.)

A REFLECTOR for shop-window lighting is referred to on page 246.

THE consolidation of the constituent units of the Imperial College of Science and Technology has been in progress for some time. Much new equipment of a most practical character is now installed. (Page 247.)

WE outline some electrical clauses in the Derby Corporation Bill which is now being considered by a House of Commons Committee. (Page 247.)

THE Board of Trade has asked that the clause in Bills before Parliament this session, giving them powers to authorise additional trolley omnibus routes, should be deleted.—A trolley omnibus route on the Cedes-Stoll system has been opened at Keighley.—A sum of £1,250,000 has been sanctioned for electric railway purposes in Berlin. (Page 247.)

THE petition for extension of term of the Telegraphone Patent will not be heard before May 20th. The Specifications published by the Patent Office last Thursday included one by E. Raymond-Barker for a system of working Morse over submarine cables not requiring a split battery, while another, taken out by Callender's Cable & Construction Co., covers lead sheathing wire armoured cables, so as to protect the armouring from chemical action. (Page 248.)

MR. WINSTON CHURCHILL was called before the Marconi Committee in the week, and expressed himself strongly upon the action of the Committee in calling him. Mr. A. A. Campbell Swinton has also made a statement to the Committee in connection with his report upon the Poulsen system.—The Postmaster-General's annual statement in the House of Commons last week mentioned the erection of a wireless station at Aberdeen with a view to meeting the requirements of the North of Scotland for additional telegraphic facilities. During the past year 162,000 miles of telephone wires have been laid, and 20,000 new subscribers have been connected. (Page 250.)

THE Harrogate Borough Electrical Engineer has outlined a scheme for developing electric cooking and heating, and a similar scheme has been adopted at Bexley.—An electric transporter bridge is contemplated at Glasgow.—Mr. Robert Hammond will act as arbitrator to determine the price to be paid by the Salford Corporation for traction current.—A strike of electrical wiremen has taken place at Leicester. (Page 251.)

AN £80,000 loan has been sanctioned at Aberdeen; additional generating plant is to be installed at Wolverhampton, Hamilton, Battersea, Glasgow, Warrington, Rochdale, Stalybridge, Grimsby, King's Lynn, Hoylake, Felixstowe, and Peterborough; electric cranes are required at Southampton. (Page 251.)

### ARRANGEMENTS FOR THE WEEK

(TO-DAY) THURSDAY, MAY 1st.

*Iron and Steel Institute.*

10.30 a.m. Annual Meeting at Institution of Mechanical Engineers. Among the papers down for reading is "A New Form of Electrically Driven, Two-high, Continuous Running, Reversing Mill," by Andrew Lamberton.

*Institution of Electrical Engineers.*

8 p.m. "The Use of the Electrostatic System of Measurement of Power," by C. C. Paterson, E. H. Rayner, and A. Kinnes.

SATURDAY, MAY 3RD.

*Birmingham and District Electric Club.*

7.45 p.m. At Swan Hotel, New Street. Discussions on "Purchased v. Home Generated Power" and "Direct v. Alternating Current for General Works Power."

MONDAY, MAY 5TH.

*Institution of Electrical Engineers: Newcastle Section.*

7.30 p.m. At Armstrong College. "On Phase Advancing," by Dr. G. Kapp.

*Society of Engineers.*

7.30 p.m. At Institution of Electrical Engineers. "Tidal Waters as a Source of Power," by C. A. Battiscombe.

WEDNESDAY, MAY 7TH.

*Institution of Electrical Engineers: Students' Section.*

7.45 p.m. Annual General Meeting. "Single-phase Commutator Motors," by E. A. Richards and D. Dunham. *Faraday Society.*

8 p.m. At Institution of Electrical Engineers. A number of papers will be read on aluminium and the phenomena of electrolysis.

### The London Electrical Engineers.

(TO-DAY) THURSDAY, MAY 1ST. C. Company.—Recruit Training, 7 to 8 p.m. Co. Training, 7 to 10 p.m.

FRIDAY, MAY 2ND. D. Company.—Recruit Training, 7 to 8 p.m. Co. Training, 7 to 10 p.m.

SATURDAY, MAY 3RD. All Companies.—Annual Musketry at Purfleet Rifle Ranges. Trains leave Fenchurch Street Station (Midland Railway, Tilbury Branch) at 1.15, 1.35, and 2.15 p.m. Equipment provided at the Ranges. Headquarters open from 10 a.m. till noon.

MONDAY, MAY 5TH—A. Company. TUESDAY, MAY 6TH—B. Company. THURSDAY, MAY 7TH—C. Company. FRIDAY, MAY 8TH—D. Company. Infantry Drill, 7 to 9 p.m. Technical Instruction for all Members on the Sixth Rate and for all Candidates for Higher Rating, 7 to 9 p.m. Musketry Instruction, 9 to 10 p.m.

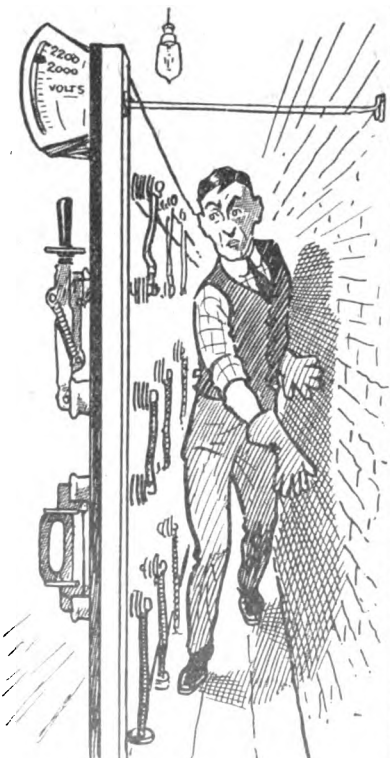
WEDNESDAY, MAY 7TH. All Companies.—Annual Musketry at Purfleet. SATURDAY, MAY 10TH. Headquarters open from 10 a.m. till 12 noon.

**Institution of Civil Engineers Premiums.**—Among the premiums awarded by the Institution of Civil Engineers for papers read during the past session is one to Mr. G. D. Snyder, of New York, on "Notes on City Passenger Transportation in the United States." We published an abstract of this paper on page 135 of our March 6th issue.

**The British Electrical and Allied Manufacturers' Association.**—The following firms have recently become members of the Association:—Alley and MacLellan, Ltd., Peter Brotherhood, Ltd., The Dowsing Radiant Heat Co., Ltd., The Electrical Apparatus Co., Ltd., George Ellison, J. H. Holmes and Co., Premier Accumulator Co., Ltd., Wandsworth Electrical Manufacturing Co., Ltd., Whipp and Bourne. The firm of Jaeger Brothers has become an Associate Member.

**Finsbury Technical College O.S.A.**—A jovial concourse gathered at the Waldorf Hotel on Friday evening last on the occasion of the seventh annual smoking concert of this Association. The varied programme was excellently carried out, and credit is due to Mr. C. B. Naudand for its arrangement and to Mr. R. W. Clark, the concert secretary, for his activities in bringing about such a satisfactory result. During the evening the Chairman, Mr. Julian L. Baker, announced that Mr. W. J. Tennant had found himself unable longer to carry on the duty of editing the Magazine, which he has done since the founding of the Association. Mr. E. W. Moss had been asked to take on the duties of editorship, which he was pleased to say he had undertaken to do.

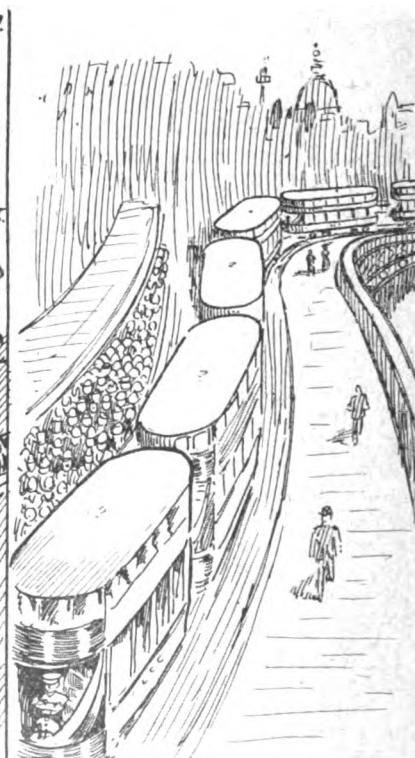
### THE INSTITUTION OF ELECTRICAL ENGINEERS COUNCIL ELECTION.



The man who may not vote for Mr. Ram.



The man who may not vote for Mr. Chattock.



The men who may not vote for Mr. Fell.

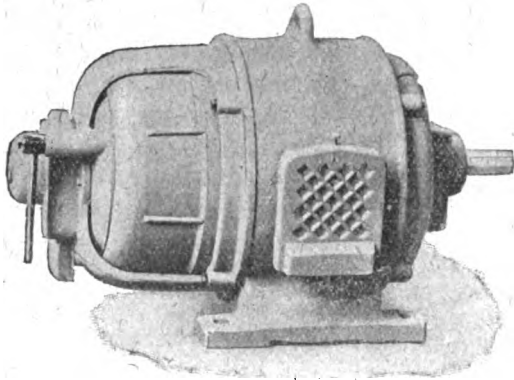




## SMALL INDOCTION MOTORS FOR ALL CLASSES OF WORKSHOP DRIVING.

PROMPT DELIVERY IN SIZES FROM  
1/4 TO 10 H.P. AT ALL THE USUAL  
SPEEDS AND PRESSURES.

OPEN, PROTECTED & ENCLOSED TYPES.



HIGHEST GRADE MATERIAL and  
WORKMANSHIP.

### BROWN, BOVERI & CO., Limited

CAXTON HOUSE, WESTMINSTER, LONDON, S.W.

And at MANCHESTER, GLASGOW,  
and NEWCASTLE.

would then be lagging by 45 degrees. With the machine overloaded to a little under three times its normal load the phase angle would be zero, so that up to this limit the machine still acts as a phase advancer. Applying this machine to the group of induction motors previously considered with a power factor of 0.7 this is increased to 0.9, and the added motor will have a rating of 60 k.v.a. and will take 25 kw. without increasing the line current. The cost of the motor is about £120, of which £70 must be debited to it as a motor and £50 as a phase advancer. So that 25 kw. of saleable power are produced with an expenditure of £2 per kw. If the customer purchases the plant a discount of 5 per cent. in the power used will provide 10 per cent. for interest and sinking fund under the worst conditions likely to prevail. The author also refers to the system of metering devised by Professor R. Arno, of Milan, as a result of extensive investigations as to the cost of generation and transmission of energy as affected by power factor. A small lag is given to one element of the meter so that it registers approximately k.v.a.-hours.

#### DISCUSSION IN LONDON.

Mr. W. M. MORDEY opened the discussion by pleading for more practical attention being given to the subject of condensers for power-factor improvement. He estimated that of the advancers described, the Author's machine cost about 10s. per k.v.a., and in 1905 he calculated that the cost of Mansbridge paper condensers would be about £1 per k.v.a., but this ought to be much lower now. The tests so far carried out indicated that the advancer caused a large increase in the slip of the motor, which would be very objectionable in some cases; but he expected great developments in some directions, especially in railway work, where by this means smaller and lighter motors could be used. The condenser improved the system, and not the motors.

Mr. A. W. ASHTON, to indicate the progress made in the use of condensers for power-factor correction since the reading of Mr. Mordey's Paper, then gave a list of some of the places where they had been installed. This list included one of 4 mfd. capacity at 7,000 volts for the Midland Electric Power Corporation. No one firm had fitted dynamic phase-advancing apparatus to such an extent he contended, and no single case of breakdown had come to the manufacturer's ears. He could not agree with the Author's figures as to the saving effected by

a consumer using phase advancers and being given a discount of 5 per cent. The 2 per cent. loss thereby occasioned exactly wiped off the advantage of the 5 per cent. discount. A further 5 per cent. was also necessary to allow him to write off the capital. The efficiency of condensers might be taken as 99.5 per cent.

Mr. H. W. BOSWORTH (Lancashire Dynamo and Motor Co., Ltd.) disagreed with the Author's results given in the Paper that the proportionate increase in the amount of dynamic machinery required if rotary condensers are used, compared with extra generating plant, is about 30 per cent. He estimated that when the effect of power factor is taken into account that the increase is only about 5 per cent. Rotary condensers also had the advantage that they could be run at a very high speed. He pointed out that in actual practice the Lancashire Dynamo and Motor Company's self-starting synchronous motor had two resistances. After the first is cut out the exciter is put on through a resistance of its own. All the operations are done by turning one wheel.

Mr. F. CREEDY pointed out that with the Miles Walker advancer the motor slip can be brought to zero if desired by brush shifting. He asked why shunt advancers have not been developed, as these could improve the power factor at no load.

Mr. J. T. IRWIN (City and Guilds Engineering College) suggested that a bigger phase displacement could be obtained with the Kapp Vibrator by affixing one end of a long lever attached to the armature to the mid-point of a spring, preferably an air buffer.

Professor KAPP, in reply, said that his vibrator had not been tested with a motor specially built for it, but there would be no difficulty in reducing the increase in slip due to its use to a very small amount if the two machines were correctly proportioned. He laid great importance on the fact that with dynamic advancers a smaller motor can be used at a higher efficiency. Shunt advancers had been made, but he had not dealt with them. With Mr. Irwin's arrangement a larger phase displacement for one particular load could be obtained, but the vibrator could not then work so well at other loads. He was very pleased with it as it stood, and did not want to complicate it.

#### DISCUSSION AT BIRMINGHAM.

Mr. R. A. CHATTOCK (City Electrical Engineer and Manager, Birmingham) said that there would be no very substantial saving effected on the mains of his system by the use of phase advancers, because the greater proportion of the mains was between the sub-stations and the generating station, and there was practically no lagging current owing to the use of rotaries in the sub-station, which can take a leading current if required. He did not like the idea of a special discriminating meter such as that devised by Professor Arno, as he thought it would not be understood by consumers, and be mistrusted by them.

Mr. A. R. EVEREST (B.T.-H. Co.) remarked that self-starting synchronous motors had been known in America since 1894, and had been extensively used in that country for a long while.

Dr. M. L. KAHN (G.E. Co., Witton Works) said that the frequent inquiries which his firm now receive for self-starting synchronous motors prove the demand for these machines.

Mr. R. O. ORSETTICH (Chief Engineer, G.E. Co., Witton Works) saw a great future for phase advancers, especially in mines, where it is difficult and costly to add to the cable system when increases in the power demand have to be met. There is no difficulty in using self-starting synchronous motors if four times full-load current is not objected to; he thought the reason why these machines were more used in America was because the power stations were of such large capacity that the supply companies did not object to the big current rush which arises on starting up large machines of this type.

Mr. SHUTTLEWORTH (B.T.-H. Co.) stated that a power company in the North had already ordered three phase advancers. To increase the power factor from 0.8 to unity would, he said, increase the rotor current by 13 per cent.

Dr. W. E. SUMPNER (Municipal Technical School, Birmingham) regretted that Dr. Kapp had not given fuller particulars of his phase advancer.

Mr. A. M. TAYLOR (Electricity Supply Department, Birmingham Corporation) calculated that the utmost rebate a supply company could offer would be 1 1/2 to 2 1/2 per cent., instead of 5 per cent. as stated by the Author, the reason for this being that supply engineers had in most cases already discounted for the power factor of their generators, and there was not the margin on the steam side amounting to an extra 25 per cent. which the Author's premises would involve. In the case of a general D.C. supply from sub-stations, the electrical side represented only some 10 per cent. of the capital outlay on the system. The Supply Company would therefore have to face some 90 per cent. of that spent per kw. on its existing consumers, together with additional fixed charges. The additional 4 per cent. loss on the consumer's motor had to be paid for from somewhere. He thought that 50 per cent. of the fixed charges could be saved by the use of a phase advancer, and suggested the use of synchronous motors and batteries in sub-stations.

Dr. KAPP replied briefly, and gave a demonstration in his laboratory of the working of his phase advancer and of the Scherbius advancer.

## ELECTRICAL ENGINEERING IN THE MINING AND METAL INDUSTRIES

### SUGGESTION TO USE THE THURY SYSTEM IN MINES

A PAPER by Mr. S. F. Walker on the application of the Thury high-tension continuous current series system to mining work was discussed at a meeting of the Western Local Section of the Institution of Electrical Engineers on April 14th.

The author, in giving an outline of the Thury system, explained that the high tension used was quite incidental, and the chief feature was that the circuit was always closed, irrespective of whether work was being done on the system or not. There was, he said, no such thing as a short circuit to contend with, nor could there be overloading of motors with consequent burn-outs. To start a motor it was only necessary to open a double-pole switch and to rock the brushes of the motor until it took up the work it was required to perform. To shut the motor down, the brushes were simply rocked back to the neutral point and short circuited. He assured the members present that commutation troubles had been satisfactorily overcome. For such duty as winding engines, pumps, fans, &c., a Thury motor was in every way a success, and he did not see any reason why the system should not be taken down the pit shaft and used underground. He proposed the adoption of motor generators at the pit bottom, and distributing on the same system to groups of as many as four coal-cutters at the "face," limiting the pressure of distribution to, say, 200 volts or even less. He thought that the added expense of the plant would be well compensated for by freedom from danger of shock. One of the chief characteristics of the Thury system was that everything was insulated. Not alone is it necessary to insulate each motor from earth, but each motor must be insulated from the plant which it is intended to run. He did not think, however, that there would be any difficulty in carrying this out satisfactorily. To insulate the plant underground, he suggested building an invert and arch, and filling the floor in with asphalt, setting the plant on concrete foundations resting on glass insulators, and filling in around the concrete foundations with bitumen. It was interesting to note that the efficiency of a Thury motor only varied 5 per cent. from one-fifth to full load, the full load efficiency being as high as 95 per cent. on reasonably large motors. He recommended that each group of mines should have its own local Thury distribution system, the generator being driven by a motor fed from the main Thury transmission line. It was quite possible, however, to take the one system through all the motors of one mine, and proceed to the next, and so on till you returned to the generating station. The simplicity of the generating station would appeal to engineers. No switchboard was required, each set only requiring its own switch pillar. He would suggest running the generators in tandem by means of turbines, and placing the switch pillar by the side of the generator on the engine-room floor. In comparing the losses on three phase and the Thury system for a typical 500 kw. installation, the author made out that for three phase the losses per day would amount to approximately 320 kw.-hours against 168 kw.-hours for the constant current. With a 3,000 kw. typical installation the losses on three phase would be approximately 1,473 kw.-hours against 648 kw.-hours for constant current.

Mr. R. RUTHERFORD (General Manager, Rhymney Iron Co.) suggested that the Thury system might lead to cheaper rates from power-supply authorities. On account of the  $C^2R$  losses, however, the system was one essentially for good load factors.

Mr. F. S. CARTER (Chief Engineer, Baldwins, Ltd., Port Talbot) suggested that among the points which would render the system unsatisfactory, there would be great difficulty in maintaining good insulation underground. For haulages of 1,000 h.p. or more, insuperable difficulties would be presented by having to insulate the machines on shifting ground. The necessary insulation of couplings for large motors would also present difficulty. There would also probably be difficulty in dealing with commutation on the high-speed turbo-generators to which present-day practice tended. The system, however, appeared to be a good one for winding and fans.

Mr. C. G. MORLEY NEW (Assistant Engineer, Cardiff Tramways) said that cable losses would swamp any advantage the

system might have. He also drew attention to the idle current losses and the difficulty in couplings breaking.

Mr. A. NICHOLS-MOORE (Newport Corporation Tramways) thought in comparing the losses on three-phase and constant-current the Author was hardly fair to three-phase in basing his figures for three-phase on practice of 1903. He found no difficulty in obtaining transformers of 100 kw. capacity with an efficiency of 98.7 per cent. He also considered high-voltage commutators on high-speed machinery were a very bad feature, and if the author had compared costs rather than losses the Paper would have been far more valuable.

Mr. J. LAING WILSON (Callender's Cable and Construction Co.) thought there was much to be said in favour of the system for transmission, but he considered three-phase was much the better for distribution to consumers. With the Thury system a break in the cable would mean the stoppage of all motors. There was also the question of the full  $C^2R$  losses to be considered.

Mr. J. W. MORCAN considered that great difficulty would be experienced in keeping plant in line, as it was absolutely necessary to pack up foundations in some collieries at least once a month. There was also the question of breakage of cables due to "falls." One of the great advantages three-phase had over the Thury system was that lighting was always easily available instead of its being necessary to have innumerable motor generators scattered over the mine.

Mr. W. A. CHAMEN (General Manager of the Treforest Electrical Consumers, Ltd.) was under the impression that there was a future for the Thury system, and though he understood the inventor put his system forward for transmission only, there was no reason why in certain cases it should not be a success applied to mine distribution.

Mr. S. F. WALKER said that he would propose introducing a number of short-circuiting devices so as to cut out any faulty circuit. There was every probability of a cable earthing if a severe fall occurred. The earthing of the main, however, would not interfere with the supply. In dealing with the trouble of shifting ground, it was only a question of building the containing room strong enough. There was no question, however, that good insulation was the great point, and this could be provided for better than a good earth at the "face." It was also only a question of money to keep the voltage low enough on coal-cutters. He admitted that at present lamps were not designed for currents in the region of those employed at present on the Thury system; he thought some time such lamps would be made. In the meantime, one had the alternative of introducing motor generators.

**Wireless Telephony in Mines.**—According to the *Colliery Guardian*, experiments are being conducted at Dinnington Main Colliery, Yorkshire, on a system of underground wireless telephony of German origin, by which it is claimed that conversation can be carried on through 1,500 yards of solid rock.

**The Strength of Metal Filament Lamps.**—The General Electric Co. have sent us some further testimony of the ability of the Osram Drawn-Wire Lamp to withstand shocks and jars. About three months ago they supplied to the Niddrie & Benhar Coal Co., Ltd., Portobello, a number of 100-volt 16 candle-power traction type Osram lamps, to be installed at the pit-heads and picking tables, where vibration is extremely severe, but the following unsolicited report shows that the lamps are quite adaptable for this kind of work:—"The Osram Lamps in use under these severe conditions prove most satisfactory, and show a much smaller percentage of breakages than the lamps of other makes fitted in the offices where there is very little vibration. It may also be interesting to note that no shock absorbers are in use."

**Reducing Costs by Electrical Working in Mines.**—At a recent meeting of the Birmingham Branch of the Institution of Mining Engineers Mr. S. F. Sopwith, in describing the electric power plant at the Cannock Chase Colliery, said that electricity had been adopted to reduce consumption of coal at the colliery, and to provide a means of transmitting power underground for haulage and other purposes. The capital cost of the installation had been £21,259, and by the adoption of the scheme the colliery consumption had been reduced by at least 1½ per cent., or 6.875 tons. About 25 horses had been dispensed with underground, and a great reduction in labour had resulted from the substitution of mechanical for horse haulage. He computed that the total saving represented about 18½ per cent. interest on the capital outlay.

## ELECTRICITY IN THE TIN-PLATE INDUSTRY

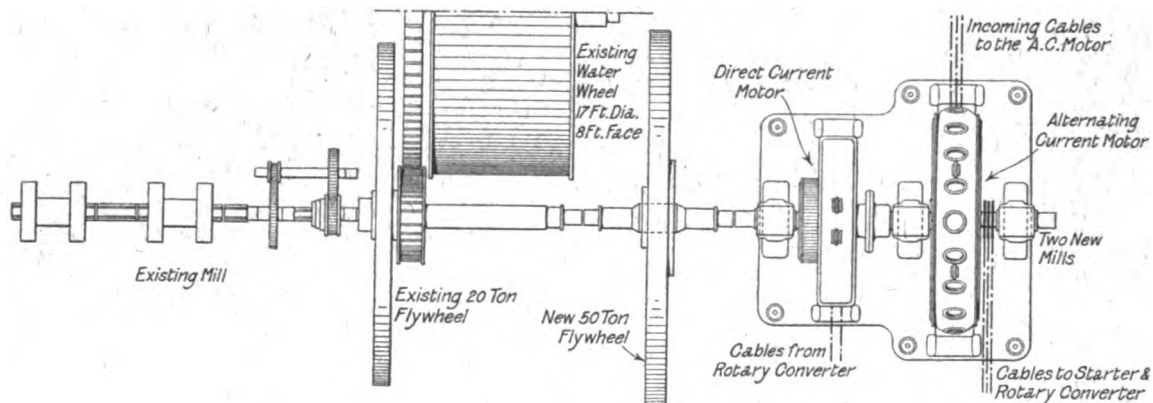
IN the course of a Paper on recent developments in the tin-plate trade by Mr. H. Spence Thomas published in the Proceedings of the South Wales Institute of Engineers, the author referred to electrical driving of tin-plate mills, and said that the credit of being the first to adventure and succeed in this direction was due to the Redbrook Tinplate Co., Ltd., and Mr. A. Taylor, their Managing Director.

At their Tynwydd Works, he continued, a 100-h.p. Siemens motor was installed under the direction of Mr. Graham M. Stevenson, to drive one mill by ropes. The power is three-phase 25 cycles alternating current, 2,200 volts, supplied by the South Wales Power Co. Lately at Swansea there has been laid down a fine electric installation having twelve mills driven by three motors. The whole of the current for the works is generated by steam on the spot, and it is said to be a part of a huge scheme of blast furnaces and steelworks. Messrs. Siemens are largely responsible for this plant also. Melingriffith works introduced last summer an electric motor as a standby in case of failure of the water supply to the 300 h.p. horizontal water turbine driving the three 28-inch by 24-inch diameter mills through a 120-ton 36-foot diameter flywheel. Another standby drive of one mill from a motor through a 16-inch wide belt on to the 40-ton flywheel is interesting, though not economical in itself. The current is obtained from the South Wales Power Company in both

said that there is an invention out with a view to coating one side only of the sheet of steel, and this by an electrical process, but time will decide as to whether it is of any commercial value. A beginning has been made in the Swansea district to coat black-plates with the metal aluminium (it is said by a cold wet electric process), and it is early yet to state whether they will grow into general use.

**Electrometallurgy in Norway.**—According to the *Board of Trade Journal*, the Hardanger Iron & Steel Works Co. have decided to discontinue the electric smelting of iron of which they were the pioneers in Norway, on account of the cost of the system. Their works near Odda are to be let to a French company for the manufacture of a fertiliser, presumably cyanamide. Another Norwegian electrometallurgical concern, the Bandak electrical copper works, is to be shut down, but this is due to scarcity of ore, though the Hybinette process, which they work is said to be successful. There is a scheme for re-erecting this copper works on the Christiania Fjord. It is also reported that a company has been formed with a capital of £19,400 for the electrolytic manufacture of metallic sodium.

**Branch Meetings of the Association of Mining Electrical Engineers.**—At a meeting at Chesterfield of the Notts and Derby Branch of the Association on April 17th it was decided to hold one meeting a quarter at Chesterfield, one during the session at Mansfield, and the other monthly meetings at Nottingham. A Paper by Mr. C. Jones on cable jointing and junction boxes



GENERAL ARRANGEMENT OF ELECTRIC DRIVE FOR TIN-PLATE ROLLS, TREFOREST.

cases. There is a works in the Llanelly area driven entirely by electricity supplied by the local power company. In all the foregoing cases the motors run considerably faster than the mill shaft. At Treforest works an electric motor of a slow-running type, about 35 revolutions per minute, is being attached to the mill shaft direct, and in this case, with gearing and friction reduced to a minimum, some very low costs for power should be obtained. This design on the electrical side is based on the same principle as embodied so successfully in bar mills of various kinds; the Skinninggrove bar-rolling mill being the last plant on these lines in England to get to work. Messrs. Siemens are again responsible for the electrical work, whilst Mr. J. W. Morgan is the consulting engineer, and with such a good load factor available, the South Wales Power Co.'s charge per unit will probably be low.

We reproduce here from the Paper a sketch of the general lay out of the plant. It will be noticed that the mill was formerly driven by a water-wheel, and that the driving system involves a main induction motor, the current from the slip-rings of which is led to a rotary converter, which supplies an auxiliary D.C. motor on the main shaft, thus enabling the set to utilise the energy which would otherwise be wasted in resistances in the motor circuit when running at speeds lower than the maximum. This system is known as the Krämer system, and an example was described in *ELECTRICAL ENGINEERING*, June 13th, 1912, page 321.

Other applications of electric power briefly mentioned in the Paper are the working of shears which are sometimes driven in groups from a line shaft by a single motor, or, especially in America, by separate motors, and electric cranes. The author does not hold out any great hope of the ultimate adoption of electrical tinning processes, and remarks that apparently there is something in the nature of the metal tin, in its relation to iron and steel which prevents the formation of an alloy, and the proper union of the two metals, so far as experiments up to date have gone.

Steel plates, he continues, have been coated with tin by means of electricity, but only in an experimental stage. It is

was discussed. At a meeting on April 18th at Glasgow of the West of Scotland Branch, Mr. M. Brown was elected President of the Branch, and Papers by Mr. J. McCann on electric coal cutters, and Mr. E. K. Scott on shaft cables, were discussed.

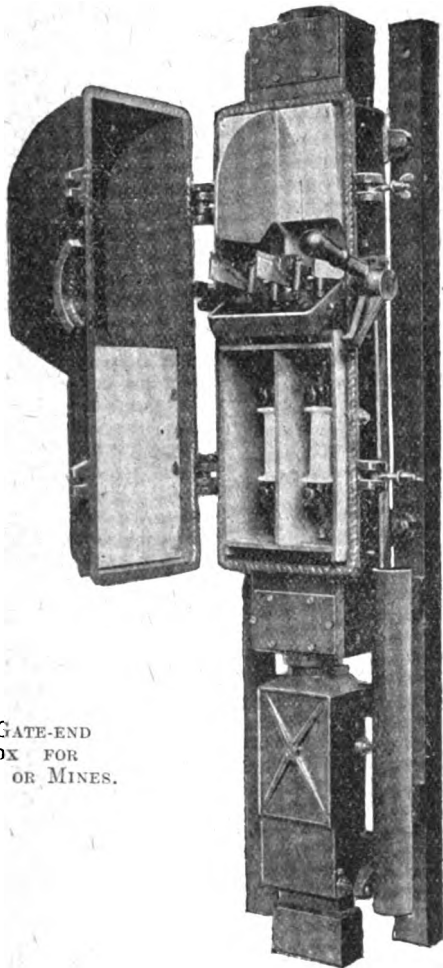
**Shaft Lighting during Sinking.**—At the inquiry into the remarkable fatal accident at Rufford Pit, Mansfield, resulting from the over-winding of a water barrel during sinking operations, caused by a temporary shelter over the engineman falling on him and preventing his stopping the engine, Sir A. Markham referred to the danger in such a case of lighting the shaft from a cable in the ordinary way, as in case of such accidents the cable was apt to be carried away. In his own collieries he had substituted large electric safety lamps hung in such a way that in case one or two were carried away, the place would still be illuminated.

**Electric Signalling and Power Plant for Collieries.**—At a joint meeting of the North Staffordshire branch of the National Association of Colliery Managers and the North Staffordshire branch of the Association of Mining Electrical Engineers, at Stoke-on-Trent, on April 12th, a Paper by Mr. W. A. Heyes was read, entitled "Notes on Signals, Bells, and Batteries." The author deplored the lack of attention usually paid to electrical signalling systems at collieries. He spoke of the excellence of the Leclanché battery when properly looked after, but said that dry cells were coming into use to an increasing extent. He had worked out that current from signalling batteries cost about 25s. per unit, or about 600 times as much as current for power purposes. In the discussion Mr. H. Lee referred to a case where a small motor-generator was used with success instead of batteries, and another speaker said that the condition of the signalling gear at most collieries was not as bad as had been made out. A Paper on colliery generating plant was afterwards read by Mr. W. Bolton Shaw, who dealt principally with gas-driven plant. Whether gas or steam plant was to be used was an economic rather than an engineering question, and whether coke-oven or blast-furnace gas was best employed in gas engines or gas-fired boilers depended largely on the quality of the gas. Sometimes it paid better to extend an existing steam plant by the addition of gas-fired boilers rather than incur the large capital expense of purifying plant. Gas from the bee hive type of oven could only be used for steam raising.



## GATE-END BOX FOR DOCKS AND MINES

PORTABLE apparatus calls for switchgear of a design differing materially from that which serves for stationary applications of electric motors. One of the chief points of difference is that the stationary motor can be earthed at the place where it is situated, whereas with the portable motor the earth conductor must come back to the switch, at which point means must be adopted for affording an effective earth connection. The gate-end box which is shown in the accompanying illustration, for which the General Electric Co., Ltd. (67 Queen Victoria Street, E.C.), are responsible, embodies precautionary measures essential for this class of work. It consists of a standard ironclad-switch and fuses, with the usual device for preventing the switch-cover being opened with the switch at the "on" position. This switch is interlocked with the plug, to which is connected the flexible cable



A GATE-END  
BOX FOR  
DOCKS OR MINES.

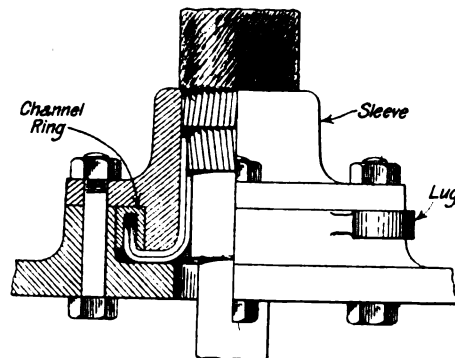
running to the motor. This interlock refuses admission to the plug with the switch closed, and prevents the plug from being withdrawn when the switch is closed. The earthing conductor is brought back from the motor to the plug, and here it is connected to special terminals which make contact with others in the plug socket. These contacts are so arranged that the first thing done on the insertion of the plug is the completion of the earth circuit, and the last thing on its withdrawal is the breaking of the earth circuit. The result is that the motor can never be under pressure with the earth connection unmade. The lower part of the interlocking bar is protected from damage by an iron tube. The interiors of the switch and fuse cases are well protected against arcs, and adequate clearances are given between the fuses and case, and between the switch blades and case. It will be remembered that the Home Office has recently called attention to the fact that many switches are defective in this respect.

**Electrical Equipment of New Pits in Scotland.**—It is reported that two new pits which are being put down on the Craig estate, Dreghorn, Ayrshire, will be provided with very complete electric equipment, including electric winding plant.

## ELECTRICAL MINING AND METALLURGICAL PATENTS OF APRIL

## Mining.

THE Patent Specifications published during April of particular interest to mining electrical engineers include No. 13,171/12, by A. Hepburn, describing a connector for the ends of the armoring of cables, in which is provided a ring of channel-section and one or more radial lugs. The armoring of the cable is stripped off the end of the cable and bent outwards, so as to enter the channel in the connector, the joint being then brazed or soldered. A metallic cap is also provided, and is secured to the base by bolts. The base may be cast in one with the joint-box if desired. This connector may be attached to the cable at the cable-makers' works. The construction is clearly shown in the figure.



CABLE ARMOURING CONNECTOR.

Specification No. 27,281/11, by A. Philip and L. J. Steele, covers the construction of a draught-proof catalytic detector, in which the catalyst, in the form of a wire, is mounted in a large chamber having protected inlets on the same side of the casing, so that the gas supply is by natural draught only. The detector is joined to an indicator (portable galvanometer) arranged for connection with an ordinary miner's lamp. Specification No. 3,002/13, by the same inventors, covers the arrangement of the catalysts in the form of a Wheatstone bridge, two wires being active and two not. A galvanometer is connected across in the usual way, and with pure air gives no deflection when the arms are balanced. The catalysts may be made by squirting special alloys or they may be of platinum and palladium. Voltage and temperate corrections are applied.

An improved construction of blasting detonators, in which a metal tube, having in one end an insulated plug tightened by compressing the tube, and having one wire passing through the plug and one connected to the tube, is described in specification No. 16,963/12, by J. Sou (France). One of the poles of the circuit is made by widening the end of the conductor situated in the axis of the plug, a metal disc (e.g., Dutch gold) in contact with the tube being embedded in the charge. Alternatively, a platinum-iridium wire on top of the charge at the base of the plug is connected between the two poles and ignites the charge by incandescing. In the former method ignition is caused by the spark between the two poles.

## Metallurgical.

The specifications relating more particularly to the metallurgical industry included No. 9,203/12, by L. Ubbelohde (Germany), for a resistance furnace, in which a wire resistor (an iron-nickel alloy is suggested) is wound on a non-conducting tube and surrounded by a porous insulator, which is in turn surrounded by a layer of carbon to protect the resistor from oxidation by the reducing action of the carbon. The insulator may be made of alumina 63 per cent., burnt clay 27 per cent., and finely picked asbestos 10 per cent., together with  $\frac{1}{2}$  to  $1\frac{1}{2}$  per cent. of water glass by weight. It is made plastic by a solution of soda. Specification No. 14,164/12, by A. Helfenstein (Austria), covers an induction furnace. The casing is connected up as a conductor in the secondary circuit, so that it forms with the heated conductor a loop as free as possible from self-induction.

G. Tischenko (Russia), in specification No. 5,855/12, describes an apparatus for refining scrap-iron by electrolysis,

in which both anode, which may be lead-lined, and cathode consist of vertical concentric cylinders so arranged that either can be separately raised. The anode may be in the middle or surrounded by a double-walled cathode open at the top, having the lower wall perforated.

### THE HOME OFFICE REGULATIONS

THE text of objections which have been made to the draft general regulations issued by the Home Office under the Coal Mines Act, 1911 (ELECTRICAL ENGINEERING in the Mining and Metallurgical Industries, February 6th, p. 74), has now been published. The rules affecting the use of electricity in mines contained in Part III. embody the existing special rules, so that only drafting changes are necessary. However, the Miners' Federation of Great Britain asks that Rule 117 shall make it obligatory to post in the top of the pit a sketch plan of the main roads, the escape roads, and the telephone station.

The National Association of Colliery Managers asks that paragraph 68 in Part II. should be amended to read as follows:—"Use of Electric Lamps other than Locked Safety Lamps.—In any mine or part of a mine where safety lamps are required to be used, electric lamps, if enclosed in air-tight fittings and having the lamp globes hermetically sealed, may, subject to the provisions of the Act, and any regulations made thereunder as to the use of electricity in mines, be used within the following limits:—(a) On main intake airways and mechanical haulage road ventilated by intake air. (b) On mechanical haulage roads in main return airways, so long as the percentage of inflammable gas in the general body of the air in that place does not exceed 1½." This is less restricted than the original paragraph, which also did not include electric lamps.

With regard to telephones, the regulations, paragraph 91, state that "if in any mine, not being a small mine, the distance, as measured by the shortest route along the roadways, of any part of the workings from the nearest shaft or outlet by which persons enter or leave the mine exceeds 1,000 yards, efficient means of telephonic communication shall be provided and maintained between the point at which the tubs coming out-by from that part of the workings are finally made up into sets or trains, or are attached to the rope of an endless rope system, and the shaft or outlet and the surface of the mine." The Mining Association of Great Britain suggests an amendment by which the distance would be increased from 1,000 yards to 1,500 yards, and would be measured simply from the main haulage to the shaft. The Miners' Federation would make the rule as it stands apply to all mines, and the Northumberland Colliery Enginemens' and Firemen's Association would reduce the distance to 500 yards. The Bristol owners ask that, as owing to the faulty and complicated nature of the strata there are in most of the collieries no general systems of haulage with general stations where the tubs are finally made up into sets or trains, the collieries on the Bristol coalfield shall, like the mines of statified iron-stone in the Cleveland district, be exempt. In Part IV., dealing with rescue and ambulance, the Miners' Federation asks that it shall be compulsory, paragraph 139 (b), for tracings to be kept at every mine showing the positions of the telephones, as well as the other items specified.

Objection is also taken by several bodies to the early date, April 1st, at which these rules should come into force.

**Electric Miners' Lamps.**—The Home Office has given notice of an order, made on April 18th, approving the Sussman Lamps Nos. 3 and 4 for use in all mines to which the Coal Mines Act applies, subject to certain conditions.

**Electrical Accidents in Mines.**—Three men lost their lives on April 8th at the Blaenavon Company's pit (Monmouthshire) through suffocation by smoke due to timbers having been set on fire and causing a fall of roof. It is alleged that the fire was due to short-circuiting of a cable supplying a haulage motor.

At the new London pit of the Digby Colliery Company a young man named A. Naylor died from an electric shock from a 450-volt circuit. It appears that the deceased stumbled over a rail when going to a switchbox to switch off the current from a conveyor motor, and fell on to the wires leading to the box, pulling a live lead out and weakening the earth wire. On examination some of the screws fastening the terminals were found to be missing, although several witnesses saw them in place a day or two before. The apparatus was being altered to meet the recommendations of the Inspector of Mines.

## FOR BRITISH MANUFACTURED PAPER INSULATED CABLES

THE  
**UNION  
CABLE  
CO., LD**

DAGENHAM DOCK,  
ESSEX.

## PATENT LOUD SPEAKING TELEPHONES

COMPLETE INSTALLATIONS FOR

**WARSHIPS, MERCANTILE VESSELS,  
MINES, POWER STATIONS, ETC.**

Adopted by the British Admiralty, Foreign Governments, the Leading Shipping Companies, and as used in many Electrical Generating Stations.

**ALFRED GRAHAM & CO.,**  
ELECTRICAL ENGINEERS AND CONTRACTORS,  
ST. ANDREW'S WORKS, CROFTON PARK, LONDON.

## ELECTRICIANS!



Have you seen

**Moseley's** latest  
production in  
**Rubber Gloves?**

**THEY ARE ABSOLUTELY THE BEST.**

You cannot afford to run risks, and should use the best glove that can be made.

Write for particulars. Samples sent on approval.

**DAVID MOSELEY & SONS, Ltd.,**  
ARDWICK, MANCHESTER.

# QUESTIONS AND ANSWERS BY PRACTICAL MEN

## RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelopes.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,336.

"MAN," who propounded this problem (published in our last issue), gave the distance between centres of the desks as 3 ft. 9 in. instead of 9 ft. 3 in. The time for sending answers is therefore extended to Monday, May 5th. Readers who have already sent in replies may send amended answers.

### QUESTION No. 1,337.

Coal Mines Act Electrical Rules:—Rule 14, C (1), requires "the thorough examination of all apparatus (including the testing of earth conductors and metallic coverings for continuity) as often as may be necessary to prevent danger; and (2) the examination and testing of all new apparatus, and of all apparatus re-erected in a new position in the mine before it is put into service in the new position." Under ordinary circumstances how often will it be advisable to test earth conductors and metallic coverings, and what other "examination and testing" is necessary on the following plant? How may we prove that we have continuity and suitable carrying capacity of all armour and earth conductors? We have two 2,000-kw. generators, 3,000 volts, 40 cycles, three phase; current is transmitted at this pressure to three seams at different depths. In these seams we have haulages working direct at 3,000 volts; also in each seam we have transformers stepping down to 440 volts for pump motors and small haulage, and small lighting transformers 440 to 110 volts. The cable from the H.T. switch-board in the power-house to each seam is three-core, paper-insulated, lead-sheathed, and double-wire-armoured; it is fixed to sides of shafts by wooden cleats, and the shaft is comparatively wet. We use the lead sheath and armour as our main earth connection to surface earth plate. The shaft cable is led to a distribution board in each seam, from which all cables in use are also double-wire armoured, and the armour in every case is used as main earth wire between each motor, &c., and main cable armour to surface. I may mention here that in some places the cables are buried in the ground. We have two C.I. earth plates at the surface, and one in the sump at each seam. We transmit about 600 kw. into each seam. The depths of the seams below surface are 400 yards, 500 yards, and 680 yards. At each motor we connect up the switch, controller, motor frame, &c., to a common copper earth wire, and this to armouring of cable by means of W.I. clamps, as, of course, we cannot solder terminals on here underground.

"ASSISTANT ELECTRICIAN."

(Replies must be received not later than first post, May 8th.)

### ANSWERS TO No. 1,335.

It is proposed to make a purchase of six booster rotary converters and transformers operating from A.C. to D.C. Describe the necessary tests, stating points which should be watched.—"Met."

The first award (10s.) is made to "Rota" for the following reply:—

The necessary tests from the point of view of the purchaser are to determine (1) the heating, (2) efficiency, (3) operation, (4) regulation, (5) starting. There are several possible methods of taking the heat run. If the load on the station where they are installed is fairly steady, it may be possible to hold the load constant at the rated figure on one or two of the machines

until the final steady temperature is reached, testing the different machines in turn. Owing to the almost unavoidable fluctuations in the load, this method is seldom satisfactory. The machines can be loaded on to a temporary water rheostat, but the power absorbed is, of course, wasted, and would amount to a heavy item for a heat run on six large rotaries. The best method is to run the machines in pairs "Hopkinson," testing each rotary with its own transformer. Each pair of transformers is then connected in parallel on the high-tension side, and connected to the supply through a wattmeter, and the rotaries are connected in parallel on the D.C. side through an ammeter and circuit-breaker. The booster fields should be excited (if necessary) to give the required D.C. voltage, usually the maximum volts of the guaranteed range. The machines are then run up from the A.C. side, and before closing the D.C. switch a voltmeter is connected across the switch and the circuit-breaker in the other line. If the voltmeter reads approximately twice the true D.C. volts, one of the rotaries must be made to "slip a pole" by momentarily disconnecting it from the supply. This will reverse its polarity, and the booster fields can then be adjusted so that the opposing voltages are equal. When the voltmeter across the switch reads zero, the switch is closed, and by reducing the booster field on one machine and increasing it on the other the D.C. voltages can be made to differ sufficiently to send full-load current through the machines and transformers (measured on the D.C. ammeter), while the D.C. voltage is at the required figure. Temperatures should be taken by thermometers fixed to two of the main poles, two of the commutating poles, and two of the booster poles of each machine, also to one or two points on the windings and core of each transformer, and one thermometer should be suspended to show the temperature of the oil at the top of each transformer. (It is assumed that "Met" is familiar with the method of fixing the thermometers usually adopted.) When the temperature ceases to rise, the machines should be shut down and the temperature of the rotary and booster armature windings and core, and of the commutator and sliprings, can be measured. It is usual to allow a temperature rise as measured by thermometer of about 40° C. above an air temperature of 25° C. A steady temperature will be reached in from four to eight hours, depending on the size of the machines. During the heat run the reading of the A.C. wattmeter will give the power input which represents the losses in the two sets. Readings are also required of the D.C. amperes  $I$  and terminal volts  $V$ . Then, if  $W$ =power measured by A.C. wattmeter, the efficiency of each machine is given by

$$E = 2AV \div (2AV + W).$$

As a check on this figure, the light running losses and hot resistances may be measured in the usual way, and the sum of these for the two machines, plus the brush C'R losses on the commutator and sliprings, should check closely with the wattmeter reading. The armature C'R calculated as for a D.C. generator requires to be multiplied by a factor depending on the number of sliprings, the power factor of the A.C. input, and the voltage ratio. This factor has the following values at unity power factor: two-phase machine (four sliprings), 0.38; three-phase machine (three sliprings), 0.57; six-phase machine (six sliprings), 0.27. These figures assume that the A.C. to D.C. voltage ratio is normal. (The calculation of the factor for power factors lower than unity and for various amounts of excitation of the booster field is too long to be described here.) The armature resistance is conveniently obtained by measuring the resistance between any two sliprings which are connected to points on the armature one pole pitch apart. With regard to operation, this should be sparkless from no load to, say, 25 per cent. overload, and without serious sparking up to the maximum overload specified, both at the minimum and the maximum D.C. voltages. This can be observed during the Hopkinson run, remembering that the machine which is being tested for operation must run A.C. to D.C. The machine with the weaker booster field when running Hopkinson will be running D.C. to A.C., and the operation will probably not be so good as if running under normal conditions—in fact, it is probable that it will be necessary to rack the brushes slightly from the true neutral to give good operation on the inverted machine. The actual best position can, of course, be determined on test. Regulation and compounding readings can also be taken with the machines coupled Hopkinson, of course, on the machine running A.C. to D.C., the load being varied by the booster of the other machine. Since the rotaries are to run A.C. to D.C. it is probable that they are required to start from the A.C. side. They may be started for the Hopkinson run by the method which will be employed in service (taps on the transformer, or a starting motor), and if a maximum starting current has been specified, an ammeter in the A.C. circuit will show whether the machines comply with the guarantee. If starting by means of transformer taps, the field splitting switch (if

provided) must be opened while running up, and may be employed to "slip a pole" if it is necessary to reverse the voltage on one rotary as described above. If starting by means of an induction motor, the synchroniser connections should be checked by means of a voltmeter across the terminals of the paralleling switch before paralleling for the first time. These and other points, such as connection diagrams, &c., should, however, be fully covered by the instruction book supplied by the makers. It is, of course, necessary that the A.C. voltage and periodicity should be held constant at the rated figures throughout the tests. The starting test in particular is greatly affected by any drop in the supply voltage, due to the sudden load. Also all the tests should be taken with the machines running at unity power factor, unless otherwise specified in the guarantees. A simple method of determining this is to watch the ammeter in the A.C. circuit while adjusting the rotary main shunt field. Unity power factor gives the minimum ammeter reading for a given load.

The second award (5s.) is made to "A. M.," who suggests practically the same tests, and mentions that there are two sets of tests which the machines have to pass. These are: (1) tests at the maker's works, and (2) tests under service conditions on site, the latter consisting of a day's run at full load, maintained by hand regulation, in parallel with others, while the former are similar to those given by "Rota," except that a 24 hours' full-load run is proposed so as to make sure that the transformers, if oil cooled, have attained a steady temperature. It is, however, suggested that the core loss should be determined, and regulation and compounding tests made, while the only high pressure insulation test advocated is to subject the machines to twice working pressure for five or ten minutes.

### EXTENSIONS AT BLACKPOOL ELECTRICITY WORKS

THE ceremony of formally starting up the two new turbo-generators in the Blackpool Electricity Works took place on April 23rd. On that and the following day there was also an exhibition of heating, cooking, and lighting apparatus and other domestic appliances, while cooking demonstrations were given by Ferranti, Ltd., and the British Electric Transformer Company.

The new sets installed consist of a 1,500-kw. turbo-alternator for lighting, erected by the British Thomson-Houston Company (Rugby), and an 800-kw. mixed pressure turbo-generator for traction erected by the Brush Electrical Engineering Company (Loughborough). Exhaust steam from the existing Ferranti and Browett-Lindley engines is used in this case. The ventilating air for each machine passes through a special air filter, supplied by Balcke & Company (Broadway, Westminster, S.W.) capable of dealing with 9,000 cubic feet of air per minute. A barometric condenser by the Klein Engineering Company has been fixed, and can maintain a  $27\frac{1}{2}$ -in. vacuum, while the Rees-Roturbo electrically-driven circulating pump can deal with 200,000 gallons of water per hour. The total plant capacity is now lighting, 4,300 kw., and traction, 2,250 kw.

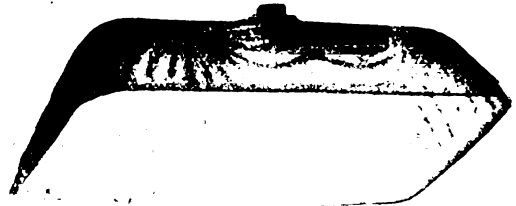
### THE "POINT FIVES"

A MEETING of the "Point Fives" (which, as most of our readers know, is a club composed of engineers to undertakings where electric current for heating and cooking is supplied at the rate of one halfpenny per unit) was held on April 18th at Bradford, where the Chairman, Mr. T. Roles, welcomed the members. Mr. W. G. Pickvance (Wrexham), Mr. H. Gray (Accrington), and Mr. S. E. Fedden (Sheffield) were elected members. Mr. F. W. Purse, although he could not be formally elected until he took up his duties at Carlisle, was invited to attend the next meeting, and Mr. Allen, who ceases to be a member on leaving Carlisle, was elected an honorary member for twelve months to give him time to introduce a 0.5 tariff at Wolverhampton. Mr. Roles gave a long address devoted to the development of the heating and cooking load at Bradford, where the headway was almost solely due to the  $\frac{1}{2}$ d. per unit tariff, which has been in force since July, 1910. Electric heaters were very popular, and a small number of complete cooking outfits were in use. There was, however, no hiring scheme, and many types of apparatus on the market were not quite suited to the local conditions, which involved the baking of bread at home. With the present lines of cheap radiators available, it did not seem necessary to inaugurate a hiring scheme to popularise their use. Of 918 residence consumers 471 had adopted the special domestic tariff of 15 per cent. per annum upon the rateable value plus one halfpenny per

unit. The total capacity of heating and cooking apparatus connected to the mains exceeded 1,000 kw. Some interesting statistical tables accompanied the address. There was a long discussion, and it was decided that a special meeting should be held at the Institution of Electrical Engineers on May 23rd, to consider the standardisation of electric cookers and adopting the rateable value plus  $\frac{1}{2}$ d. per unit tariff as standard. The next ordinary meeting will be on June 17th, during the I.M.E.A. convention, and Mr. Blackman will be in the chair. This will be an open meeting, and all desirous of attending should send in their names to the Hon. Sec., Mr. A. H. Seabrook, 19 York Place, Baker Street, W. With regard to electrical publicity, it was decided that owing to the "moribund" state of the Electrical Supply Publicity Committee, the Association must for the time being make its own arrangements for its members' requirements, and a sketch was approved, to be used for posters and postcards. The members of the Association will have the first call on these. They will also be available to anyone at 28s. per 100 plus 7s. 6d. for over-printing name and address for the posters, and 16s. per 1,000 for the postcards. Applications to be sent to the Hon. Secretary, Mr. A. H. Seabrook. Although no resolution was passed, it was felt strongly that this question of publicity is one which the electrical industry cannot afford to neglect any longer, and a lead was looked for from the Industrial Committee of the Institution of Electrical Engineers as to what must be done in this direction.

### REFLECTORS FOR SHOP WINDOW LIGHTING

A GREAT deal of attention has been paid of late to avoidance of glare in shop-window lighting, and very effective results are obtained by lamps in concealed positions provided with suitable reflectors. The British Thomson-Houston Co. (Mazda House, 77 Upper Thames Street, E.C.) have developed a system employing Mazda lamps in conjunction with specially formed silvered-glass reflectors, of which an example is illustrated here. The lighting units are fixed close up to the ceiling of the window, immediately behind the fascia board, and are arranged in a single evenly spaced row. The arrangement gives a more uniform and diffuse illumination than could be obtained from lamps hung



"X-RAY" REFLECTOR FOR SHOP-WINDOW LIGHTING.

in the field of vision, and produces a good effect. The reflectors are of similar construction to those employed in the Company's well-known "eye-rest" system of indirect lighting. The glass is blown in one piece in steel moulds and then annealed and fire-glazed. The outside of the glass blank is plated with pure silver which is protected by several coats of elastic enamel. This process of manufacture renders the reflectors exceedingly durable. The interior surface is formed into spiral and vertical corrugations, which effectually prevent any striation or streakiness in the illumination. The reflectors for shop-window lighting are supplied in six different shapes, giving the various light distributions required.

**The Institution of Electrical Engineers.**—The following is the result of the balloting for new members and transfers from one class to another at the meeting on Thursday:—*Members:* W. H. Eccles, E. S. Heurtley, A. C. Kelly. *Associate Members:* T. T. Baker, A. de Lima Barros, E. H. Bullmore, W. R. Churchill, R. C. Creasey, G. J. H. Elliott, H. Foster, J. F. Mitchell, J. Strachan, E. Stubbs, W. L. L. J. Thain. *Graduates:* F. N. H. Beamish, G. H. Eardley-Wilmot, E. G. Goulding, W. E. Jamieson, J. M. van Nieuwerkerken. *Students:* P. W. Anderson, E. D. Beggs-Robertson, H. Clausen, F. de Gouvêa Freire, W. A. Kennedy, G. N. Le May, F. A. P. Perrow, R. E. Rushforth, C. W. C. Sadler. *Candidates Transferred—Associate Member to Member:* S. E. Bastow, A. W. Beuttell, J. M. Blair, J. J. R. Overton. *Associate to Associate Member:* A. M. Fyfe, H. H. L. Prendergast, A. J. Wray. *Student to Associate Member:* G. H. D. Ascoli, H. J. G. Davison, A. E. Dent, D. Jackson, E. M. Marvin, A. R. Stelling, A. D. Taberner, J. D. A. Vincent, G. W. Wyles. *Student to Graduate:* H. R. L. Groom, S. N. Jackson, A. Kennard, A. C. Patel.



# ADAMS IGRANIC

ELECTRIC CONTROL GEAR FOR PUMPS.

ADAMS  
MFG CO LTD  
BEDFORD  
AND  
LONDON

## THE IMPERIAL COLLEGE OF SCIENCE AND TECHNOLOGY

ON Tuesday last representatives of the Press were entertained at luncheon by Sir Alfred Keogh, the Rector of the Imperial College of Science and Technology, South Kensington, in the commodious new Students' Union, when the several buildings which are to house the new and enlarged departments were thrown open to inspection, and the experiments and investigations being carried on were explained. For some time reorganisation and consolidation of the various institutions forming the Imperial College have been in progress, so that instead of there being many departments carrying on more or less the same work within a stone's throw of one another, it is possible for the interchange of students to take place so that the best and most practical teaching of all subjects is obtainable for all. In the new building of the Royal School of Mines there is, among other equipment, a complete full-sized plant for the treatment of various ores, including crushers, shaking tables, slimers, &c., all driven by electric motors. Another and perhaps better known department is the Electrical Department of the City and Guilds (Engineering) College, under the direction of Professor T. Mather, where, in addition to the large and well-equipped general laboratories, the "Traction Bay" is now in full working order. It contains a motor-generator, static balancers and transformers, so that direct current from 100 to 600 volts is available, as well as alternating current of different frequencies and pressures for experiments on traction motors. A full-sized bogie tramcar, with rails and conduit, is also available for testing. In this connection there is a dynamometer for determining the draw-bar pull, and each wheel drives a drum, to which is affixed a flywheel in three sections. These can be coupled together by means of electromagnetic clutches, so that the equivalent inertia of a 5, 10, or 15 ton car can be obtained. Another unique equipment consists of a complete installation of McKenzie Holland electric signalling. In this course, as in others including advanced dynamo design, the foremost experts in the several branches are retained to deliver lectures on their special subjects. In addition, one must mention the large and important department of Civil and Mechanical Engineering, under the direction of the Dean of the College, Professor W. E. Dalby, and the department of Geology, which includes oil production. The latter is, we believe, the only one of its kind in the world. Others of the new departments which have immense possibilities are those dealing with the commercial treatment and preservation of timber and the cultivation of rubber.

## DERBY CORPORATION BILL A New Stand-by Clause

THE Derby Corporation Bill, which is now before Section A of the Local Legislation Committee of the House of Commons, deals in Part V. with the electricity undertaking. At one time a fight with the gas interests seemed probable, as it was rumoured that the Derby Gas Light and Coke Company intended to endeavour to obtain an "electrolysis" clause, and also to secure the insertion of some form of the famous "Bermondsey" clause, or its latest modification, known as the "Winchester" clause. It has, of course, been the settled practice of Parliament for many years not to countenance applications for special protection for water and gas mains from electrolysis, owing to the fact that it considers the Board of Trade regulations on the point sufficient, and there seemed to be no peg upon which to hang a "Bermondsey" clause, so it is perhaps for these reasons that the gas company have withdrawn their opposition to the Bill, and the electrical clauses are now going through unopposed.

They give the Corporation powers to lay additional mains, to erect overhead wires, and to construct sub-stations under the streets. No such sub-station, however, is to be constructed within a distance of 25 yards of any railway property or factory, except with the consent of the owners, which, if withheld, is subject to the arbitration of the Board of Trade. Clause 45 provides that if any consumer of electricity supplied under an agreement uses the energy in a manner contrary to

the terms of the agreement, the Corporation may discontinue to supply such consumer.

Clause 46 is a new stand-by clause. It lays it down that the maximum power which any consumer shall be entitled to be supplied with by the Corporation shall not include any supply of energy taken only on extraordinary occasions, or as a stand-by supply, unless such consumer shall pay to the Corporation a minimum annual sum which will give a reasonable return on the capital expenditure involved in meeting that supply. Another clause inserted by agreement with the Gas Company is that the Corporation shall not charge for electricity used for working motors for compressing gas supplied by the Derby Gas Light and Coke Company a higher rate than the highest rate charged for the time being for current for lighting purposes.

## ELECTRIC TRACTION NOTES

A sum of about £1,250,000 has been sanctioned by the Lower House of the Prussian Diet for the conversion of the Berlin City Railway, the Circular Railway, and the suburban lines to electric traction. In the course of the discussion it was stated that the cost of electric working would be £300,000 a year cheaper than steam, and that forty trains an hour could be run instead of the present twenty-four. The City Railway has reached the limit of its capacity by steam working.

In the large number of Bills which have been deposited in Parliament this session authorising the running of trolley omnibuses, a clause was universally inserted giving the Board of Trade powers to sanction further routes upon application by the promoters in the future. The idea of this is to obviate the expense of coming to Parliament again, inasmuch as it is a much cheaper procedure for the Board of Trade to sanction extensions by way of provisional orders. Exception, however, has been taken to this clause in many instances, and especially so in regard to the Metropolitan Electric Tramways (Trackless Trolley) Bill, many of the London local authorities regarding it as a possibility that the Board of Trade could sanction the running of trolley omnibuses in any district without the local authorities being heard. We now understand, however, that at the request of the Board of Trade itself, this particular clause has been deleted from all Bills this session.

Bearing on this question, the following resolution passed by the County Councils Association last week is of interest:—"That it is undesirable that any powers should be included in a private Bill introduced this session to authorise a trackless trolley system or the running of motor omnibuses within an administrative county area (other than exclusively within a County Borough or the County of London), as the reclassification of main and other roads has not yet been made by the Road Board, and that members of the House of Lords and the House of Commons be invited to take such steps as may be necessary to eliminate from private Bills clauses proposing to give such powers."

The General Purposes Committee of the L.C.C. have made a report with regard to Sir Laurence Gomme's evidence before the House of Commons Committee, which is inquiring into the cause of accidents from motor traffic in London. In this evidence certain opinions were expressed as to the appointment of a traffic board for London, which were intended to be personal expressions of opinion, and were not intended to express the views of the Council as a body on this question. The General Purposes Committee, however, are of the opinion that this evidence may give rise to misapprehensions in the minds of some of the members of the Committee, and in order to remove this possible misconception, the Chairman of the Select Committee has been communicated with. At the same time the General Purposes Committee recommend that the Select Committee should receive evidence from Sir Edward White on behalf of the Council on the establishment of a traffic board for London.

The Board of Trade have officially inspected the first trolley omnibus line in Keighley, which is upon the Cedex-Stoll system.

## "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

### Specifications Published April 24, 1913

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

8,352/12. **Submarine Telegraphy.** E. RAYMOND-BARKER. For ordinary Morse working a "rocking-beam pole-alternator" is used. This may be polarised or not, but the broader end of a pointed tongue is stiffly pivotted. At each working of the armature of the pole-alternator the tongue impinges upon one side of a stiffly pivotted "rocking beam," and must move it one way or the other. If one current impulse moves it to the left, the next will force it to the right. Either motion closes the circuit of a common local battery. An alternative arrangement is to use a "ratchet-wheel pole-alternator," which takes the place of the rocking beam. It is moved on one tooth by each blow, and commutators fixed to it ensure alternate positive and negative currents. Three figures.

14,157/12. **Armoured Cables.** CALLENDER'S CABLE Co. and C. PIPKIN. To protect wire armouring from chemical effects. A steel or iron wire is enveloped in a lead sheath put on under pressure in a similar way to that adopted for sheathing the insulation of lead-covered cables. The individual wires are then built up to form the armouring in the usual way. Two figures.

14,958/12. **Milk Sterilisation.** A. HELBRONNER, M. VON RECKLINGHAUSEN, and V. HENRI (France). An additional stage in the treatment covered by Specification 14,833/12. This consists in "homogenising" the milk prior to its exposure to the ultra-violet light, and after the preliminary heating by passing it through a filter at about 60° C. under a pressure of approximately 150 kg. per sq. metre.

22,875/12. **High-frequency Oscillations.** K. ROTTGARDT. Highly heated iodine vapour is brought into contact with the discharge gap fed with A.C.

947/13. **Wireless for Air-craft.** L. ROUZET (France). Owing to the difficulty of insulating the antenna winch, the antenna is counterpoised by a carefully insulated network, and the winch is situated at the node. Two figures.

### Specifications Published To-day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, E.C., at the price of 8d. each, post free.

Names in *italics* indicate communicators of inventions from abroad. Summaries of some of the more important of these patents will appear in our next issue.

**Arc Lamps:** OGILVY-WEBB, WHITE and REINÉCKE, 8,232/12; B.T.-H. (*G.E.C., U.S.A.*) [Electrodes] 16,707/12.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** VAN DAALEN and SCHREIBER [Transmission] 24,122/11; JERRIM [Staples and cable fasteners] 1,933/12.

**Dynamos, Motors, and Transformers:** PRICE [Dynamos and motors] 21,932/12; CONRAD [A.C. rectifiers] 622/13.

**Electrochemistry:** TRIQUET [Sterilisation of water using mercury vapour lamps] 9,314/12

**Heating and Cooking:** BELLING [Geysers] 8,682/12; SCHAEFFER [Hot-air douches] 18,212/12.

**Ignition:** WECKERLEIN & STOCKER [Starting multi-cylinder engines with magnetos] 8,986/12; DELIGNY [Spark plugs] 22,530/12; SIEMENS & HALSKE [Spark plugs] 1,064/13.

**Incandescent Lamps:** FISCHER [Manufacture of drawn tungsten wires] 9,981/12; B.T.-H. (*G.E.C., U.S.A.*) [Machine for manufacturing] 14,962/12.

**Instruments and Meters:** TURNER [Prepayment meters] 13,647/12; A.E.G. [Meters] 16,358/12; MOUL (*Korting & Mathiesen*) [Armature for D.-C. watt-hour meters] 27,246/12.

**Switchgear, Fuses, and Fittings:** CUMONT [D.-C. motor controller] 8,108/12 KOVACS [Cut-outs] 17,635/12; HERRENSCHMIDT & Co. [Automatically reversing tanning-tub operating motors] 20,976/12; HORTON [Switches] 21,102/12; KENNEDY [Regulators for train-lighting systems] 21,157/12; B.T.-H. (*A.E.G.*) [Automatically stopping electric hoists] 26,681/12.

**Telephony and Telegraphy:** WEINTRAUD [Disinfecting telephone receivers] 3,046/12; HARRISON, MOORE and SAVIN [Telegraphy] 5,655/12; CLARKE and CHADBURN'S (SHIP) TELEG. [Revolution tell-tale] 5,692/12; JAMESON [Selectively calling up wireless stations] 19,014/12; VON DER HEIDE [Hollow reinforced concrete masts] 939/13; RICKETS [Telephony] 2,397/13.

**Traction:** MERZ and REDMAN [Railway conductor rails] 13,801/12.

**Miscellaneous:** ALLENKIRCH and GEHLHOFF [Thermo-electric heating and cooling body] 8,050/12; WEIGL [Neutralising effect of inertia of selenium cells] 8,598/12; KINGSLEY-FIELD [Gyro-

scopic apparatus] 13,238/12; DOWNING and MOULTON [Alarm controlling for cash-boxes, &c.] 15,028/12; LA FORCE [Remote indication of level of a liquid in a reservoir] 15,160/12; TRAUTMANN [Burglar alarms] 19,105/12; STERN and BRITISH EVER-READY ELEC. Co. [Packing-envelopes or -cases for batteries] 19,856/12; LILIENTHAL [Röntgen Rays] 23,169/12.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** PORAK [Cable insulating and tensioning gear] 16,671/12; BROWALSKI [Insulator] 7,382/13; SIEMENS-SCHUCKERT. [Loom driving] 7,842/13; A.E.G. [Motor regulation by boosting and bucking machines] 7,896/13.

**Dynamos, Motors, and Transformers:** A.E.G., 7,784/13.

**Electrochemistry:** HELBRONNER [Milk sterilisation] 7,428/13.

**Ignition:** ROYER, 7,302/13.

**Incandescent Lamps:** SANOSCOPI-GLAS. GES. [Glass absorbing ultra-violet light] 7,864/13.

**Telephony:** SIEMENS & HALSKE [Supervisory circuits] 7,531/13.

**Miscellaneous:** BRUNCKO [Clocks] 7,275/13.

### Application for Extension of Term of Patent

8,961/99. **The Telegraphone.** V. POULSEN. Owing to the fact that the Law Officers cannot attend earlier, it was decided last Thursday that the hearing of the petition for extension of term of this patent beyond the customary 14 years shall not take place before May 20th.

### Opposition entered to Grant of Patents

3,878/12. **Ships' Telegraphs.** P. R. KEEPIE and H. M. R. MADDICK. To indicate direction of rotation of shaft two or more rotary switches consisting of rings connected by free wheels to the shaft and free in opposite directions are used. A brush bears on each ring. One ring is thus stationary, while the other revolves.

### Grant of Patent Allowed

21,734/11. **Signalling and Advertising.** C. E. WILLS (ELECTRICAL ENGINEERING, February 27th, p. 122).

### Amendment of Specification allowed

27,697/11. **Burglar Alarms.** A. RICHON. As a result of the extended investigation under Section 8, this specification has been amended by way of disclaimer.

### Expiring and Expired Patents

The following Patent expires during the current week, after a life of fourteen years:—

9,387 of May 4th, 1899. **Detectors for Railway Facing Points.** W. H. DEAKIN and W. ROBERTS. When the points are set and locked, the corresponding circuit controller and lock bolt circuit controller automatically close the circuit of the corresponding signal lever with the exception of a contact switch, so that on the signalman closing this the corresponding signal lever will be unlocked by the electro-magnetic gear, whilst the circuit corresponding to the other signal lever will be open at the lever and at the points so that it remains locked.

The following are the more important Patents that have become void through non-payment of renewal fees.

**Arc Lamps:** E. PEARCE and S. WALTON [Regulating mechanism] 521/07.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** H. PIERER and L'HOEST [Train lighting on the series system, dynamo being driven by separate motor] 695/03; H. C. SOULE [A.C. motor control] 28,017/08.

**Dynamos, Motors, and Transformers:** B.T.-H. (*A.E.G.*) [Starting a single-phase commutator motor having short-circuited brushes] 440/07; F. CONRAD [Mercury vapour rectifiers] 26,555/08.

**Instruments and Meters:** SIEMENS BROS. DYNAMO WORKS (*Siemens Schuckert*) [Maximum demand indicators] 468/08.

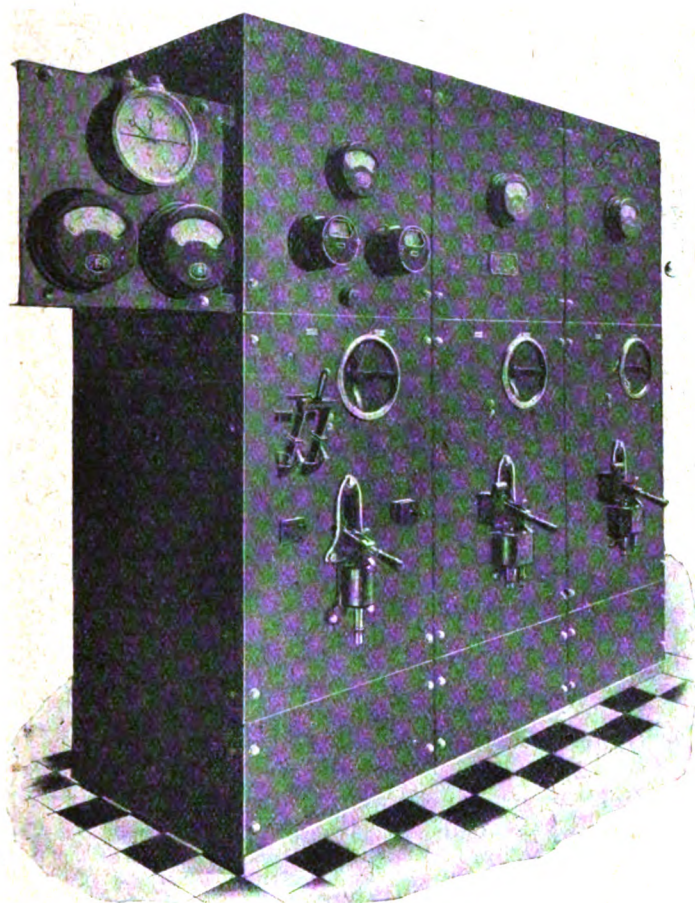
**Switchgear, Fuses, and Fittings:** L. K. JOB [Thermal flasher—a brass bar is overwound with the heating coil] 894/06.

**Telephony and Telegraphy:** F. RITCHIE [Controlling pen of teleautograph receiver] 550/04; G. A. M. AGRELL [Type-printing telegraph receiver] 700/08.

**Traction:** W. McLELLAN and C. H. MERZ [Speed and distance recorder for electric trains] 571/05.

**Miscellaneous:** F. and M. P. ROBERTS [Electrically driven flexible diaphragm pumps] 12,364/08.





G.E.C. High Tension Switchboard (Front View).

# G. E. C.

## High Tension

## Fool-Proof

# SWITCH-BOARDS

G.E.C. High Tension Switchboards are designed and manufactured for all requirements, and amongst the many important features embodied in their construction are the following :

**Cubicles Constructed of Steel.**  
**Easy to Manipulate.**

**Fireproof.**

**Impossible to break Circuit on Links.**

**Interlocking of Switchgear renders same "Dead" when Cubicle Doors are Open, consequently cleaning and adjusting operations can be carried out in**

**ABSOLUTE SAFETY.**

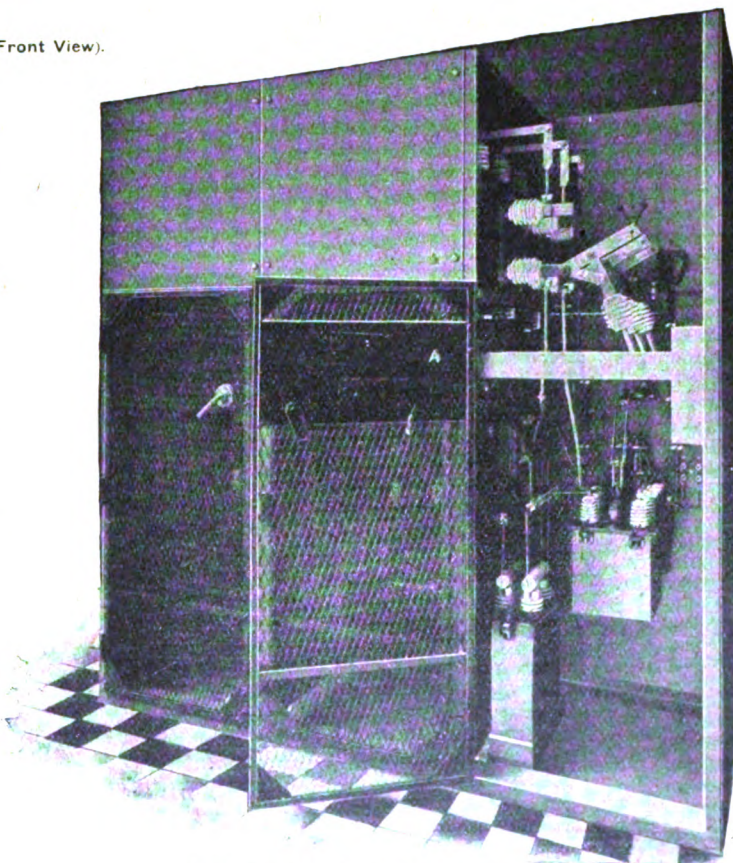
*Write for full particulars and prices.*

**THE GENERAL ELECTRIC CO., LTD.,**  
**Head Office: 67, Queen Victoria St., London, E.C.**

**Telephone: London Wall 3600 (20 lines).**

**Telegrams: "Electricity, Cent., London."**

**Branches:—Manchester, Birmingham, Glasgow, Cardiff, Newcastle, Dublin, Belfast, Liverpool, Sheffield, Leeds, Bristol, Swansea, Hull, Nottingham, Southampton, etc.**



G.E.C. High Tension Switchboard (Back View).

*When corresponding with Advertisers, please mention "Electrical Engineering."*



# THE LONDON ELECTRIC WIRE COMPANY

Telegrams: "ELECTRIC LONDON." **AND SMITHS LTD.** Telephone No. 3105 London Wall.

Offices and Warehouse:  
PLAYHOUSE YARD, GOLDEN LANE, LONDON, E.C.

Works: { CHURCH ROAD WORKS, LEYTON, E.  
ANACONDA WORKS, SALFORD.

MANUFACTURERS OF EVERY DESCRIPTION OF CABLES AND WIRES FOR ELECTRICAL PURPOSES.

**DYNAMO WIRES** Strips and Compressed Strands. **INSTRUMENT WIRES**, Silk and Cotton Covered.

**EUREKA, PLATINOID** and other High Resistance Wires. **ENAMEL** Insulated Wires.

**FLEXIBLES. INSULATING VARNISH. BRUSHES. FUSE WIRES. JOINTING MATERIAL.**

**HIGH CONDUCTIVITY COPPER WIRE.**  
**SPECIAL TROLLEY WIRE.**

**SILICIUM BRONZE & PHOSPHOR BRONZE WIRE.**  
**ALUMINIUM WIRE.**

**MICA** BRITISH MICA CO., LD.  
Contractors to  
H.M. Government.  
Lebanon Road Works,  
Wandsworth, S.W.  
Tel.—405 P.O. Putney.  
Tele.—"Micamini," London.  
**MICANITE**  
Plate Tubes,  
Rings, &c., in

**PLATES**  
**MICANITE**  
**SEGMENTS**  
THE MICANITE & INSULATORS CO. LD.  
OFFICES AND WORKS -  
WALTHAMSTOW, LONDON, E.

**CRYSELCO**  
**ELECTRIC**  
**LAMPS.**  
KEMPSTON WORKS, BEDFORD.

**GLASS TUBES**  
**AND RODS**  
FOR ELECTRICAL PURPOSES  
GUILBERT-MARTIN  
9, Edmund Place, LONDON, E.C.

**ELECTRICAL PORCELAIN**  
OF  
**HIGHEST QUALITY**  
APPLY TO  
**JAMES MACINTYRE & CO., LTD.,**  
BURSLEM.

**F. WIGGINS & SONS,**  
FOR  
**MICA** **INSULATION**  
102, 103 & 104, MINORIES, LONDON

## TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

On Thursday last week, Mr. A. A. Campbell Swinton made a statement before the Marconi Committee in reference to Mr. Godfrey Isaacs' evidence. Mr. Isaacs had blamed Sir Henry Norman for suggesting Mr. Swinton as a member of the Technical Committee, as a report by Mr. Swinton had been published on a Poulsen prospectus. Mr. Swinton now said that he regarded Mr. Godfrey Isaacs' remark as an attack upon his *bona-fides* as an impartial and unbiassed expert witness. The report he made upon the Poulsen system was an absolutely independent one, and he had never had any connection whatever with the Poulsen Company. He said he regarded the statement in question as ungracious from the managing director of the Marconi Company, as he believed that he (Mr. Campbell Swinton) was the first to give Mr. Marconi introductions in this country when he was totally unknown in commercial and scientific circles. Another resignation from the Committee is announced in consequence of the Hon. Neil Primrose having to accompany the British delegation to America in connection with the Hundred Years' Peace. Mr. Gordon Harvey, a former member of the Committee, who retired on account of ill-health, returns in the place of the Hon. Neil Primrose.

On Monday Mr. Winston Churchill was called before the Committee in respect of a rumour mentioned by the editor of the *Financial News* to the effect that Mr. Churchill had speculated in Marconi shares. Mr. Churchill expressed the greatest indignation at being called before the Committee on such a slight pretence, and emphatically denied that he had anything to do with Marconi shares anywhere, and concluded by stating that any person who said he had was a liar and a slanderer, and that any person who repeated the rumour, at the same time having no evidence and believing it to be false, was in addition a coward. We may mention that a suggestion has been made in the lobby of the House that the Government should take steps to bring the meetings of the Marconi Committee to a conclusion.

In the course of the debate in the House of Commons on Thursday last on the vote for the salaries and expenses of the Post Office, the Postmaster-General said that the deferred rate for plain-language cablegrams across the Atlantic had

resulted in a vast increase in business, and that a system of week-end cable letters at about one fourth the usual rates had been introduced between this country, Canada, South Africa, Australia, New Zealand, the United States and the Argentine. The case of India and the East was under consideration. With regard to the Imperial wireless scheme, station sites had been provisionally selected (subject to the approval of the contractor) in England, Egypt, India, and South Africa. Government representatives were now in East Africa and the Straits Settlements seeking sites for the remaining two stations. Since the transfer of the National Telephone Company to the Post Office the wages of the operating and clerical staff have been increased 25 per cent., and the wages of the transferred staff were now 15 per cent. more, on the average, than they were under the company. Nine thousand subscribers who had been connected with wrong exchanges had been transferred to the right ones, and 5,000 more would be transferred by July, leaving 15,000 to be transferred. The complaints of bad service in London had been reduced by very nearly 50 per cent. compared with the early part of last year. In London 162,000 miles of additional wires had been laid, and 20,000 new subscribers had been connected, and although there was still some delay in providing the telephones asked for, the rate of joining up was 25 per cent. more than was the average last year. Taking the country as a whole, £1,000,000 had been spent on the improvement of the exchange system, apart from the trunk system. Last year 98 new exchanges were opened. This year it is proposed to open 220 new exchanges, several on the automatic system. The trunk traffic increased 9 per cent. over the preceding year. The capacity of the London Trunk Exchange is being increased by about 30 per cent. New telephone cables between this country and Holland and Germany are contemplated. The rural party line scheme is now being taken up with increasing rapidity. About 1,000 residents now use these lines, and 500 more are being connected. The Post Office is erecting a wireless station at Aberdeen, and it is suggested that this should meet the requirements of Dundee and Aberdeen for additional telegraphic facilities, as with the present overhead lines some trouble is experienced during the winter from storms, by providing an alternative route. An Admiralty wireless station already exists at Dundee. For several weeks last winter 3,000 men were employed remedying the damage done by storms in different parts of the United Kingdom.



The Italian Radiotelegraphic station at S. Cataldo (Bari) was reopened for ship service on 22nd April, and the Bagdad-Bassorah line was working again on the 24th, when also the Seattle-Sitka cable failed, on account of which telegrams for Alaska are being sent *via* Ashcroft.—On the same date the cable between Perim and Djibouti was put through.—The Montenegro Administration notified the opening of a telegraph office at Scutari on April 26th.—Notwithstanding the notice of March 10th, some administrations are still routing telegrams "*via* Turkey."—The Moulmein route was down on April 28th between Raheng and Bangkok, and also between Tavoy and Myitta.—Telegrams for Siam are being sent *via* Madras-Saigon at the same rate.—Mr. Theodore Vail is cruising in his private yacht in West Indian waters.

### LOCAL NOTES

**Bognor: Public Lighting.**—As already announced, an electric lighting undertaking of the local Gas Company will shortly be put into operation, and the Council has been asked to consider whether it will adopt electricity in preference to gas for the esplanade and any other streets in the town. The position is an interesting one inasmuch as the Gas Company will be competing with itself in respect of any change that may be made.

**Dudley: Sale of Electrical Undertaking.**—It is stated that a legal difficulty has arisen in connection with the sale of the Dudley electrical undertaking to the Midland Electric Corporation for power distribution. This difficulty, we understand, is with regard to an outstanding capital loan.

**Glasgow: Transporter Bridge.**—It is stated that the Corporation is contemplating the erection of an electrically operated transporter bridge over the Clyde.

**Harrogate: Development of Electrical Undertaking.**—Mr. George Wilkinson, the Borough Electrical Engineer, has prepared a report on the possible development of heating and cooking by electricity, and its effect upon the Corporation's electricity undertaking. He points out that at present practically all the buildings likely to adopt electricity are already being supplied, and that until the borough grows considerably, there is not much prospect of a very considerable development of the private lighting business. He therefore recommends that a tariff should be offered to consumers which would induce them to use electricity for cooking and heating purposes on a considerable scale. He recommends a fixed charge of 2s. 6d. per quarter per kilowatt installed in cooking plant and electric radiators, with a rate of 1d. per unit for all energy consumed, the simple conditions being, that the establishment should be entirely illuminated by electricity.

**Heywood: Loss on Electricity Undertaking.**—A loss of £4,118 is reported on the electricity undertaking for the past year. In the previous year there was a loss of £2,532.

**Leicester: Strike of Wiremen.**—The members of the Electrical Trades Union employed in Leicester came out on strike on Friday for an increase in wages. According to an official note issued by the Employers' Association, only twenty-eight men are on strike, and it appears that the demand is for a minimum of 9d. per hour. The employers, however, state that as in towns like Nottingham and Birmingham the minimum wage is 8½d. per hour, it is unfair to attempt to impose a higher rate in Leicester. The employers have offered to refer the dispute to arbitration, but this has been refused by the men.

**Liverpool: Electrical Sub-Committee.**—As indicated in our columns some weeks back, the Corporation has decided to abolish the Electrical Sub-Committee which had charge of the electric supply undertaking under the Tramways and Electric Power and Lighting Committee. The Sub-Committee was only appointed about six months ago, and there seems to have been an agitation ever since to secure its abolition, and this has now been brought about by the casting vote of the Chairman of the full Committee, Alderman Smith.

**Moffat: Electric Supply Scheme.**—Mr. W. E. Townsend, of Edinburgh, has been instructed to submit plans for an electric lighting scheme. A plebiscite of the ratepayers is to be taken on the subject.

**Salford: Price for Tramway Energy.**—Mr. Robert Hammond has been appointed by the Board of Trade to act as referee to settle the difference between the Salford Cor-

poration and the Eccles Corporation as to the price to be paid by the former for electrical energy supplied by Eccles to a portion of their tramways.

**Swinton: Street Lighting.**—A special committee is investigating systems of street electric lighting.

**Waterford: Electric Lighting.**—We announced a short time ago that the Waterford Gas Company had called in Mr. C. H. Wordingham to advise them with regard to an electric lighting scheme. A Special Committee of the Corporation has now decided to ask the Chief Electrical Engineer of the Dublin, Cork or Belfast Corporations, whichever may be available, to report with regard to a municipal electric supply scheme.

### TENDERS INVITED AND PROSPECTIVE BUSINESS

#### Generating Stations, Sub-Stations, Mains, &c.

**Aberdeen.**—The Secretary for Scotland has sanctioned the borrowing of £80,000 for the Electricity Department.

**Barnes.**—Feeder and distributor cables are required. Borough Electrical Engineer, May 19th. (See advertisement on another page.)

**Blackburn.**—On the advice of Mr. P. P. Wheelwright, the Borough Electrical Engineer, the Electricity Committee has adopted a scheme for the erection of a new power station.

**Felixstowe.**—One 150-kw. Diesel engine driven generating set. Consulting Engineer, R. P. Wilson, 66 Victoria Street, S.W. May 5th.

**Glasgow.**—One 5,000-kw. and one 2,000-kw. turbo-alternator with condensing plant. General Manager, Tramways Department. May 26th.

**Grimsby.**—Extensions to cooling towers and condensing plant, steam, exhaust and other pipework, conduits and distribution boards. Borough Electrical Engineer. (See advertisement on another page.)

**Hamilton.**—Messrs. Buchan & Partners, consulting electrical engineers, have suggested an additional expenditure of £12,000 upon the electricity undertaking, and the Council recommend an application for a loan for this amount.

**Hoylake.**—One 400-kw. generating set and condensing plant. Borough Electrical Engineer. May 5th.

**King's Lynn.**—One 400-kw. generating set and condensing plant. Borough Electrical Engineer. May 5th.

**London: Battersea.**—The Finance Committee of the L.C.C. recommends sanction to a loan of £3,275 for the provision of a boiler and circulating water pump at the electricity works.

**Peterborough.**—One 500-kw. generating set and two boilers. Borough Electrical Engineer. May 6th.

**Port Glasgow.**—The Board of Trade has granted an Electric Lighting Order to the Town Council which will, however, be worked by the Greenock Corporation.

**Rochdale.**—Electrically-driven induced draught plant. Borough Electrical Engineer. May 14th.

**Roscrea (Ireland).**—A local manufacturing firm has decided to instal plant to supply the town with electric light and power. Plans are being prepared by Mr. Lawless, a consulting engineer, of Dublin.

**Southampton.**—Two electric gantry cranes for Harbour Board. Clerk. May 9th.

**Stalybridge.**—The Joint Board has received sanction to a loan of £39,255 for electrical extensions.

**Warrington.**—Traction battery and reversible booster. Borough Electrical Engineer. May 13th.

**Wolverhampton.**—The Council has decided to apply for a loan of £22,000 in connection with the electricity undertaking. The new plant will include E.H.T. ring main feeders, four 250-kw. rotary converters, E.H.T. sub-station switchgear, L.T. sub-station switchgear, cranes, and E.H.T. switchgear for Commercial Road generating station.

### THE RECORD ELECTRICAL Co., Ltd.

LONDON OFFICE:  
CAXTON HOUSE,  
WESTMINSTER, S.W.

Telephone:  
3067 Victoria.  
Telegrams & Cablegrams:  
"Infusion,"  
London.

MEASURING  
INSTRUMENTS.

RECORD'S PATENT.

Write for Prices & Particulars.

WORKS:  
BROADHEATH,  
MANCHESTER.

Telephone:  
164 Altrincham.

Telegrams & Cablegrams:  
"Infusion,"  
Altrincham.

### Wiring

The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.

**Barrow-in-Furness.**—Electrical equipment of workhouse at Roose. Architect, H. T. Fowler, Cornwallis Street. May 7th.

**Bootle.**—Cinematograph theatre, Stanley Road. A. Kershaw, Birkdale.

**Coatbridge.**—Cinematograph theatre in Bank Street.

**Darwin.**—New Corporation baths.

**Dundee.**—Labour exchange. H.M. Office of Works, London.

**Haslingden.**—New bank for Manchester & County Bank, Ltd.

**Nottingham.**—Two new cinematograph theatres in Sneinton Road and Parliament Street.

**Stirling.**—New station buildings for Caledonian Railway Co.

**Wallasey.**—A site for a new town hall has been approved. New schools at an estimated cost of £16,000.

### TENDERS RECEIVED AND ACCEPTED

**London: L.C.C.**—The Highways Committee has under consideration tenders for two 8,000-kw. steam turbo-generators which it is proposed to instal in substitution of the reciprocating engines at Greenwich. Whilst the Committee is not yet in a position to advise as to which of the tenders shall be accepted, they recommend the Council to sanction an expenditure on capital account of £82,100 in this connection.

### APPOINTMENTS AND PERSONAL NOTES

It is suggested that in consequence of the appointment of Mr. W. Wyld, the Birkenhead Electrical Engineer and Tramways Manager, to Hampstead, the Corporation will not appoint a successor to Mr. Wyld to the dual post of Electrical Engineer and Tramways Manager. It is stated that the Electricity Committee will recommend Mr. Wyld's chief assistant, Mr. G. P. Shallcross, as Borough Electrical Engineer, at a salary of £400 per annum.

Mr. C. B. Stuart Wortley, K.C., M.P., has been appointed Chairman of the new London & Suburban Traction Co. Mr. Stuart Wortley is, as may be recalled, also Chairman of the City & South London Railway Co.

Mr. J. W. Piggott, mains engineer to the Whitby Council, has been appointed Electrical Engineer in succession to Mr. L. H. King, who has received an appointment with the Marconi Co.

Mr. W. T. Green has been appointed to take charge of the commercial side of the Leeds Electricity Department, in succession to Mr. C. N. Hefford, who as we announced last week has been appointed Manager of the Department.

Mr. Frank Timms, late of Messrs. Armstrong, Whitworth & Co., Ltd., has been appointed to the position of Installation Engineer and Canvasser to the Tynemouth Electricity Department.

Mr. C. H. Nickson has been appointed Clerk of Works for the new generating station at Bolton.

A superintendent of the central car repair depôt of the L.C.C. Tramways Department is required at a salary of £300 per annum.

### CAPPER PASS & SON, Ltd.,

Bedminster Smelting Works, BRISTOL.

SELLERS OF

ANTIMONIAL LEAD OF ALL GRADES.

BUYERS OF

LEAD ASHES & LEAD RESIDUES FROM ACCUMULATORS.

Telegrams: "PASS, BRISTOL."

Telephone: 3475 & 3476.

**WINCHES**  
THE LONDON ELECTRIC FIRM, CROYDON  
FOR ALL LAMPS, AND OTHER LIGHT WEIGHTS

### MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. G. Smith and Son, of 5 Philpot Lane, E.C., inform us that the price of electrolytic copper bars c.i.f. port of arrival, quoted on Tuesday night, was £71 10s. to £72 (last week, £72 to £72 10s.).

**Liquidations.**—The Electrolytic Alkali Co. is to be wound up voluntarily. Mr. W. H. Alexander, 24 North John Street, Liverpool, is liquidator. A meeting of creditors will be held at 14 Cook Street, Liverpool, on May 7th at noon.

**Bohemian Concert.**—The second annual Bohemian Concert of the General Electric Co.'s Athletic Club will be held on Saturday at the Talbot Restaurant, London Wall, E.C., at 7.30 p.m. The Davis challenge cup, which has been won by the G.E.C. Football Club, will be presented during the evening.

### COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &c.

**North Metropolitan Electric Power.**—At a special meeting last week, a resolution was passed extending the borrowing powers of the Company in order to meet further extensions of the Company's two main stations at Brimsdown and Willesden, and also for the extension of the Hertford and St. Albans stations.

**Durham Collieries Electric Power Co.**—Mr. Justice Neville last week sanctioned the selling of this Company to the Newcastle-on-Tyne Electric Supply Co.

**Electrical and Industrial Investment Co.**—This Company is issuing at par £85,180 4½ per cent. first debenture stock and £92,955 5½ per cent. second debenture stock. The Company was formed in May, 1912, to acquire the investments of the City of Birmingham Tramways Co., and generally to carry out the objects of an investment company. A dividend of 4½ per cent. was paid on the ordinary shares for 1912.

**Johnson and Phillips.**—Mr. R. W. Blackwell presided at the annual meeting on Thursday last week, when the report and accounts referred to in our last issue were adopted. Whilst admitting that the report for the past year was not all that the shareholders could properly desire, Mr. Blackwell expressed the opinion that the Company's property was steadily improving in value, and the business regularly increasing along safe and conservative lines. A shareholder, however, wished to know why in these times of unprecedented prosperity Johnson and Phillips had during the past five years had such bad times. The Chairman replied that one of the reasons for this was that at the time of the flotation of the Company the working capital was insufficient for the demands during troublesome times, and business fell off. The Board had, however, struggled to build up the Company, and by not recommending dividends during the past few years had, he believed, attained a considerable measure of success.

**Damages for Electric Shock.**—A switchboard attendant employed by the L.C.C. at their Hammersmith sub-station has been awarded £135 damages at the West London County Court for injuries consequent upon a shock from the 6,000-volt mains. Contributory negligence was alleged by the Council in defence, and the actual voltage was said to have been 3,750.

**Investigation into the Cause of an Explosion.**—The inquest regarding a fatal explosion at Hebburn-on-Tyne, referred to on page 228 of our issue of last week, was continued last Thursday. Evidence was given as to a smell similar to burnt indiarubber after the explosion, and the trough in which the cables were was found to be burned, charred, and part of the cables gone. The surveyor could find no trace of gas, nor were there gas-pipes near. Evidence was given by Mr. W. Bates (Northern Counties Electric Supply Co.), who said that the cables were laid in 1902, and were near the wall of the house. They were laid in wooden troughs in bitumen, and appeared to have been strained in laying, so that one lay on the top of the other instead of side by side. Mr. C. Vernier (Mains Engineer, Newcastle Electric Supply Co.) said that the cable had been fused for a length of about six feet, and that there was indication of the bitumen having been at a very high temperature. Bitumen gas did not usually cause an explosion through contact with the air, but he could find no other explanation than that the fusing of the cable had caused the explosion of gas given off from the bitumen. The jury found that the deaths were due to injuries, the result of accidental explosion of the gas given off by bitumen generated by the fusing of an electric cable.

# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 332 [Vol. IX., No. 19]  
*All rights reserved.*

THURSDAY, MAY 8, 1913.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES AND TECHNICAL COLLEGE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

*Other Advertisement Rates on Application.*

### Latest Time for Receiving

Letters for Insertion, Tuesday *first post*.

Small Advertisements and Official Announcements, Wednesday *first post*.

Displayed Advertisements, Tuesday *first post*.

Corrections in Standing Advertisements, Monday *first post*.

All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 205-206, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Circling, Fleet, London." Telephone No.: 5509 Holborn.

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

THE L.C.C. has placed a contract with the British Westinghouse Co. for two 8,000-kw. turbo-alternators for the Greenwich power station. (Page 254.)

WE publish an illustrated description of a fine new restaurant inaugurated by the Brompton & Kensington Accessories Co. last week. Its equipment represents an aggregate of 140 kw. The main kitchen contains a long range, including nine electric ovens and 12 boiling plates, and, in addition to the other cooking operations, the bread used in the restaurants is baked here. Electric current is also employed for working the meat-chopper, the coffee-grinder and roaster, &c. In the restaurant itself there is a large double griller, a heated carving-table, and hot cupboards, and there are also two smaller electric kitchens in the building, one a model domestic kitchen, and the other a mess-room for the staff. (Page 255.)

A DESCRIPTION of the delicate electrostatic voltmeters and wattmeter used at the National Physical Laboratory for checking commercial instruments with an accuracy of about 1 part in 10,000 is contained in a Paper by Messrs. C. C. Paterson, E. H. Rayner, and A. Kinnes, which was read and fully discussed at the Institution of Electrical Engineers last Thursday. (Page 257.)

AN electrically-driven ice-making plant is described in a short article. (Page 258.)

AT the adjourned discussion on Mr. Trotter's Paper on the proposed standard street lighting specification,

the basis of minimum horizontal illumination was strongly opposed by the speakers identified with gas lighting. In his reply Mr. Trotter again pointed out the agreement between the observations of the surveyors and photometrists in the street classification described in the Paper, which was strong evidence that the minimum-illumination basis was sound. (Page 259.)

SOME evidences of the strength of modern metal filament lamps are given on page 260.

AN illustration is given of a most successful electric kitchen at the staff dining-rooms of Simplex Conduits, Ltd., Birmingham. (Page 260.)

A PETITION for revocation of a Patent granted to Van Raden & Co., Ltd., and M. Metz for a switch for controlling motor-car lighting circuits on the ground of insufficiency of description of the invention, heard on Monday last, was unsuccessful. (Page 260.)

THE design of a semi-indirect lighting installation for an office is considered in our Questions and Answers columns. (Page 261.)

A NEW design of propeller fan and a motor-car inspection lamp are described on page 262.

MR. SEABROOK calls attention to the fact that all interested in pushing the use of electricity for domestic purposes are welcome to the meeting of the "Point Fives" during the I.M.E.A. Convention week. Further correspondence relates to a system of burglar alarms recently described in our Questions and Answers columns. (Page 262.)

IN connection with tenders for two 5,000-kw. turbo-alternators for the Stepney Borough Council, strong exception was taken to the B.E.A.M.A. model general conditions to which all the British firms tendered, refusing to accept the Borough Council's conditions. The contract has been placed with a Swiss firm, who, however, also tendered the lowest price. (Page 265.)

A MODEL specification for coal purchasing has been proposed by the Associated Municipal Electrical Engineers (Greater London). (Page 263.)

AN exhibition was given last week of Prof. C. F. Dussaud's so-called "cold light." Highly over-run tungsten lamps are rapidly switched on and off, and it is claimed that, owing to the periods of rest, the life of the lamps is not diminished as much as the high efficiency would lead one to expect. (Page 262.)

THE Metropolitan Electric Tramways, Ltd., have received powers to link up their tramway system with the Walthamstow tramway system by means of trolley 'buses. The annual Congress of the Tramways & Light Railways Association will be held at Blackpool on June 12th and 13th. (Page 263.)

SIEMENS BROS. & Co. are seeking leave to amend an important patent specification (No. 20,277/04) relating

to the manufacture of drawn metallic filaments. A specification for some improvements in the Stone system of train lighting expires during the current week after a full life. The specifications published last Thursday include one by C. H. Fischer for the production of tungsten suitable for drawing into filaments, and one by C. R. Belling for an electric geyser. (Page 264.)

THE technical advisory committee appointed in connection with the Marconi inquiry has done far more useful work than the main committee. It reports that the generation of continuous oscillations is not yet sufficiently powerful for the long-distance transmissions that are required, and recommends the use of the Marconi methods at the outset, in view of the excellent results which are already obtained with the Marconi stations. The Marconi Co. and also the Telefunken Co. are already experimenting with continuous oscillation generators, as well as the Poulsen and Goldschmidt companies. The Committee recommends that the Post Office should be free to use for the stations of the Imperial wireless chain any improvements, and should not be confined permanently to the use of any particular system, or be tied by patent rights, and they recommend that two of the stations should be allotted for experimental investigations by an engineer of standing and a competent staff appointed for this special purpose.—Negotiations are proceeding between the Hull Corporation and the Postmaster-General with regard to the purchase of the Post Office telephone undertaking there by the Corporation. (Page 265.)

THE hitch in the sale of the Dudley electricity undertaking is with regard to the repayment of the outstanding loans by the Company which proposed to purchase the works.—Arrangements for wiring small houses are being entered into at Kilmarnock.—A tariff has been fixed at Bexley to develop electric cooking. (Page 267.)

OUR Tenders Invited column gives particulars of a considerable number of prospective orders for electrical machinery. Among the sums contemplated to be spent may be mentioned, £35,900 at Salford; £13,500 at Derby; £500,000 at Birmingham; £7,000 at Keighley; £5,700 at Shipley; £3,000 at Bridlington; whilst new generating plant is also required at Plymouth and Brighton. A number of Councils who have just received electric lighting provisional orders also propose to proceed with them immediately. (Page 267.)

THE Derbyshire & Notts Electric Power Co. has now been placed upon a sound financial footing, and orders for a considerable amount of plant have been given.—The Westinghouse Co. is able to carry forward a credit of £66,889. (Page 268.)

**Indirect Lighting in a Fruit Warehouse.**—The British Thomson-Houston Co., Ltd. (Mazda House, Upper Thames Street, E.C.), have sent us some particulars of yet another example of a lighting installation on their "eye-rest" indirect lighting system. This time it is a fruit warehouse that has taken advantage of the well-diffused and comfortable illumination that can be obtained by this system. Messrs. Elders & Fyffes, the large fruit importers, of 31 Bow Street, W.C., have had the eye-rest system installed throughout their offices and warehouse for several months, and it has given satisfaction both as regards illumination and current consumption. Plain brass bowl Eye-Rest fittings are employed, each containing four 80-watt Mazda lamps. The illumination in the offices and warehouse is uniform and glareless, and of high intensity. Eye-rest lighting has considerable advantages in a warehouse. The store-rooms are generally filled with stacks of baskets and crates, which with direct lighting would cast long, dark shadows. Eye-rest illumination is practically unaffected by such conditions, and men can walk between the crates and examine the markings on them without having to strike matches or put themselves into uncomfortable postures.

## LONDON COUNTY COUNCIL TRAMWAYS Various Turbo-Generators Temporary Arrangements for Bulk Supply

SIXTEEN tenders have been received by the L.C.C. for the two 8,000-kw. turbo-generators and auxiliaries required for the Greenwich Power-house. We gave some particulars of the contents of the specification in our issue for February 27th, p. 117. The tenders received were as follows:—Escher, Wyss-Siemens, £48,012; Westinghouse-Westinghouse, £50,532; Willans-Siemens, £50,560; Richardsons, Westgarth—Brown, Boveri, £51,610; Fraser & Chalmers—Brown, Boveri, £52,939; Willans—G.E.C., £53,710; Willans—Dick, Kerr, £53,720; Fraser & Chalmers—Siemens, £54,839; Richardsons, Westgarth—Siemens, £54,861; Howden—Siemens, £55,342 10s.; Richardsons, Westgarth—G.E.C., £58,259; Fraser & Chalmers—G.E.C., £58,889; Brush-Brush, £60,500; Parsons-Parsons, £64,339; B.T.H.—B.T.H., £70,224; Bellis & Morcom—Siemens, £70,770. The estimate of the Chief Officer of Tramways was £62,500.

The above prices are subject to a bonus or penalty on steam consumption, at the rate of £500 per tenth of a pound of steam less or more than 12.75 lb. per kw.-hour at full load. Having regard to the very great importance of obtaining the best possible type of plant for the generating station, Sir Alexander Kennedy was asked to advise on the tender, and as the result has advised that the second lowest tender, that of the British Westinghouse Co., amounting to £50,532, should be accepted. This Company's guaranteed steam consumption is 12.44 lb. of steam per kw.-hour at full load. The corresponding figure offered by Messrs. Escher, Wyss & Co. is 12.82 lb. per kw.-hour, subject to an allowance of 3 per cent. either more or less. On the assumption that both sets of figures were obtained in actual operation, the extra steam required by the two Escher-Wyss turbines would represent an additional expenditure for coal of about £1,500 a year at present prices. An additional provisional sum of £4,000 for transformers will be included in the contract. The Westinghouse Co. stipulates that certain modifications shall be made in the clause usually inserted in the Council's contracts as regards the submission to arbitration of any disputes arising thereunder. This clause, however, is substantially in agreement with the standard clause in the Council's usual form of contract.

Before any alteration can take place at the station, one of the reciprocating engine sets will have to be removed. As the load at the night and morning peaks, however, makes it necessary for the existing four turbines and three reciprocating engines to be constantly working in parallel, leaving one reciprocating engine as spare, there will, until one of the new turbines is available, be no spare plant. In these circumstances, the Highways Committee recommend that an arrangement should be entered into with the London Electric Supply Corporation for a temporary supply of power up to 2,000 kw. at the rate of £3 per kw. per annum, plus 0.3d. per unit for a period of not less than nine months. The supply would be taken at the New Cross sub-station. The Company will provide the necessary measuring instruments and meters, and a cable-duct between their power-house and the Council's line of ducts. The Council, on the other hand, will provide the trunk main between the switchgear at the New Cross sub-station and the Company's generating station at Deptford, at an estimated cost of about £2,060.

The Committees' recommendations were adopted at the meeting on Tuesday.

**Paris Meeting of the Institution of Electrical Engineers.**—The following is a full list of the Papers that will be discussed at the joint meeting of the Institution of Electrical Engineers and the Société Internationale des Electriciens in Paris from May 21st to 24th:—"High-tension Continuous-current Traction," by Gratzmuller; "Single-phase Traction," by M. Latour; "The Electrification Schemes of the Chemin-de-Fer du Midi," by M. Julian; "The Electrification of the Paris Suburban Lines of the State Railway," by A. N. Mazen; "Railway Electrification Problems in the United States," by H. Parodi; "Petrol-Electric Motor-trains," by J. B. Damoiseau; "Long-distance Transmission of Electric Energy (Continuous-current)," by J. S. Highfield; "Long-distance Transmission of Electric Energy (Three-phase Current)," by M. Leblanc; and "Automatic Telephony: Application of Mechanical Devices to the Assistance of Manual Operating in Telephone Exchanges," by W. Slingo.

### The London Electrical Engineers.

(To-day) THURSDAY, MAY 8TH.—C. Company. FRIDAY, MAY 9TH.—D. Company. Infantry Drill, 7 to 9 p.m. Technical Instruction for all Members on the Sixth Rate and for all Candidates for Higher Rating, 7 to 9 p.m. Musketry Instruction, 9 to 10 p.m.  
SATURDAY, MAY 10TH. Headquarters open from 10 a.m. till 12 noon.  
MONDAY, MAY 12TH.—Headquarters closed.  
TUESDAY, MAY 13TH.—Headquarters closed.  
WEDNESDAY, MAY 14TH. All Companies.—Annual Musketry at Purfleet. Railway tickets sent on application.  
THURSDAY, MAY 15TH. C. Company.—Infantry Drill, 7 to 9 p.m. Technical Instruction for all Members on the Sixth Rate and for all Candidates for Higher Rating, 7 to 9 p.m. Musketry Instruction, 9 to 10 p.m.  
FRIDAY, MAY 16TH. D. Company.—As for Thursday, 15th.  
SATURDAY, MAY 17TH.—Annual Musketry at Purfleet. Headquarters open from 10 a.m. till noon.



## THE "B & K" ELECTRIC RESTAURANT

ON Wednesday last week the directors of the Brompton and Kensington Electricity Supply Co., Ltd., and the affiliated company the Brompton and Kensington Accessories Co., Ltd., entertained a party of thirty-six guests to inau-

Beeton (Chairman of the company) and Mr. R. S. Downie (the Engineer and General Manager) are to be congratulated on their success. Much has been said with regard to the establishment of showrooms, but undoubtedly to give the

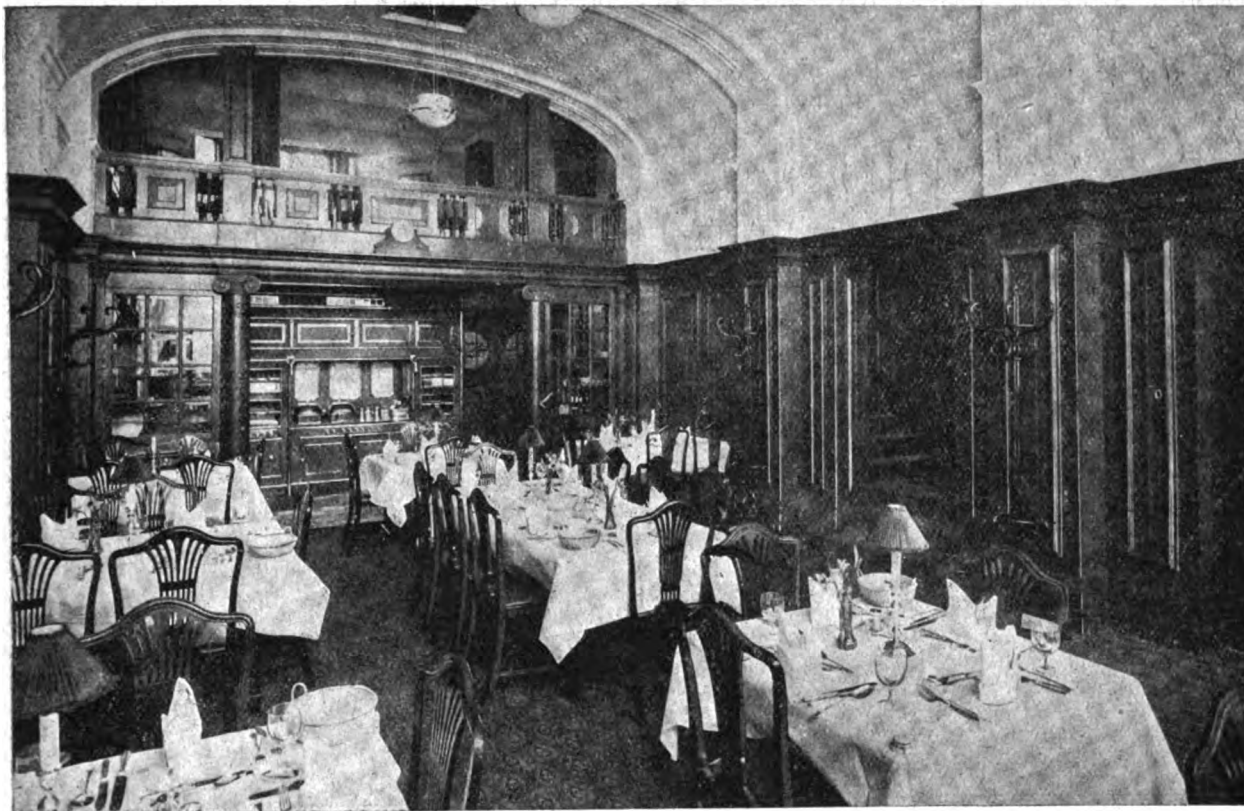


FIG. 1.—GENERAL VIEW OF LARGE DINING-ROOM.

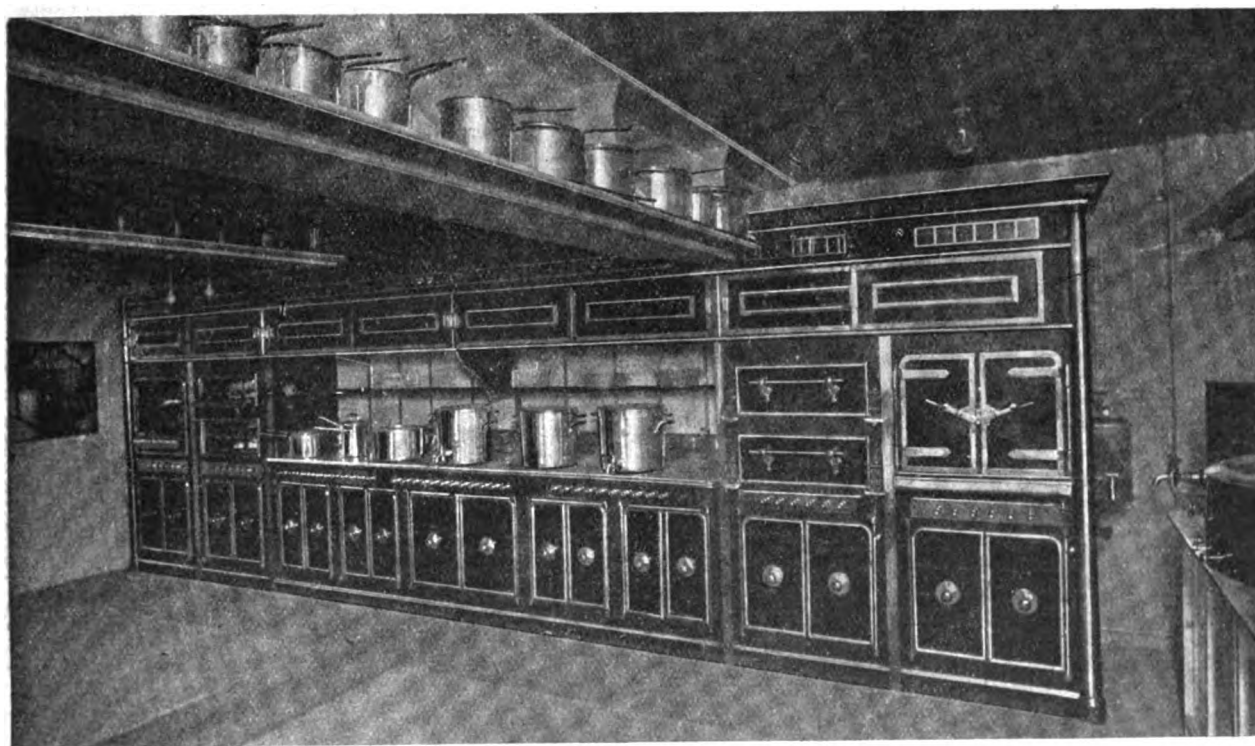


FIG. 2.—THE ELECTRIC RANGE IN THE MAIN KITCHEN.

gurate the Electric Restaurant, which adjoins their offices in the Earl's Court Road. The arrangements of the electrically equipped restaurant are the most complete we have yet seen, the dinner was excellently cooked, and Mr. H. R.

consumer an opportunity of sampling and tasting the food under ordinary mealtime conditions is likely to ensure better results than even the best of the very effective showroom "demonstrations" which are now in vogue. It is uncertain

## “Megger” TRADE MARK.

# INJUNCTION.

ON the 4th April, 1913, in the High Court of Justice, Chancery Division, Mr. Justice Eve granted to EVERSLED & VIGNOLES, Ltd.,

### A PERPETUAL INJUNCTION

against a well-known electrical firm (who did not resist the application) restraining them from advertising or selling any testing instruments other than those made by

**EVERSHED & VIGNOLES, Ltd.,**

under the name “Megger” or under any other name which is a

### COLOURABLE IMITATION OF THE NAME “MEGGER.”

Messrs. EVERSLED & VIGNOLES, Ltd., give notice that they are the Sole Proprietors of the registered trade mark “MEGGER” and that they will proceed against any persons infringing or imitating in any way the said mark.

ACTON LANE WORKS,  
CHISWICK, LONDON, W.

Telephone: 1370 CHISWICK (2 lines).  
Telegrams: “DOROTHEA, LONDON.”

whether a municipal electricity undertaking could establish a public restaurant adjoining its showrooms without obtaining special parliamentary powers, but it is conceivable that this might be arranged by contract with a firm of caterers. In the case of an electricity supply company the business of restaurant keeping may in the same way not be within the “objects” set forth in the memorandum of association, but an affiliated company can be formed for this purpose, as in the present case.

To return from this digression to the restaurant itself and the equipment of the kitchen, &c., we may first mention that electricity is employed not only for cooking, but also for baking the bread, for all the heating, ventilating, lighting, cleaning, for working the refrigerating plant, and even for running the clocks and for the table bells.

The electrical equipment has been supplied by various manufacturers to the design and specification of the accessories company. The experience gained by the company at the “Queen’s Head” Electric Restaurant, Earl’s Court Exhibition, last summer, and the results obtained on their own and consumers’ premises during the past three years, has enabled them to produce apparatus which is suitable for the purpose in view and able to stand up to its work under everyday conditions.

A general view of the main room of the restaurant is seen in Fig. 1: there are also several tables on the gallery, and there is another room used as a tea-room. The total seating capacity is 90 to 95. The main kitchen is on the first floor, but there is in addition a large double griller at the back end of the main room (seen in Fig. 1), together with a carving table and hot cupboard, and in the servery behind this are electrically-heated urns for supplying tea and coffee. Hot plates are fitted throughout the establishment, and at each table is a pair of 5-ampere plugs controlled by a “twinob” switch to enable the visitors to make their own toast or to experiment themselves with chafing dishes or other small pieces of apparatus if they desire. These plugs, as well as the one for lighting a candle-lamp on the table and the bell-push, are neatly and conveniently arranged. A lamp indicator board in connection with the bell system is placed in the servery.

The equipment in the main kitchen comprises one large cooking suite, having a loading of 70 kw. controlled by fifty-eight switches. As seen from Fig. 2, there are nine ovens in the lower part; these are of various sizes and loadings for different cooking operations. At the right there are two steamers for vegetables, fish, puddings, &c., and, immediately adjoining, ovens for baking all varieties of bread and rolls required in the restaurant. At the left-hand side there is a large fish fryer, adjoining which is a grill and toaster. On the main hob are fitted twelve boiling plates of various sizes and loadings. Running along the top of the suite are switch indicator lamps, and immediately underneath are hot cupboards for silver. Plugs for immersion heaters are provided on the ranges.

The other equipment in the main kitchen comprises a coffee roaster, a meat chopper, a coffee grinder, a bain Marie, a fish kettle, a stock pot, an egg boiler, &c., all electrically heated or driven. The switches are in all cases immediately by the apparatus they control.

The hot water supply in the kitchen and scullery on this floor is supplied by a “Cooper” water heater.

There is also on the first floor a small model kitchen fitted with the usual pattern of domestic stove, and in the basement is a mess-room, with another electric range, where the restaurant staff, numbering about eighteen, will have their meals served and cooked. Both these installations will be shown under ordinary working conditions to visitors.

The basement also contains the refrigerating plant for supplying the cold chamber and for making ice, and a 100-gallon Cooper immersion heater supplying hot water for general purposes. This is controlled by a thermostat, which switches on when the temperature drops to 120° F. and off at 130° F. The ventilating arrangements comprise duct-work, by means of which the air is drawn in from outside, cooled in summer and warmed in winter and delivered to the restaurant through gratings, being afterwards exhausted by means of motors situated on the roof of the building.

The loading of the total electrical equipment is approximately 140 kw. There are two sub-stations in the basement, each containing two 50-kw. transformers. These sub-stations also feed into the network. The pressure is 100 volts

alternating. Arrangements for metering all the circuits through the building are very complete and will enable accurate data to be obtained.

The lighting has been as well thought out as the cooking arrangements. In front of the restaurant and offices there are two lamp-posts of the pattern introduced by the B.T.-H. Company for their "white way" system. Each has four 100-watt and one 200-watt lamps. The main restaurant, in addition to the table lights, has three fine semi-indirect "Alba" fittings, each containing a 200-watt lamp. There is a dimming choking-coil in series with these. The other rooms are chiefly lighted with ceiling lamps and holophane shades; in one of the passages concealed cornice lighting is most effectively employed, and a glass-shelf cupboard for cakes, &c., in the tea-room is prettily lighted up by concealed "tubolite" lamps.

## ELECTROSTATIC POWER MEASUREMENT

**T**HE Use of the Electrostatic System for the Measurement of Power" was the title of a Paper read on Thursday last before the Institution of Electrical Engineers by Messrs. C. C. Paterson, E. H. Rayner, and A. Kinnes. After a brief historical survey, the authors state that they have used the electrostatic system for all their A.-C. measurements at the National Physical Laboratory for over six years. The instruments consist of voltmeters and a wattmeter, together with the supplementary apparatus for testing and checking commercial instruments. The accuracy obtained is considerably better than five parts in 10,000, and the instruments are adaptable for use over a wide range—currents up to 3,000 amperes are now measured, and larger currents could be dealt with. Other advantages are: the fact that the voltmeter and wattmeter require only a minute capacity current, so that they can be changed over from one circuit to another without causing any disturbance; eddy currents do not arise; the instruments are independent of frequency or wave-form changes, however a correction for the inductive effects of the shunts, about 0.8 per cent. for 3,000 amperes, is necessary, and the instruments are of the direct deflection type. The disadvantages are the small controlling force, and therefore slow movement of the moving system, and in order to keep down the time of swing of the wattmeter moving system (undamped) to about 8 seconds, and yet leave the instrument robust enough to stand ordinary everyday use, it is desirable to work with a pressure of about 2 volts on the quadrants for full deflection over the scale. This means that a pressure drop of 1 or 2 volts is wanted whatever be the current through the series resistance. The dissipation of 4 kw. in the resistance is readily managed with water cooling, but this must be regarded as a disadvantage. Considerable benefit, however, accrues, as they form a good non-inductive load for the transformer and generator supplying the current, and thus help to prevent wave distortion of the generator and to keep three-phase circuits balanced. Their relatively high resistance also helps to produce a low time-constant. The instruments are not portable.

The actual apparatus consists of a 160-volt standard horizontal Kelvin and White multicellular voltmeter, with oil damping. A 20-mm. diameter concave mirror with a radius of curvature of 3 metres reflects a beam of light from a Nernst lamp on a scale 4 metres away and 8 metres long. Pressures can be read to an accuracy of 1 part in 10,000. The wattmeter consists of a brass ring 23 cm. diameter and 9 mm. thick. On this ring is centred a platform carrying the whole of the instruments, and free to be rotated bodily by a tangent screw. The moving system is suspended from an upper platform and can be moved laterally to facilitate centring the needle in the quadrants. The needle and quadrants are made of a special copper-aluminium alloy. The diameter of a set of quadrants, of which there are four, is 12 cm., and the slots are 0.5 mm. wide. Amberite insulation is used, and adjustments in height can be effected to 0.001 mm. The moving system consists of a phosphor-bronze strip 20 cm. long annealed in a reducing atmosphere under slight tension. An iris diaphragm is fixed so that when unshipping the instrument to change the needle or make some other adjustment, it is only necessary to take the weight of the needle by means of a screw, disengage the hooks, and close the iris diaphragm on to the spindle. This enables the whole of the top of the instrument to be lifted off without straining the suspension in any way. The upper quadrant system can then be raised, and the needle with its short spindle is ready to be removed. The concave mirror has a radius of curvature of 3 metres, and is 20 mm. high and 8 mm.

wide. The making of the needle requires great care, since any lack of symmetry will cause an uneven scale calibration. The accuracy desired in the measurement of power necessitates an angular deflection through 45 degrees. The needles are 50 mm. across, and are of double fan shape. They are now made from an annealed copper-aluminium alloy 0.015 mm. thick, and are fluted so as to give sufficient rigidity and to increase the damping. The moving system comes to rest after  $1\frac{1}{2}$  complete oscillations.

For the measurement of current above 500 amperes a step-up transformer with a ratio of 1 to 100 or 1 to 200 is connected across a standard resistance carrying the current to be measured, and an electrostatic voltmeter is connected across the secondary. The authors have found that, instead of tending towards a constant value as the frequency increases or the wave-form varies, the transformation ratio continues to rise. It was found that for the particular transformer used and for frequencies between 25 and 100 cycles, a resistance of 143,000 ohms, with a positive temperature coefficient, across the secondary checked this tendency, except for the small variation due to the variation of the magnetising current with frequency, and this only affects the reading 0.08 per cent. The core of the transformer is a split laminated ring of 16 sq. cm. cross-section and 16 cm. diameter. The secondary winding is made in twenty wedge-shaped sections of 2,000 turns each, so wound that they fit closely round the core when in position. The primary is in four sections of 100 turns each. Series, parallel or series-parallel connections may be used.

Appendices to the Paper deal with the troubles due to use of ebonite for electrostatic measurements, the design of instrument scales, and a bibliography.

## DISCUSSION.

Professor E. WILSON (King's College), in opening the discussion, asked what had been the experience of the authors with measurements at very low power-factors—say, below 0.1. About two volts were lost in the shunts, and, to get a deflection not too small, the volts on the instrument had to be increased, so that more energy had to be dissipated. If his instrument was used, one could get down to very low power factors.—The instrument referred to was invented by Professor Wilson and Mr. J. S. Highfield, and instead of shunts being used, the currents circulate in two air-cone coils, thus producing a vertical field, in which is revolved an armature at a known fixed speed by another motor, and the pressure produced by this charges the needle of a high-pressure electrostatic instrument whose quadrants are charged by the pressure of the circuit. This instrument has a large distance between the fixed and moving parts, a very wide range, and is very robust.

Mr. J. S. HIGHFIELD (Chief Engineer and Manager, Metropolitan Electric Supply Co.) referred to the importance of having instruments in power stations capable of measuring large amounts of power with considerable accuracy. The Wilson-Highfield instrument was very suitable for this work, as transformers were dispensed with.

Mr. G. L. ADDENBROOKE thought that the reason electrostatic instruments had so far not been much developed was because people generally had regarded the Kelvin electrometer as the last word in this kind of apparatus, and also because electrostatics was not now taught so thoroughly as formerly. By regarding many phenomena from the electrostatic side instead of from the current side, a much better idea of the distribution of potentials was kept in mind. He found that if large air-condensers were used, the electrostatic wattmeter could be used for very low power-factors. Though he started by using a two-volt drop, he now preferred only a 1.5-volt drop, as water cooling could be dispensed with if an oil bath was used. An accuracy of 1 part in 500 was quite sufficient for most purposes.

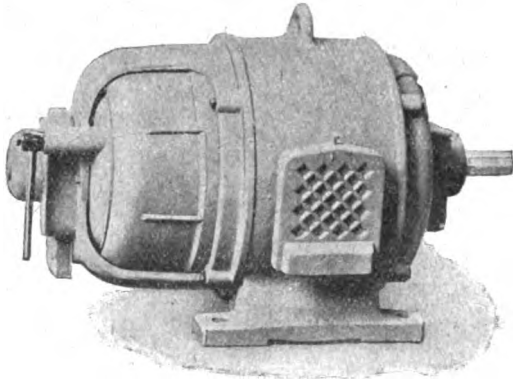
Mr. A. P. TROTTER doubted whether it was sound practice to use a single instrument for so many purposes. He did not think it advisable to calibrate the middle of the scale, as with a uniform curve the zero error could be assessed at any part of the scale. Mr. Addenbrooke's instruments were used, he knew, in a number of large works for testing purposes.

Mr. A. CAMPBELL (Principal Assistant, National Physical Laboratory) said that people did not generally appreciate the difficulties in the design of direct deflection instruments. He was pleased to see that the step-up transformer had been brought to such a high state of perfection. The inherent difficulty was that the primary self-induction must be as high as possible so that the number of secondary turns becomes excessive, and it is ready to resonate with a very small capacity across the terminals, the capacity of a few yards of flux often giving an error as much as 5 per cent. It was also impossible to avoid the effects of distributed capacity, and so errors due to resonance with harmonics came in. It was quite an easy matter to construct such transformers, but the authors' design gave an improved space-factor over his designs. He would like to know how much was the zero creep and how much the new standard wattmeter was better than the Kelvin voltmeters.

## SMALL INDUCTION MOTORS FOR ALL CLASSES OF WORKSHOP DRIVING.

PROMPT DELIVERY IN SIZES FROM  
1 TO 10 H.P. AT ALL THE USUAL  
SPEEDS AND PRESSURES.

OPEN, PROTECTED & ENCLOSED TYPES.



HIGHEST GRADE MATERIAL and  
WORKMANSHIP.

**BROWN, BOVERI & CO., Limited**

CAXTON HOUSE, WESTMINSTER, LONDON, S.W.

And at MANCHESTER, GLASGOW,  
and NEWCASTLE.

Mr. R. W. PAUL asked whether the cylindrical system had been considered by the authors, what was the capacity between needle and quadrants, and how much larger was it than with the cylindrical system of Ayerton and Mather. He thought that the period of the instrument was so long that it might be a disadvantage.

Mr. J. T. IRWIN (City and Guilds, Engineering, College) remarked that it was a big step to calibrate the wattmeter on unity power-factor and then use it for low power-factors, as the electrostatic wattmeter only read correct at zero and unity power-factor, since in addition to the spring control there was a certain control due to the voltage of the needle. He suggested a test turning the torsion head and calibrating at different voltages. He also showed how, by two tests, using an air condenser and a quadrature transformer, the effects of frequency and wave shape, if any, could be detected.

Mr. S. W. MELSOM (National Physical Laboratory) spoke of the insulating qualities of ebonite as affected by light, and the necessity for having a perfectly smooth surface to obtain constancy.

Professor J. T. MORRIS (East London College) asked what precautions were taken to get an alternating current with an accuracy of 1 part in 10,000.

In addition Mr. F. H. Nalder, in conjunction with the other speakers, expressed appreciation of the accurate work which had been accomplished by the authors, which, he said, was so perfectly done there was nothing to criticise. Mr. C. C. Paterson, in reply, said that it was doubtful whether it would be safe to raise the volts much above 10, as, above this, tilting of the needle was likely. It was not good to use 10,000 volts direct on an instrument, as these pressures were not often met with, and calibration was difficult. They used two volts because sufficiently robust control was obtained, but in Berlin 0.1 volt on the needle was used. They reckoned to have all their apparatus correct to 1 part in 10,000. The constancy of the current was obtained by driving the alternator, provided with heavy flywheels, by batteries. The field current was led into the motor through discs revolving in mercury. The zero creep due to the phosphor bronze suspension was fairly constant at about 3 mm. or less per full-scale deflection after 15 minutes. They had not considered the cylindrical system very carefully, as the temperature coefficient did not only depend on the length of the suspension. He did not think that Mr. Irwin's suggestions were correct. They had found that the change in constant was only 0.2 per cent. for a 10 per cent. voltage change.

## AN ELECTRICALLY DRIVEN ICE PLANT

THE Port of Blyth Steam Fishing and Ice Co., Ltd., are the owners of a large number of steam trawlers, and have their headquarters at Blyth, Northumberland. The preservation of the fish calls for a considerable amount of ice, and the Company have their own ice plant at Blyth Harbour, which is entirely electrically driven. Three-phase current is taken from the mains of the Northern Counties Electric Supply Co. at a pressure of 11,000 volts 40 cycles, and transformed down on the premises to 440 volts. The compressor room contains a five-panel distribution switchboard and four ammonia compressors by The Linde British Refrigerating Co., Ltd., each pair of which is belt-driven by a 30-h.p. slip-ring Westinghouse induction motor, running at 575 r.p.m., controlled by a liquid starter. Pipes from these machines are taken to the condenser coils on the roof of the buildings, over which sea water from the harbour is pumped by centrifugal pumps, belt driven by 11-h.p. squirrel-cage motors, running at 760 r.p.m. Upon leaving the cooling coils, the ammonia, now in a liquid form, is passed through an expansion valve, so that it is again gasified and lowered in temperature. It is then led to coils which are disposed in the brine tanks. Having abstracted heat units from the brine, the gas is again taken to the inlet side of the compressors. The brine—chloride of calcium in this case—is kept in circulation around the ice moulds in the freezing tanks by means of impellers operated through countershafting by 8-h.p. motors, one for each tank. Each row of ice moulds in the icemaking tanks is held together by means of a light steel framework, which is mounted on wheels running along rails in the tanks. When each row of frozen moulds is removed at one end of the tank, the remaining rows are pushed forward to allow this row to be replaced after the ice has been tipped and the row of moulds refilled. The rams which push the moulds forward are driven by the 8-h.p. brine impeller motors, through belts and gearing, the rams being advanced, returned and thrown out of action by the movement of a single lever. Each icemaking tank is served by a 4½-ton overhead travelling crane, by Messrs. Babcock and Wilcox, driven by a 4-h.p. slip-ring motor. After each row of moulds is lifted from the brine tanks it is dipped for a few seconds into a tank containing hot water, in order to loosen the ice in the moulds. Upon its removal from the hot-water bath the row of moulds is dropped into a hinged trough, when the crane is lowered and the contents of the moulds tipped. The hoists for handling the ice on the floor of the freezing room are driven through gearing by 1½ B.H.P. 750 r.p.m. squirrel-cage motors. Two ice crushers, together with creepers delivering ice at the quay side, are together driven by 15-h.p. 750-r.p.m. motors.

The machinery repair shop, woodworking shops and forge are located in a building close by the ice plant, and are driven by two 15-h.p. motors. The Company carries out most of its own repair work, in addition to making and mending ropes, nets, and other adjuncts of the fishing industry.

The power wiring consists of three-core paper lead-covered and braided cable supported on insulators. This system was chosen on account of the amount of moisture which is always present. It has also the advantage of reducing the "drop" along the cables, and makes a much neater arrangement of the wiring than is possible with single-core conductors, which are apt to become unsightly when a large number of individual motors are supplied from a common distribution box. The motors are sectionalised into two sections at the main switchboard, and the motors for each pair of compressors are controlled from a special type of distribution box. An ammeter and plugging arrangement is provided so that the current taken by each motor can be observed. Each box is of the three-phase type, and the outgoing terminals of the fuses are connected to special terminals at the front of the slate, so that connections can be made without any difficulty.

Altogether the plant is a most interesting one, and reflects great credit on the Linde British Refrigerating Co., its owners, the consulting electrical engineers—Messrs. Tennant and Barrs, of Newcastle, and the British Westinghouse Co., to whom we are indebted for the above particulars.

**Electrical Trades' Benevolent Institution.**—It will be remembered that at the Festival dinner, Mr. E. Byng offered to contribute £100 to the funds of the Institution if nine other persons or firms would do the same. Mr. G. Sutton and Mr. Hugo Hirst's donations of this amount have already been announced, and Mr. Emile Garcke has now also promised £100, making in all £400 out of £1,000. We hope that the remaining six donations of £100 will be speedily promised, as Mr. Byng's offer only holds for three months after the announcement was made.



## STREET LIGHTING SPECIFICATIONS

THERE was another long discussion upon the proposed standard clauses for inclusion in the specification of street lighting at the adjourned joint meeting of the Illuminating Engineering Society, Institution of Electrical Engineers, Institution of Gas Engineers, and Institution of Municipal and County Engineers, on Tuesday, April 29th. The previous discussion was reported in *ELECTRICAL ENGINEERING*, April 17th, page 218.

The adjourned discussion was opened by Mr. F. W. GOODENOUGH (Gas Light & Coke Co.), who laid down the requirements for a specification on which to invite tenders for street lighting as follows:—A basis easily comprehensible by members of local authorities, a standard with which "the man in the street" is familiar and can understand, and general, not limited, application. Such a specification should, he said, be so framed that it was not open to being interpreted in such a way that the lighting of a street was reduced to an absurdity whilst the specification was strictly complied with, and it should leave nothing to the discretion of the contractor. There should be no qualifying or descriptive clauses which leave to the lighting authority the decision of which scheme would prove most satisfactory for the lighting of the streets in question. Otherwise the whole object of adopting a "Standard Specification" would be defeated. Again, the provisions for making the tests, upon which penalties for deficiency are to be based, should be such as to secure as far as possible precision of result. In his opinion the draft specification failed to comply with any one of these requirements. He doubted whether one Councillor in a thousand could be made to understand what was meant by saying that the streets in his district would be lighted with a minimum illumination of 0.025 foot candles on a horizontal plane at a height of 3 ft. 3 in. above the ground level. There was no good reason why limits of specific candle-power should not be adopted as the basis of the street-lighting specification, and on this method streets could be graded into classes in which lamps of a specific candle-power would be placed on columns at a specific height and at a specific distance apart, according to the class. The argument of the advocates of the draft specification, that local authorities were out to buy illumination, was only using words to confuse ideas. The local authority wanted illumination as an effect, and to secure that effect lamps of certain candle-power at certain heights and distances apart were needed. If they did not work upon this basis there was the possibility of very small units of light being placed on very high columns wide apart, which would give the same minimum horizontal illumination as lamps of greater candle-power on lower columns at the same distance apart, or as lamps of the same candle-power on lower columns nearer together. Dr. L. Bloch, of Berlin, had expressed the opinion that the prescription of a certain minimum illumination alone was not sufficient to ensure a well-lighted street, and in further support of his own objection to the proposed specification, Mr. Goodenough also quoted Dr. Louis Bell. If the joint committee would abandon the proposed "unit of measurement clause," he said, and substitute one providing for rated candle-power of lamps determined by direct readings at specified angles, in a specified term, with a specified relationship between rating at the widest and narrowest angles, and would provide a schedule showing by what principle the arrangement, height, spacing, and placing of lamps of specified candle-power, the illumination of streets in different classes would be obtained, then a specification of real practical value with a true scientific basis would be provided. The draft specification, he concluded, was suffering from science run mad; it had the atmosphere of the laboratory and not of the street, and he asked the joint committee to come down to practical conditions and considerations.

Prof. J. T. MORRIS, referring to opinions of well-known men on the Continent and in America, suggested it might be possible to arrange for minimum horizontal illumination, plus either the average or the mean hemispherical candle-power given by the lamps.

Mr. J. W. D. BRADLEY (Engineer and Surveyor to the Westminster City Council) said that he had for twelve years conducted the execution of contracts for public lighting definitely based on a candle-power standard, and he did not hesitate to express satisfaction with these contracts, and his preference for that system over the surface illumination test. To give an intending contractor the candle-power he is required to supply, and the height above the street at which it was to be fixed (stating within limits the polar distribution), and reserving the right of approval of the general character of the lantern and its reflectors, supplied him with a definite practical problem to solve, and he could deal with it with much less trouble than if he had to consider the many points involved by the adoption of a minimum illumination value over a large area. He believed that he had been the first to specify a definite amount of measured light as a basis for tendering.

Mr. FRANK BAILEY (Chief Engineer, City of London Electric Lighting Co.), after expressing his complete approval of the draft specification, said he regretted that an attempt had been made by Mr. Abady at the last annual meeting of the Institu-

tion of Gas Engineers to prejudice the consideration of the draft specification by adversely criticising it in public, whilst it was still a confidential document.

The Chairman, however, remarked that he thought that the responsibility for this discussion rested with the Council of the Institution of Gas Engineers, and not with Mr. Abady.

Mr. E. ALLEN (Vice-President of the Institution of Gas Engineers) held similar views to the other representatives of the gas industry, and thought something might be done to act upon Prof. Morris's suggestion of taking into account something else in addition to minimum horizontal illumination.

Mr. ROGER T. SMITH (Great Western Railway Company) sympathised with the committee in their efforts to save time by the adoption of minimum horizontal illumination, and said that for his railway-station lighting he had adopted this plan, although he had also included diversity factor and a term for intrinsic brilliancy of the lamp in his own specification.

Mr. W. R. COOPER thought the objections to the use of minimum horizontal illumination were largely due to misconception. If minimum illumination, one great advantage of which was that it took advantage of every mortal thing, was not adopted, what was the alternative? He did not think the difficulty of taking candle-power only as the basis was appreciated, and thought the horizontal illumination on the street surface was the best.

Mr. JACQUES ABADY said he believed that, but for the criticism at the Institution of Gas Engineers, the specification would have been a *fait accompli* by now. Continuing, he expressed himself with great vigour against the specification, which he characterised as completely wrong from beginning to end. It set up, he said, a certain standard minimum, measured in a particular way, and then admitted that 80 per cent. of the streets could not be so measured. It was the candle-power that produced the horizontal illumination, and not *vice versa*, and therefore why not measure the candle-power? Mr. Harrison's table at the end of the specification was based upon theory run mad. Taking two lamps 100 ft. apart and 10 ft. high, they would have to have a candle-power of 95.5 in order to give a horizontal illumination of 0.01 foot candle. Supposing there was a badly-lighted street which it was desired to illuminate better. An electrical engineer might offer to supply 100-watt lamps which would give 95.5 candles. A gas engineer who worked upon the specification and the table would find that incandescent gas lamps of 43.8 candle-power on posts 20 ft. high and 100 ft. apart would give the same minimum horizontal illumination as the electric lamps of 95.5 candles on posts 10 ft. high. This appeared to him absurd. Again, assuming lamps 10 ft. high and 100 ft. apart, according to the table they would have to be 95.5 candle-power, but if they were moved only 10 yards further, then the illuminating power would have to be more than doubled. Could it be said that the lighting of a street under these two sets of conditions would be the same? The 200 candle-power lamps would, of course, be very much better than the 95 candle-power lamps, and yet the table showed them to be equal.

Mr. LEON GASTER explained that it was not intended that the draft specification should be adopted before it had been openly discussed at a joint meeting of all concerned.

Mr. A. P. TROTTER briefly replied to the discussion. With regard to Mr. Abady's remarks that minimum horizontal illumination was absurd, he referred him to the report of the surveyors in the Paper, who drove through the streets and classified them into three classes. The photometrists went out and made measurements which fell into exactly the same classes as the surveyors found. He would like to hear anybody explain that away. He was sorry, he said, that, after all the trouble he had taken, that he had not yet been able to convey to Mr. Abady what illumination really meant.

We have received a long letter from Mr. K. Edgcombe referring to some remarks made by Mr. Goodenough to which Mr. Edgcombe had not the opportunity of replying, as he had already spoken in the discussion. What Mr. Edgcombe wishes in particular to make clear is that his being now in favour of the draft specification did not imply that he had changed his views since writing an article in 1907 that had been quoted by Mr. Goodenough. Mr. Edgcombe points out that in that article he distinctly stated that it was the average horizontal illumination that mattered. He was still strongly of that opinion, although he was not in favour of making the statement of either maximum or average illumination compulsory in a specification.

**Meter Approved.**—The Board of Trade has approved the Bat meter, type H.T.R., for use on the two-wire continuous-current system.

**Manchester Local Section of the Institution of Electrical Engineers.**—The annual report records the holding of twelve meetings during the past session and the annual dinner. The membership of the Section is now 812 (including 22 graduates and 197 students), an increase of 27 over last year. The constitution of the Committee for next session was given in *ELECTRICAL ENGINEERING*, April 24th, page 236. The Manchester Students' Section has held eight meetings and three visits to works.

### THE STRENGTH OF OSRAM LAMPS

THE motor car illustrated in Fig. 1 is used by the General Electric Co. (India), Ltd., for business trips to mills and factories within a radius of thirty miles of Calcutta. There are over fifty mills in this area, in every one of which Osram lamps are installed in considerable numbers. Not-

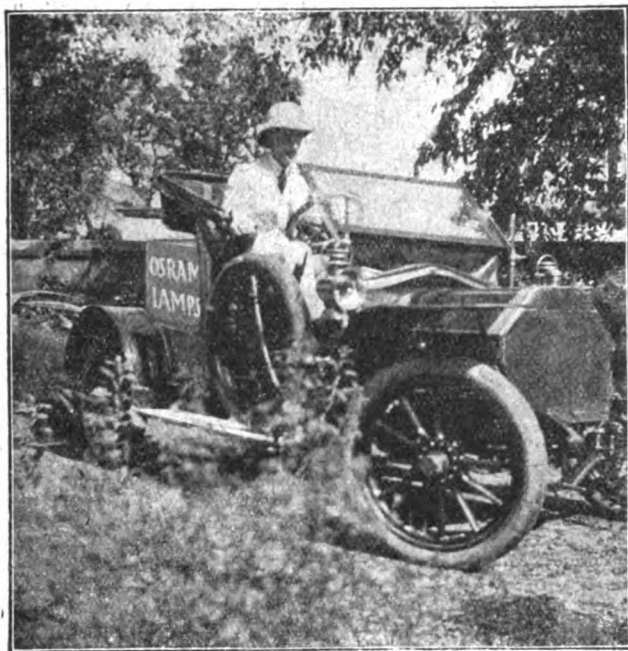


FIG. 1.

withstanding the fact that the vibrations to which the Osrams are subjected in these places are abnormal, no complaint of excessive breakage has been received. The case shown at the rear of the car contains samples of various types of Osram lamps. During a period of nine months the same sample lamps have been carried daily, and throughout this period only one has suffered through breakage of its filament. When it is remembered that the roads in India (as witness the illustration above) are extremely rough, it will be appreciated that the very strongest filaments are required to withstand the continual jolts and jars.

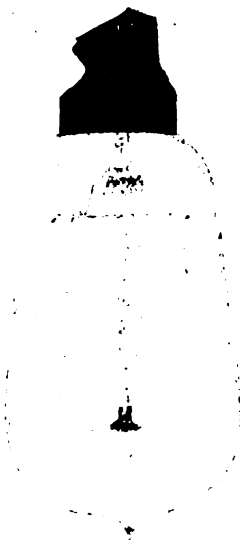


FIG. 2.

on the current, and immediately lit up, evidently being none the worse for its strange encounter.

**Tata Hydro-electric Power Supply Company.** We are given to understand that the total capacities of the motors and transformers to be applied to the textile mills and flour mills in the Bombay district, which are to derive their power from the mains of the above company, will exceed 36,000 h.p. for the motors and 40,000 k.v.a. for the transformers. At the present time, twenty-seven textile mills and two flour mills are to be electrified, and the whole of their equipment is being manufactured by the British Westinghouse Company. It includes, besides motors and transformers, the complete control gear for each mill.

### AN ELECTRIC KITCHEN

SOME three months ago Simplex Conduits, Ltd., equipped an electric kitchen in connection with their office staff dining club in Birmingham. The time is yet early to have secured any very exhaustive figures as to cost, but the records so far secured have already borne practical results, whilst the experience gained is proving exceedingly useful and clearly demonstrating that electricity can more than hold its own from every point of view for cooking, even on a more extensive scale than is required in the average household. Some forty meals are prepared per day,



SIMPLEX STAFF DINING CLUB ELECTRIC KITCHEN.

consisting of soup, at least two kinds of joints, a choice of sweets, coffee, &c., and in addition some sixty teas per day. The records of cost so far secured may be regarded as distinctly satisfactory, in view of the fact that they include the heating of all the "washing up" water, and that the cook has had no previous experience of electrical methods. The average cost per person per meal has proved to be a fraction of a halfpenny, with current at one penny per unit. The kitchen is being used to test articles of standard manufacture in actual practice rather than obtain results from the use of a large elaborate cooking range. The cook has become a firm convert to electric cooking and fully appreciates the advantages of the "Plexsim" Cooker, a large size of which is in constant use. So far there has been freedom from breakdown of the actual elements, the only mishap being a broken connection to the grill on a cast-iron oven. A view of the kitchen is reproduced.

### PETITION FOR REVOCATION OF PATENT

A PETITION brought by Peto & Radford, Ltd., for revocation of Patent No. 3,549,11 for a switch for motor-car lighting circuits, granted to Van Raden & Co., Ltd., and M. Metz, was heard on Monday last in the Court of the Comptroller-General of Patents. The petition was held to have failed.

The title of the patent specification is "Improvements in Methods of and Apparatus for the Electric Lighting of Motor Cars and for other Purposes." It is stated that the object of the invention is to provide a switch for controlling certain circuits from storage batteries. There are ten claims and seventeen figures. It was urged by Peto & Radford, Ltd., represented by Mr. Courtney Terrell, that the patent should be revoked under Section XI. c. of the Patents Act, 1907, on the ground of insufficiency of description of the invention (not the description of the apparatus), the insufficiency alleged being that the switch, as well as the circuit connections, were claimed, although the switch itself was old. An identical switch, with the exception of the "off" position, was said to have been described in Specification No. 13,903/06 by W. A. Stevens for the control of a petrol-electric system. There was no invention, said Mr. Terrell, in incorporating a separate switch for the "off" position into the circuit-controlling switch in the way it had been done by dividing an existing contact. The only novel parts were the circuit connections. The patent as it stood was too broad. Van Raden & Co., he said, had been threatened with an action for infringement, but their switch was not the same, and was not used for the same purpose. That was how the patent had been brought to their notice, and they petitioned for its revocation. Mr. J. Hunter Gray, who represented Van Raden & Co., objected to prior specifications being cited on the ground for revocation chosen, but after some discussion this was allowed in accordance with the Comptroller's previous practice in some cases. However, Mr. Gray's argument that the switch described was a new switch was upheld, and the petition was dismissed.

# QUESTIONS AND ANSWERS BY PRACTICAL MEN

## RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelopes.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,338.

What are the most sensitive and reliable high resistances suitable for use in a thermal detector for wireless, and how may they be cheaply constructed?—P. P.

(Replies must be received not later than first post May 15th.)

### ANSWERS TO No. 1,336.

Please give the best method of semi-indirect lighting of offices arranged as follows:—Room, 63 ft. by 23 ft. by 14 ft. high; six double desks across the room, each at present with six 32-c.p. tantalum lamps; height of lights over desks are 2 ft. Desk centres, 9 ft. 3 in.; height, 3 ft. 6 in.; lengths, 19 ft.; passage down one side, 4 ft.; ceiling whitewashed; end walls dark green; large windows at each side of room. There are no obstructions such as pillars. Compare cost of installing and current consumption with B.O.T. unit at 1d.—"MAN."

The first award (10s.) is made to "W. L. G.," whose reply is given in slightly abbreviated form below:—

I would suggest the following scheme of semi-indirect lighting for the office in question. I gather the existing conditions consist of thirty-six 32-c.p. tantalum lamps arranged in rows of six over each desk, the total candlepower being 1,152, and, assuming a lamp efficiency of 1.7 watts per c.p., a consumption of 1.95 units per hour, practically 2 units per hour. The existing candle-power per sq. ft. of area works out at 1.26 c.p., which is somewhat high according to the various tables given in text-books, and has doubtless been found to be too severe. The object of semi-indirect system of lighting is to reflect most of the light on to the ceiling, at the same time allowing a certain amount through the opal bowl in the form of direct light. With the fittings suitably spaced, a most comfortable and soothing effect is at once apparent and with the absence of "glare." Having regard that the scheme is for office lighting, and doubt-

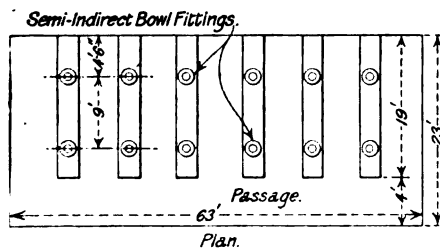


FIG. 1.

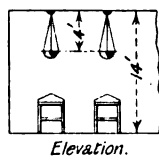


FIG. 2.

less economy of working is essential, I would suggest that over each desk be installed two semi-indirect fittings, fitted with 16-in. diameter opal bowls arranged as in Fig. 1, each fitting to be of 100-watt capacity, the lamp to be of the tungsten type having an efficiency of 1.25 watts per c.p. The fittings should be arranged 10 ft. from floor to brass bowl rim, with 4 ft. suspension from ceiling (see Diagram 2). Each fitting should have its own local switch for economy of working. This arrangement will give an illumination of 2.5 to 3 foot-candles on the desks. Good practice for direct office lighting is to allow 0.5 c.p. per sq. ft. of area, and add, say, for loss in semi-indirect system, 20 per cent., as

the walls are dark. In comparing the cost of installing, the wiring per point will be identical; the only difference will be the extra cost of the fitting, which is, roughly, five times greater than an ordinary plain office pendant with opal shade. In regard to current consumption, the system would take 1.2 B.O.T. units per hour with tungsten lamps; and here I would point out the saving effected is really due to the adoption of higher efficiency lamps and a reduction in the illuminating power, as the existing system appears excessive.

The second award (5s.) is made to W. D. Douglas, for a reply which is given somewhat condensed below:—

In this case, the work being presumably of a clerical nature, an intensity of 4 candle-feet on the working plane may be taken as a satisfactory allowance. The area of the working plane may be taken as 60 ft. x 21 ft. = 1,260 sq. ft.; therefore, the amount of effective light needed, measured in lumens (area in square feet x by intensity in candle-feet), is  $1,260 \times 4 = 5,040$  lumens.

With most commercial semi-indirect fittings about half the light will fall on the reflector, and about 45 per cent. will reach the ceiling direct. Of the former amount, about 50 per cent. (25 per cent. of the total) will be reflected, 40 per cent. (20 per cent. of the total) transmitted, and about 10 per cent. (5 per cent. of the total) absorbed. The total amount of light falling on the ceiling is thus 70 per cent. Of this, about 55 per cent. (38 per cent. of the total) will reach the working plane, allowing for the darkening of the white ceiling with time. Of the light transmitted through the reflector bowl (20 per cent. of the

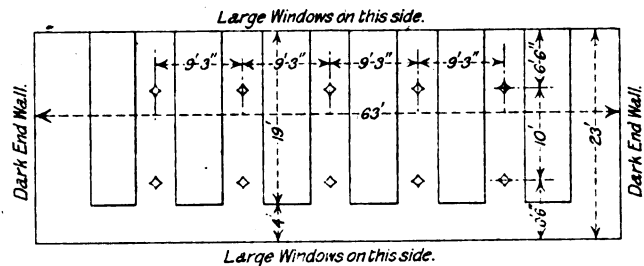


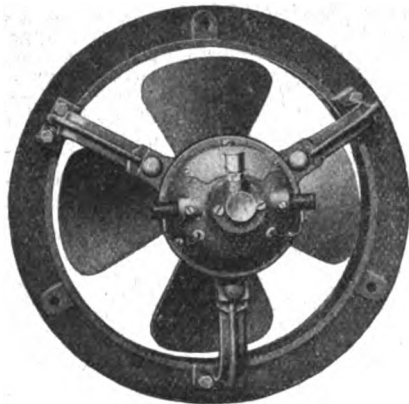
FIG. 3.

total), about 15 per cent. of the total will reach the working plane. Thus out of the total amount emitted by the assumed light source,  $38 + 15 = 53$  per cent. will be available for illuminating purposes. Therefore, the total light emitted by the lamps must be 9,520 lumens. A 40-watt tungsten lamp gives 323 lumens; therefore, thirty 40-watt lamps will be sufficient. The Holophane prismatic semi-indirect form of reflector has been assumed. If a less efficient reflector bowl is used, the intensity on the working plane will be correspondingly reduced. A good arrangement would be to have ten reflector bowl fittings, each to take three 40-watt lamps. These should be mounted in pairs centrally over the spaces between the desks, i.e., 9 ft. 3 in. apart. This permits of easy access for cleaning the bowls, which should be done frequently; and it must be remembered that the majority of the light is being reflected from the ceiling, which removes the necessity for having the bowls over the desks. This disposition leaves a space of 13 ft. between the last pair of bowl fittings and the end walls. This has the advantage that the intensity of light on the ceiling will shade off, making less of a contrast with the dark end walls, and the intensity on the end walls themselves will be low, both of which conditions will tend to provide a slight rest for the eye when it is raised from its work. The bowl fittings should be suspended 2 ft. 6 in. to 3 ft. below the ceiling. The installation of this system should almost halve the operating costs, its consumption being 1,200 watts, or 1.2 B.O.T. units per hour, against 2,300 watts, or 2.3 B.O.T. units per hour with the local lighting. At the very low rate of 1d. per B.O.T. unit, this would represent a saving of 1.1d. per hour. The cost of installation, including fittings and labour, would probably be about £12 10s., but this would vary with local conditions.

**The Imperial College of Science and Technology.**—The London County Council announces that it is prepared to award a limited number of free places at the Imperial College of Science and Technology for the session 1913-14. No restrictions as to income are prescribed, there is no written examination, and the places are awarded for one, two, or three years on consideration of the past records of candidates. Application forms may be obtained from the Education Officer, L.C.C. Education Offices, Victoria Embankment, W.C., and must be returned not later than Saturday, May 24th, 1913.

### A NEW PROPELLER FAN

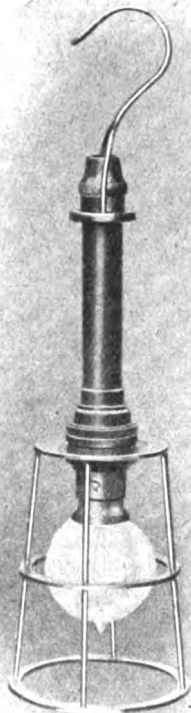
WE have received particulars from the Wilson-Wolf Engineering Co., Ltd. (Thornton Road, Bradford), of their new "Polar" propeller fan, illustrated below. This is a medium-power fan running at a slightly higher peripheral speed than the corresponding sizes of the same firm's "Arctic" fans, and discharging about 10 per cent. less air.



Owing to the higher speed, they are fitted with smaller motors, and in consequence their prices are lower. A feature is that the blades are reversible, so that, to change the direction of the discharge air, it is only necessary to reverse the direction of rotation. The rings are circular and can be quickly fixed, and the motors are dust-proof and fitted with combined thrust and journal ball-bearings.

### INSPECTION LAMPS FOR MOTOR CARS

SOME useful new patterns of inspection lamps for motor cars have been brought out by Simplex Conduits, Ltd. (116 Charing Cross Road, W.C.). One of these is the lamp illustrated here, which is sold at the low price of 4s. 6d., including a 4, 6 or 8-volt lamp and three yards of flex. It is strongly made in brass and is provided with a substantial guard, a suspension hook, and a cord grip at the top to prevent the wire pulling out. A more elaborate pattern has a glass globe over the lamp and an arrangement of three brass legs for standing the lamp upright. A guard can be fitted over the glass globe, constructed so that the legs or hook can be used at either end.



**A Water Power Scheme with 5,412-feet Head.**—The scheme which is now in hand for utilising the water power of the lake of Fully, near Martigny, Valais, Switzerland, will employ the highest head of water that has yet been used, namely, 5,412 feet. The scheme has been worked out by M. Boucher, of Lausanne, the orders for the material have been placed, and the work has commenced. The pipe line has to withstand a pressure of 2,425 lbs. per square inch at the lower end, and special construction was necessary. The pipe line in a length of about 2½ miles consists of pipes with inside diameters of 19½ in. and 23½ in., and thicknesses of from 1½ in. to 1¾ in. The pipes of the upper section will be of the water-gas lap-welded type, whereas those of the lower part will be seamless, drawn from a steel ingot. The turbines for 15,000 h.p. will be built by Piccard, Pictet & Co., of Geneva, and the construction of the pipe line is in the hands of Thyssen & Co., at whose works at Mülheim (Ruhr) the pipes are being constructed.

### PROFESSOR C. F. DUSSAUD'S "COLD LIGHT"

A DEMONSTRATION of Professor C. F. Dussaud's "cold light," which has been much referred to in the French, and also the English Press recently, was given at the offices of Messrs. Louis Schloss & Co., 3 Rangoon Street, Crutched Friars, last week. Briefly the method consists in employing incandescent lamps with drawn tungsten filaments which are enormously over-run, and alternately switched on and off. We gathered from conversation with the inventor, that lamps run at 150 per cent. excess voltage, and alternately switched on and off from forty to fifty times a second, will last several hundred hours, but we were unable to ascertain the relation between the length of the period of incandescence and rest which results in this enormous difference between the life of the lamp used in this manner, and one over-run with ordinary alternating current, or whether it is merely the substitution of intermittent for alternating current which produces the long life claimed. In an alternative arrangement the frequency of interruption of current is lower, but three lamps are employed which are successively lighted so as to give a continuous effect without flicker.

Professor Dussaud proposes to use his system, among other things, for lighthouse work, but with a less frequency of interruption, by simply arranging that the revolving lamp shall be automatically switched off when turned away from the sea. For cinematograph work he also proposes to arrange a revolving contact maker on the shaft of the apparatus, so that the lamp is only alight (about 150 per cent. over-run) for the fraction of a second in which each picture is at rest, and is then extinguished during the time taken for the following picture to take its place. The lamp would thus be lighted sixteen times in a second, and would be alight for three-quarters of each sixteenth of a second and extinguished for one quarter. In this case, of course, Professor Dussaud does not expect that the lamp will have a very long life, but he considers that the saving in energy and apparatus will more than compensate for the cost of lamp renewals, and there is the additional advantage that the temperature of the bulb practically does not rise at all, so that there can be no danger of setting fire to the film. It is the high efficiency of an over-run lamp, and in consequence the relatively small heat production, compared with an ordinary lamp, which is accountable for the name "cold light" which Professor Dussaud has given his system.

### CORRESPONDENCE BURGLAR ALARMS.

*To the Editor of "ELECTRICAL ENGINEERING."*

SIR,—Referring to the diagram on your "Questions and Answers" page in to-day's issue, the magnetic switch therein is obviously shown diagrammatically, not as actually constructed. Now as small magnetic, or, more correctly, electrically-operated switches for use on low-voltage circuits and small currents are not very common items, it would be interesting if "Alarm" would say what make of switch he uses. I can only call to mind one make, and this is double-pole and of rather unwieldy construction.

Yours faithfully,  
W. PERREN MAYCOCK.

West Norwood, April 24th, 1913.

We have also received a letter from Mr. C. W. von Roemer, pointing out that the diagram of connections which "Alarm" gives is not correct as it stands, for, owing to the use of a common terminal, the switching on of any of the three lamps by its own switch would also light the other two lamps as well. Instead of the single set of contacts on the magnetic switch, three sets of contacts would be necessary if three lamps are to be lighted automatically when the alarm is actuated.

### THE "POINT FIVES."

*To the Editor of ELECTRICAL ENGINEERING.*

SIR,—I have been asked to make it quite clear as to the persons entitled to attend the above meeting during the M.E.A. Convention week on June 17th. On behalf of the Association I would like to say that it was the wish of our members at the Bradford meeting that any persons interested in pushing the use of electricity for domestic purposes would be welcomed, whether manufacturers, other technical men, or laymen. In order that the Committee may make arrangements for the place of meeting, it is necessary that all who propose to attend should let me know not later than May 22nd.

Yours, &c.,  
A. H. SEABROOK, Hon. Sec.

19 York Place, Baker Street, W.  
2nd May, 1913.



## STEPNEY AND THE B.E.A.M.A. GENERAL CONDITIONS

THE Stepney Borough Council has, on the recommendation of Mr. W. C. P. Tapper, the Borough Electrical Engineer and Manager, accepted Messrs. Escher Wyss & Co.'s tender for two 5,000-kw. turbo-alternators at a price of £38,031. This tender was so much below the next lowest that in all probability it would have been accepted in any case, but it may be noted, however, that all the British firms tendering refused to accept the Stepney Borough Council's general conditions, and tendered only to the new general conditions of the British Electrical and Allied Manufacturers' Association, to some clauses of which objection was taken by the Borough Council. One of these clauses, we understand, would absolve the contractors from penalty for delay due to "unusual inclemency of weather, civil commotion, general or local strikes or lock-outs, combinations of workmen, or in consequence of fire, or of any accident in the manufacture of important parts of the plant, or of any accident to or breakdown of important parts of machinery in the contractors' or sub-contractors' premises."

Another clause to which objection was taken is that relating to the time of taking over the plant. It appears that according to the B.E.A.M.A. conditions the contractor can give the engineer two months' notice that the plant is ready, and unless the engineer puts in an objection the plant is regarded as having been automatically taken over.

The amounts of the tenders were as follows, some firms having tendered for different makes of condensing plants and alternators in connection with their engines. Where not otherwise stated, the speed is 1,500 r.p.m.

Escher Wyss & Co., £38,031; Dick, Kerr & Co., £41,215; Richardson, Westgarth & Co., 7 tenders from £41,223 to £45,345; Willans & Robinson, 8 tenders from £41,089 to £49,130, and 2 tenders (£43,570 and £44,850) at 3,000 r.p.m.; Belliss & Morcom, 3 tenders from £43,195 to £46,573; Brush Co., £43,500 at 3,000 r.p.m.; J. Howden & Co., 5 tenders from £41,665 to £45,679; C. A. Parsons & Co., 4 tenders from £45,591 to £47,434, and one (£41,495) at 3,000 r.p.m.; British Westinghouse Co., £47,627; B.T.H. Co., £47,750; Oerlikon Co., £50,091 and £50,430.

## THE COAL SPECIFICATION OF THE ASSOCIATED MUNICIPAL ELECTRICAL ENGINEERS (GREATER LONDON)

A MODEL specification and conditions of contract for the purchase of coal for electricity works has been drawn up by the Associated Municipal Electrical Engineers (Greater London) and approved as a fair specification by the Society of Coal Merchants. Copies are available at a price of 10s. from the Hon. Secretary, Mr. E. S. Calvert, Electrical Engineers' Office, Finchley, N. A standard form of advertisement for tenders is proposed, and the general conditions are long and evidently carefully thought out. The general idea of the specification is that tenders may be invited alternatively for "named coal," that is, coal from a known pit, of a particular class and size, as specified by the colliery, or for "guaranteed coal," that is, coal which is to come up to certain standards of calorific value, moisture and size, as defined in a table attached to the specification. Thus, to take one example out of the eighteen classes of coal scheduled, "Semi-bituminous and pseudo-anthracite Welsh washed large nuts are to have a calorific value of 14,300 B.Th.U. per lb., moisture not exceeding 5 per cent. and not more than 15 per cent. is to pass through a  $\frac{1}{4}$  in. square mesh sieve. The specification sets out the method of taking samples, and requires that the tests of calorific value are to be taken by the Mahler Bomb calorimeter. The tenderer is to be allowed to nominate experts, to be approved by the purchaser, in case of dispute. Perhaps the most important part of the specification is the scale of bonuses and penalties, which provide within certain limits for increase or decrease of the price in direct ratio to the calorific value. There are also adjustments of price dependent upon the percentages of moisture and small coal, and the purchaser is to have the right to reject the consignment altogether if it is more than  $7\frac{1}{2}$  per cent. below the calorific standard, if the moisture exceeds  $1\frac{1}{2}$  times the standard percentage, or if the proportion of small coal as defined in the schedule for that particular class of coal exceeds 25 per cent. by weight. Forms of schedule for tenderers' prices are appended to the specification.

## CATALOGUES, PAMPHLETS, &c., RECEIVED

**TELEPHONE AND TELEGRAPH CABLES.**—A finely printed and useful catalogue of telephone and telegraph cables has been issued by W. T. Henley's Telegraph Works Co., Ltd. (Blomfield Street, London Wall, E.C.). It occupies 138 large and well-illustrated pages, and covers every type and almost every useful size of dry-core cable, as well as rubber-insulated and pure rubber aerial cables, cables and wires for internal telephone work, and all accessories. The greater part of the book relates to multiple cables, and besides the ordinary dry-core multiple telephone cable, the "quad" type, screened telegraph cables and subaqueous cables are dealt with, among others. Useful notes on testing and jointing are included, and a page is devoted to the subject of loading telephone circuits. The dimensions throughout are given both in the British and metric system. Every telephone engineer should obtain a copy of this list, as it cannot fail to be of service to him.

**AIR COMPRESSORS.**—A well-illustrated catalogue from Isaac Storey and Sons (Empress Foundry, Cornbrook, Manchester) deals with Scott's patent air compressors, of which they are sole makers. The main features of these compressors are the measures taken to ensure small clearances, efficient cooling and inter-cooling, and the particularly quick acting and reliable valves of the multiple-ball type, entirely without springs and requiring no valve pockets.

**INTERCOMMUNICATION TELEPHONES.**—The Sterling Telephone and Electric Co., Ltd. (200 Upper Thames Street, E.C.), describe the "Primax" intercommunication telephone system in a new pamphlet.

## ELECTRIC TRACTION NOTES

Arrangements are now complete for the Congress of the Tramways and Light Railways Association at Blackpool on June 12th and 13th. The headquarters will be the Imperial Hydro Hotel. On the Thursday, after a reception by the Mayor and Corporation and the Blackpool and Fleetwood and Blackpool and St. Anne's Tramway Cos. Papers by Mr. E. H. Edwardes, on "Possibilities for Increasing Profits on Inter-urban Lines," and by Mr. F. Bland, on "Tramways, a *Résumé*," will be read. The Papers down for Friday's meeting are "Railless Traction and Motor Buses," by Mr. H. England, and "Standard Rules for Motormen and Conductors," by Mr. A. V. Mason. Excursions are arranged for both afternoons, a banquet will be held on Thursday evening, and a dance on Friday evening.

The Metropolitan Electric Tramways (Railless Traction) Bill has been passed by a House of Commons Committee presided over by Sir Ivor Herbert. The Bill provides for linking up the Middlesex and Walthamstow electric tramway systems between Wood Green and Walthamstow, over a route for which the Metropolitan Electric Tramways, Ltd., had powers to construct a tramway, but which it was not thought would be financially successful. One of the conditions attached to the Bill is that a bridge over the River Lea shall be widened. The question of a contribution towards road maintenance did not arise in this case, as the company has a working arrangement with the Middlesex County Council with regard to tramways in the greater portion of Middlesex.

The Finance Committee of the Manchester Corporation has pointed out that, on the basis of 5 per cent. on capital expenditure, the Tramways Department should contribute £103,117 to rate relief for the past completed financial year. The Tramways Committee, however, have protested against a larger sum than £100,000 being allowed, which sum was provided for in the annual estimates. The Corporation are to be asked to sanction a visit by the General Manager and Permanent Way Engineer to London, Glasgow, Paris, Berlin, Hamburg, Vienna, New York, Boston, Philadelphia, Chicago and Toronto to study methods of passenger transportation.

Mr. Harry Lawson has given notice that on the second reading of the L.C.C. (Tramways, Trolley Vehicles and Improvements) Bill he will move that the Select Committee be instructed to insert a provision making the running of trolley vehicles subject to the provisions of Section 23 of the L.C.C. (Electrical Power) Act, 1900. This section is the one which gives the Borough Councils veto over the system of traction to be adopted, and has been used in several parts of London as a means of preventing the use of overhead wires.

## "ELECTRICAL ENGINEERING" PATENT RECORD

*(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)*

### Specifications Published May 1, 1913

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

24,122/11. **Power Transmission.** H. B. VAN DAALLEN and H. P. SCHREIBER. For power transmission from a prime mover two independent armatures are mounted in a single stationary field, the intensity of which can be varied at different points. Five figures.

430/12. **Operation of Track Points of Telfer Tracks.** R. P. STRACHAN and STRACHAN & HENSHAW, LTD. The switches or points are controlled from the telfer cab. They are worked by an electric motor through an eccentric or crank, and the motor is braked near the end of the stroke of the crank. Six figures.

8,682/12. **Geysers.** C. R. BELLING. The general arrangement of the spiral type described in ELECTRICAL ENGINEERING, Vol. VIII., p. 324, June 13th, 1912. Two figures.

9,981/12. **Manufacture of Drawn Tungsten Wires.** C. H. FISCHER. Pure anhydrous tungstic acid is reduced by a hot current of hydrogen in the presence of a volatile drying agent, e.g., phosphorus pentoxide. The crystals of tungsten which are formed are separated out, cooled, pressed into flakes, and then agglomerated, by pressing and simultaneously heating, into rods, which are then rolled in a machine which applies pressure at more than two points. Three figures.

19,014/12. **Wireless "Calling-up."** F. JAMIESON. Selectivity is obtained by using a continuous wave train from the transmitting station, which lasts a given time for each station. The receiving stations are fitted with clockwork, which starts up on receipt of the first wave, and runs until the wave train ceases, but only that station which is tuned for the exact time of the wave train is called up. This is obtained by the construction of a switch controlled by the clockwork. Four figures.

### Specifications Published To-day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, E.C., at the price of 8d. each, post free.

Names in italics indicate communicators of inventions from abroad. Summaries of some of the more important of these patents will appear in our next issue.

**Arc Lamps:** SCHUER [Flame arcs] 10,496/12.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** KETTERING [Storage systems] 3,794/12; WESTERN ELEC. (*Western Elec.*) [Cables] 9,509/12; MARKS (*Reinert*) [Supporting of insulators for conductors] 10,805/12; METAL JOINTING CO. and HARDEN [Carrying metal-sheathed cables through bulkhead partitions] 10,989/12; DE STEFANI [Protective apparatus] 22,129/12; MARKS (*Brown, Boveri*) [Parallel working of synchronous machines] 24,097/12.

**Dynamos, Motors, and Transformers:** BROWN, BOVERI [D.C. transformation] 6,550/12; ROSENBERG [Synchronous machines] 9,644/12; BROWN, BOVERI [Phase compensation in induction machines] 10,113/12; WESCOTT [Current transformers] 28,967/12.

**Electrometallurgy and Electrochemistry:** MARKS (*Patents Purchasing Co.*) [Arc furnaces] 8,791/12; STEYNIS [Manufacture of ozone] 19,146/12.

**Heating:** KISSHÁZY [Vulcanisers for tyres] 1,579/13.

**Ignition:** STURGEON [Setting timing gear] 26,443/12.

**Incandescent Lamps:** DEUTSCHE GASGLÜHLICHT (Auer-Ges.) [Wire drawing] 11,439/12; SCOLLAR and DICK, KERR [Filament manufacture] 11,455/12; BAUM [Metal filament holders] 16,865/12; WESTINGHOUSE METALLFADEN GLÜHLAMPENFABRIK [Treatment of metals or alloys to render them ductile and malleable] 19,283/12.

**Instruments and Meters:** MAURICE [Electrometers for measuring variations in earth potential] 18,065/12; SIEMENS BROS. & CO. (*Siemens & Halske*) [Hot-wire instruments] 943/13.

**Storage Batteries:** WOOD [Accumulator lugs] 12,713/12.

**Switchgear, Fuses, and Fittings:** TURNER [Switches for multiple unit control] 13,740/12; B.T.H. and WALLACE [Switches] 15,776/12; SCHATNER [Electro-magnetic remote-control switches] 20,247/12; BURR [Oscillating spring contact for bells, &c.] 22,311/12; RAILING, STRACHAN and COATES [Time lags] 22,509/12; MAJORANA [Discharge apparatus] 23,024/12.

**Telephony and Telegraphy:** STERLING TELEPHONE (*Telephon Fabrick vorm J. Berliner*) [Combined intercommunication and party-line telephones] 6,580/12 and 7,593/13; KLEINSCHMIDT [Keyboard tape perforators] 8,960/12 and 1,267/13; BROWN [Telephony] 9,179/12; WILLIAMS [Automatic wireless alarm] 9,882/12; HILTZ [Printing telegraph receivers] 14,831/12; KNUDSEN [Telegraph apparatus] 15,591/12; IMRAY (*Cie Generale*

*Radiotelegraphique*) [Receivers for wireless] 28,070/12; FULLER [Antiseptic guards for telephone mouthpieces] 4,704/13.

**Traction:** TURNER [Electric tramway brakes] 15,023/12.

**Miscellaneous:** CLARKE and CHADBURN'S (SHIP) TELEG. [Direction tell-tale or indicator] 9,673/12; COOK [Keyboard controlled signals] 16,765/12; STEWART [Magnetic speedometers] 17,942/12; "CEDES" ELEC. TRACTION and CLIFFORD [Extensible ladders for fire-escapes] 20,244/12; GARNHAM [Egg tester] 22,603/12.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Dynamos and Motors:** ALLMÄNNA SVENSKA ELEK. AKTIEBOLAGET [A.C.] 7,776/13.

**Heating:** GEB. SIEMENS [Non-metallic elements] 7,932/13.

**Ignition:** BOSCH [Distributor] 5,532/13.

**Incandescent Lamps:** STEINMANN [Mercury vapour] 8,172/13.

**Instruments and Meters:** SIEMENS & HALSKE [Housing the recording strip of electrocardiographs] 7,846/13; [Photographically recording electrical measurements] 8,240/12.

**Switchgear, &c.:** BRUNN [Commutator switches] 2,295/13.

**Telephony and Telegraphy:** BLACKWELL [Reducing telephone disturbances] 2,508/13; KÄHLER [Telegraphy] 8,173/13.

**Miscellaneous:** CAMPBELL [Measuring capacities] 2,009/13; SIEMENS SCHUCKERT [Regenerating transformer oil] 8,130/13.

### Application for Amendment

20,277/04. **Manufacture of Drawn Tungsten Filaments.** C. D. ABEL (*Siemens & Halske*). Application has been made by Siemens Bros. & Co. for leave to amend this specification "for the purpose of narrowing the claims, more clearly defining the scope of the invention, and of removing matters which are superfluous." There are four claims to this specification. The first three cover the manufacture of drawn filaments of molybdenum, thorium, tungsten, zirconium, or alloys thereof, free from non-metals, by heating the metal or alloy in a vacuum or indifferent atmosphere by the passage of an electric current and then drawing the mass. It is proposed to delete molybdenum, thorium, and zirconium, and the claim for alloys, and to qualify tungsten by the word "drawn." In addition it is proposed to delete Claim 4 entirely. This is for manufacture from a compound of the metal with elements which are separated in a gaseous form on heating.

### Grant of Patent Allowed

26,184/11. **Oil and Electric Furnace.** V. STOBIE. The Comptroller has allowed the Grant of this Patent subject to Amendment.

### Expiring and Expired Patents

The following Patent expires during the current week, after a life of fourteen years:—

9,882 of May 10th, 1899. **Train Lighting.** E. J. PRESTON and A. B. GILL (*J. Stone & Co.*). This specification covers some improvements in detail of the Stone system of train lighting. An electromagnetic switch on each coach is controlled by a switch in the guard's van. The lubrication of the bearings of the dynamo is controlled by electromagnets so that the oil supply is cut off when the dynamo is at rest. Where two batteries are used and are put in parallel by the short-circuiting of the resistance between them by the slowing down of the train, an increase of pressure, due to one battery being more highly charged, sometimes passes an increased current through the lamps. To obviate this the resistance is subdivided, only a portion being short-circuited.

The following are the more important Patents that have become void through non-payment of renewal fees.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** H. H. LAKE (*W. G. Clark, U.S.A.*) [Cable insulators] 1,395/07; R. B. RANSFORD (*W. A. Manson, South Africa*) [Insulated wire strainer] 980/08.

**Dynamos and Motors:** H. F. T. ERBEN [Adjusting effect of commutating poles] 5,866/07.

**Ignition:** A. F. WHITE [Magnet ignition] 1,091/06.

**Incandescent Lamps:** B. T.-H. (*A.E.G.*) [Filament supports] 1,196/07.

**Switchgear, Fuses, and Fittings:** T. S. PERKINS [Motor controllers with magnetic blow-outs and refractory shields] 13,860/00; C. A. PARK and C. L. MASON [Electro-magnetic switch for train lighting systems] 1,373/07.

**Traction:** R. and H. DUCKWORTH and D. KERR [Switches for the control of sectional conductor systems by the weight of the vehicle] 689/05.

**Miscellaneous:** W. FAIRWEATHER (*Arnold Magnetic Clutch Co., U.S.A.*) [Adjustable speed magnetic clutch] 1,349/04; J. C. BOUSFIELD (*P. Boll and R. Falkner, Australia*) [Sheep shearing machine] 906/08.

# ADAMS IGRANIC

ELECTRIC CONTROL GEAR FOR PUMPS.

ADAMS  
M<sup>FG</sup> C<sup>Y</sup> L<sup>TD</sup>  
BEDFORD  
AND  
LONDON

## TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

The attention of the Marconi Committee has at last been directed once more to wireless telegraphy. The members of the Committee themselves have been too much interested in speculations, rumours of speculations, and speculations as to the source of rumours, to devote themselves to expediting the establishment of the wireless telegraph system urgently needed for the British Empire; but the technical "Advisory" Committee, appointed to report on the merits of existing systems of wireless telegraphy, particularly with a view to their capacity for continuous communication over distances repaired by the "Imperial Chain," have now issued their report. It is a clear and well-written document, giving precisely the information required and the reasons which have actuated the members of the Technical Committee in coming to their decisions. It will be remembered that the Committee was formed of the following members:—Lord Parker of Waddington, Mr. Duddell, Dr. Glazebrook, Sir Alexander Kennedy, and Mr. Swinburne, with Mr. Rayner as Secretary.

Stated in the briefest possible terms, the finding is that the Marconi system is the only one which has proved itself up to the present to be suited for continuous and reliable signalling at useful speeds by day or night over distances of from 2,000 to 2,500 miles—the distances required by the "Imperial Wireless Chain." The other systems considered were the Telefunken, Poulsen, Goldschmidt and Galletti. In the last mentioned (which is little known) a series of spark gaps are employed, arranged to operate in a cycle, each discharge causing an immediate discharge in the next spark gap of the series, so that the resulting oscillations from the sequence of discharges may be regarded as practically continuous; no evidence was given, however, as to the practicability of this system, even over short distances, although a representative of the Galletti Company was one of the witnesses heard. As regards the two systems using continuous oscillations—the Poulsen and the Goldschmidt—the conclusion arrived at is practically the same as that given in Mr. Duddell's presidential address at the Institution of Electrical Engineers last year, namely, that the arc in the former and the generator in the latter will have to be constructed to give more power to the aerial if effective transmission is to be accomplished over the very long distances in question. The advantages of continuous over intermittent trains of waves in allowing more accurate tuning and greater selectivity is admitted, and the Committee actually express the opinion that ultimately high-frequency continuous oscillation generators will displace high-frequency generators dependent upon spark discharges which produce groups of oscillations, yet they point out that high power is the first essential for these long-distance transmissions, and in this respect the Marconi apparatus is undoubtedly superior to all others. It is working on a commercial scale over the 2,300 miles between Clifden and Glace Bay, and although the number of messages transmitted does not necessitate the regular use of duplex working, its possibility was satisfactorily demonstrated to the Committee. High-speed automatic transmission was also demonstrated to them: a speed of sixty five-letter words a minute was attained, and the Committee see no reason why this speed should not be greatly exceeded if necessary. The Marconi apparatus is described as follows:—

"The Marconi Company use at their Clifden station a high-frequency generator, in which condensers charged from the high-tension batteries are discharged by projections which are fixed on a rapidly rotating wheel, and which pass close to metal discs on each side of it. Each discharge produces a group of high-frequency oscillations in a primary circuit, according to the Company's usual practice. We observe that, for the purposes of the Imperial Chain, they proposed to charge the condensers from an alternator through a high-tension transformer, as is their practice elsewhere, including the long-

distance station at Coltano. This method is in our opinion preferable. . . . The communication is practically continuous, though there are, no doubt, periods when the signals become very weak, and even occasional periods when no signals can get through. Periods of this nature are due to natural conditions, and will be incident to the working of any system. During such periods communication can, in our opinion, be insured only by the use of great power in the aerial. We understand that for this reason, and having regard to the increased power required for high-speed transmission, the Marconi Company proposed to employ for the Imperial stations practically double the power now used at Clifden. Even so, we think there may be periods when communication is impracticable, especially in tropical regions, where atmospheric disturbances may be expected to cause more difficulty than over the Atlantic."

It is interesting to note that both the Marconi Co. and the Telefunken Co. are experimenting with continuous oscillation generators of their own. These are briefly described in the report:—

"The Marconi continuous high-frequency generator consists essentially of a rapidly rotating contact-maker in a direct-current circuit with special dispositions of other circuits to give continuous oscillations in the aerial. The Telefunken continuous high-frequency generator consists of an alternator constructed to give as high a fundamental frequency as may be convenient in the first instance, the frequency being doubled or quadrupled by a polarised transformer method."

The Committee point out that it is not within their province to report on the actual agreement made between the Post Office and the Marconi Co., but it is clear that they have in mind not only the terms of the agreement, but also its recent repudiation by the company. They point out that while the company has had unique experience in the sort of long-distance work required, including the erection of the stations and in organising the traffic and staff, yet the use of their system does not necessarily imply that they need be the contractors for its erection, and that in some respects it might be better for the Government itself to undertake this. The Post Office, they recommend, should reserve complete liberty of action and should not be pledged to the continuous use of any "system." Two of the stations, they think, should be allotted for experimental purposes and placed in charge of an engineer of high standing possessing special knowledge of the subject, with a highly-trained staff, and they think that the ultimate result would be that the Post Office stations would be "ultimately equipped with apparatus far more efficient than that now used in any so-called system, more especially as the Post Office will be able to combine, in spite of existing patent rights, apparatus or devices which, because of the existence of such rights, cannot now be combined by anyone else." Many engineering firms, the Committee states, are engaged in the design of high-frequency alternators for the generation of continuous waves, there is a wide field for experiment and development of receiving plant, and there is some evidence that the design of the aerial is in a transition stage. Approval is expressed of the Marconi Company's directive aerial; it has the advantage of not requiring very great height, its use with the separate receiving station comparatively close to the transmitting aerial makes duplex working practicable, and the Committee see no reason why this form of aerial should not be capable of use with any form of high-frequency generator.

A Bill has been introduced into the Canadian Parliament confirming a contract for a Poulsen wireless installation between Great Britain and Canada.

The line between Barfrough and Teheran was down on April 30th, and on the same day communication with India and Siam via Kanburi and Raheng failed.—The Moulmein-Raheng-Bangkok line was repaired on 2nd inst.—The lines to the Chihuahua and Sonora States of Mexico were also repaired, and on the 3rd inst. the Duala-Fernando-Po line was down.—An interruption on Siamese territory occurred to the Prompenh-Bangkok line.—On the 3rd inst. also there was delay to telegrams for offices between Loanda and Malange and Novo Redondo.—On the 5th inst. the Teheran-Barfrough communication and the line between Duala and Fernando-Po were repaired and were normal on 6th inst.



## PHENIX ASSURANCE COMPANY, LIMITED.

ESTABLISHED 1782.

Head Offices: 19 & 70, LOMBARD STREET, LONDON, E.C.

TOTAL FUNDS EXCEED

£15,000,000

CLAIMS PAID EXCEED

£90,000,000

CHAIRMAN: RT. HON. LORD GEORGE HAMILTON, P.C., G.C.S.I.

### FIRE - LIFE - ACCIDENT - MARINE

Loss of Profits following Fire, Workmen's Compensation, Fidelity Guarantee, Burglary, Trustee and Executor, &c.

#### ELECTRIC LIGHTING.

The Company has always encouraged the development of Electricity, and the well-known "Phoenix Fire Office" Rules for Electrical Installations are in use throughout the world. Copies will be supplied free on application to Head Offices.

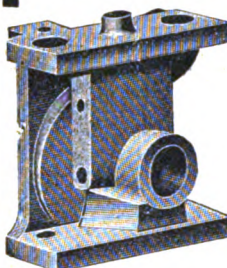
General Manager: SIR GERALD H. RYAN.

### Why waste time and money on machining

small intricate pieces when the most complicated parts can be cast in a finished state by

"PRANA"

### Die-finished Castings



HOLES, SLOTS, etc., CAST to PERFECT SIZE! ABSOLUTE ACCURACY GUARANTEED FOR ALL REPETITION WORK

Send for illustrated booklet, mentioning this paper; or send sample for quotation to

**AERATORS, Ltd**  
UPPER EDMONTON  
LONDON, N.

### ELECTRICAL PORCELAIN

OF  
HIGHEST QUALITY

APPLY TO

**JAMES MACINTYRE & CO., LTD.,**  
BURSLEM.

The Micanite & Insulators Co., Ltd.

WALTHAMSTOW,  
London, E.

FOR  
**FIBRE**  
SHEETS, RODS  
AND  
TUBES.

ONCE  
USED



ALWAYS  
USED

PRICE: ONE SHILLING PER STICK.

Sole Manufacturer— **S. W. CUTTRISS**, Prudential Buildings, LEEDS.

**STEATITE  
INSULATORS**  
SUPPLIED  
FOR ALL KINDS OF  
ELECTRICAL WORK  
**WILLIAM SUGG & CO. LTD.**  
WESTMINSTER.

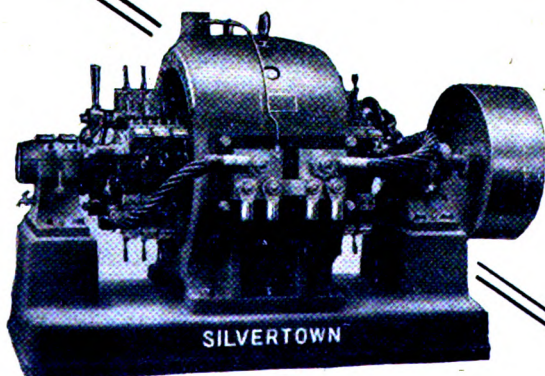
## As Electrical Engineers & Contractors,

the India Rubber, Gutta Percha and Telegraph Works Co., Ltd. (The SILVERTOWN Company) are among the oldest and foremost in the country, having been the first to manufacture Gramme machines in England.

### — THE SILVERTOWN COMPANY —

have had considerable experience in the manufacture of Dynamos, Motors, Balancers, Boosters, Motor Generators, Rotary Converters, Petrol-electric Plant for Private House, Hotel and Ship Lighting and Power, Switchboards, &c., having executed many important contracts for British and Foreign Governments and Corporations.

# SILVERTOWN



3000 AMP. PLATING DYNAMO.

MACHINES HAVE ALWAYS BEEN NOTED FOR EFFICIENCY AND A HIGH STANDARD OF WORKMANSHIP AND FINISH.

Estimates on Application.

**The India Rubber, Gutta Percha  
and Telegraph Works Co., Ltd.**

Head Offices:  
106, CANNON STREET,  
LONDON, E.C.

Works:  
SILVERTOWN,  
LONDON, E.

WHEN CORRESPONDING WITH ADVERTISERS. PLEASE MENTION "ELECTRICAL ENGINEERING."



## LOCAL NOTES

**Aberdeen: Electricity Accounts.**—In sanctioning a loan of £80,000 referred to in our Tenders Invited column, the Secretary for Scotland has suggested that there should be included among the appendices of the electricity accounts each year a tabulated statement setting forth the revenue of the undertaking for each year since the commencement, and the manner in which this revenue has been applied.

**Bexley: Electric Cooking Apparatus.**—The Electrical Engineer reports several applications for electric cookers on hire, and states that the cost of such apparatus and utensils is approximately £8 per set. The makers would guarantee and maintain the apparatus for four years, and assuming that the Local Government Board would sanction the borrowing of the necessary money and its repayment over a period of ten years, he anticipated that these cookers could be let on hire at the rate of 4s. per quarter. For hire-purchase the rate recommended is 15s. per quarter for three years, or 10s. per quarter for five years. The Council has adopted the Committee's recommendation to agree to this scheme, in addition to a rearrangement of the tariffs in order to include the rateable value system as an alternative. This latter is on the basis of 2s. 6d. in the £1 on the rateable value, plus 1½d. per unit.

**Dudley: Sale of Electricity Undertaking.**—The hitch in the arrangements for the transfer of the Council's electricity undertaking to a company, is on the question of the repayment of the outstanding loans. The arrangement in the agreement to which the Board of Trade has taken exception was that the Company should make the annual repayments in respect of the outstanding loans as they fell due. This, of course, left the ratepayers of Dudley responsible for the amounts still outstanding in the event of the Company for any reason failing to meet its liabilities. At the same time, similar arrangements have previously been sanctioned in connection with the acquisition of works by a company from a local authority, although not, we believe, in the case of electricity works. The Board of Trade requires that the Company should repay the whole of the loans immediately, but this would deprive the Company of the advantage of the lower rate of interest at which the Council has borrowed.

**Falkirk: Electricity Works Extensions.**—A new 600-kw. turbo-generator and condensing plant has just been put into operation, and a further 2½ miles of E.H.T. cable. A number of transformer sub-stations have also been installed in order to deal with increased power and lighting load. The cost of the extensions has been £6,000.

**Kilmarnock: Wiring Small Houses.**—The Council has approved a scheme for the wiring of dwelling houses up to a rental value of £20 free of cost, the charge for current to be at the rate of 5d. per unit for lighting purposes with a minimum of 25s. per annum. The approval of the Council is on the understanding that the scheme will be abandoned if it is not found to be profitable.

**West Ham: Electric Cooking Demonstrations.**—Mr. F. S. Grogan will give a series of electric cooking lectures and practical demonstrations at the Town Hall, Stratford, from May 20th to 23rd inclusive. The lectures will commence at 3.30 p.m. and 7 p.m. each day.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

## Generating Stations, Sub-Stations, Mains, &amp;c.

**Basingstoke.**—The Board of Trade has granted the Council an electric lighting provisional order, and it is anticipated that steps will be taken immediately to put it into force.

**Birmingham.**—The Electric Supply Committee have now issued their long anticipated report upon a new power station, in which they recommend the adoption of steam turbine plant, and an ultimate expenditure of £500,000, the capacity being then 100,000 kw. At the present rate of progress, the first section of the new power house of 15,000 kw. will be required for the winter of 1915-16. The Finance Committee have issued a report upon the scheme, and offer no objection to it on financial grounds.

**Bradford.**—An expenditure of £2,711 is contemplated on mains extensions.

**Bridlington.**—An expenditure of £3,000 is contemplated upon mains.

**Brighton.**—A new turbo-alternator is required.

**Derby.**—An inquiry has been held concerning a loan of £13,500 for electrical extensions.

One 750-kw. three-phase to single-phase motor-alternator. Borough Electrical Engineer, May 23rd. (See advertisement on another page.)

**Dundalk.**—A loan of £5,000 for electric lighting extensions has been inquired into.

**Dungarvan.**—Proposals for an electric lighting scheme are invited.

**Keighley.**—An inquiry has been held concerning a loan of £7,000 for a new turbo-alternator, switchgear, cables, &c.

**Kingstown.**—The Board of Trade have granted the Dublin Southern District Electric Supply Co. an electric lighting provisional order for Blackrock, Kingstown and Dalkey.

**London: Hackney.**—Land for two new sub-stations has been acquired.

**Lytham.**—The Board of Trade have granted the Lytham Council an Electric Lighting Order. It is stated to be the intention of the Council to commence the scheme immediately.

**Melbourne.**—Tenders are invited for 20,000-volt switchgear, and L.T. switchgear, for the power station and sub-stations in connection with the Melbourne railway electrification. The consulting engineers are Messrs. Merz & McLellan, 32 Victoria Street, S.W. Tenders to Agent General, Melbourne Place, W.C., by June 2nd.

**Plymouth.**—A new turbo-generator is to be installed at an estimated cost of £5,500, in addition to switchgear, cables, &c., costing £2,000.

**Rosyth.**—The Admiralty contemplate the erection of a large power station here.

**Salford.**—An inquiry was held last week concerning a proposal to borrow £35,900 for electrical extensions. There was no opposition. It is anticipated that £8,000 will be spent during the first twelve months on plant, and £4,000 on mains. A sum of £12,000 is also required in connection with bulk supply from the Lancashire Electric Power Co., details of which were given in our issues for February 13th, page 88, and February 20th, page 100.

**Shipley.**—A Local Government Board inquiry was held last week concerning a loan of £5,700 for electrical extensions.

**Worthing.**—The Borough Electrical Engineer has been instructed to prepare plans and estimates for additional plant.

## Wiring

The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.

**Aberdeen.**—Hospital and nursing home at Old Mill. Mr. J. A. Bell, the City Electrical Engineer, is advising.—New training centre buildings, St. Andrew Street. Architect, J. A. Allan, 25 Union Terrace.

**Bradford.**—Electric lighting of the Belle Vue Boys' Secondary School. City Architect, May 15th.

**Brighton.**—Municipal offices in Fisher Street.

**Dartford.**—Elementary school, Lower Road.

**Eastbourne.**—Sanatorium.

**Edinburgh.**—New buildings at St. George's High School for Girls, costing £25,000.

**Leeds.**—New school at Farnley.

**London: L.C.C.**—Electric lighting of the Lewisham Bridge and the Fairfield Road elementary schools. (See advertisement on another page.)

**Islington.**—A committee has been appointed to deal with the electric lighting of the workhouse.

**Ludlow.**—Isolation hospital.

**Manchester.**—New branch library.—Electric lighting of Withington workhouse. Architect, E. H. Overmann, 49 King Street, May 13th.

**Nottingham.**—Extensions to Council school at Trent Bridge. City Architect.

**Smethwick.**—Proposed school.

**Taunton.**—Proposed new town hall.

FOR  
STEAM JOINTS  
USE



JOHN HUDSON & CO.'S SUCCESSORS, Mansell St., London, E.

### TENDERS RECEIVED AND ACCEPTED

**Blackburn.**—A contract has been placed with the British Westinghouse Co. for a new turbo-generator.

**Coventry.**—The Corporation has accepted the tender of the Brush Electrical Engineering Co. for five double-deck trams with four-wheeled trucks.

**London: L.C.C.**—We refer on another page to the tenders for the two 8,000-kw. turbo-alternator sets for the Greenwich power house. The British Westinghouse Co. has received the contract.

**G.P.O.**—The contract with the General Electric Co. for the supply of Osram lamps has been extended for a further period of six months.

**Hampstead.**—As a result of tests carried out by Mr. H. H. Couzens, the Council has decided to adopt Mr. Haydn Harrison's design of fittings as used in Marylebone. In certain streets new posts are to be erected thirty yards apart, with the height of the light source such as to produce a satisfactory minimum illumination. Mr. Harrison has been instructed to proceed with the work immediately.

**Lewisham.**—The tender of Messrs. Weston & Son was recently accepted for the electric lighting of the infirmary, but this firm does not now wish to take up the contract at the price quoted. The Committee at its last meeting recommended the Board of Guardians to accept the tender of Messrs. Haycraft & Son at £759 10s., but after some discussion the matter has been referred back to the Committee for further consideration.

**Stepney.**—See page 263.

**Peterborough.**—The tender of W. T. Henley's Telegraph Works Co. has been accepted for cable at £566.

**Sheffield.**—The Corporation has accepted the tender of the Brush Electrical Engineering Co. for 25 double-deck trams with top covers and four-wheeled trucks.

**York.**—The tender of Callender's Cable & Construction Co. has been accepted for H.T. cables at £2,170. This was the lowest tender received.

### APPOINTMENTS AND PERSONAL NOTES

The following increases in salaries are recommended by the Glasgow Tramways Committee:—Mr. J. Dalrymple, General Manager, from £1,100 to £1,250 per annum; Mr. L. Mackinnon, Traffic Superintendent, from £600 to £625 per annum; Mr. J. Ferguson, Chief Engineer, from £600 to £625; Mr. E. T. Goslin, Electrical Engineer, from £550 to £660 per annum.

Mr. H. F. Street, Electrical Engineer and Tramways Manager to the Southampton Corporation, has been permitted to relinquish the Tramways Managership owing to the enormous increase in the size of the electricity undertaking during recent years. He will in future give his whole time to the electricity undertaking at his present salary.

Mr. A. W. Barham, Chief Assistant Engineer to the Watford Urban District Council, has been appointed Chief Electrical Engineer in succession to Mr. F. W. Purse, recently appointed to Carlisle.

Mr. G. F. Naylor, Assistant Electrical Engineer, has been appointed Chief Electrical Engineer and Tramways Manager by the Nelson Corporation in succession to the late Mr. D. Helme.

The salary of Mr. A. G. Cooper, Borough Electrical Engineer at Colne, has been increased from £300 to £325 per annum.

Mr. B. Andrews has been appointed Manager of the Southport Tramways at a salary of £200 per annum.

Mr. W. E. Bradshaw, of the Charing Cross, West End and City Electric Supply Co., Ltd., has been appointed to the position of Mains Superintendent at Islington, recently rendered vacant by the resignation of Mr. T. A. G. Margary.

Mr. H. W. Leonard, of the Publicity Department of the General Electric Co., was given a first prize at a fancy dress carnival at Birmingham recently for a costume representing Aladdin and the wonderful (Osram) lamp.

An engineering representative for power business is required in the Sales Department of the Bristol Electricity Department. (See advertisement on another page.)

A chief assistant electrical engineer is required by the Watford Council. Commencing salary, £150 per annum.

### MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. George Smith & Son, of 5 Philpot Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night, was £72 5s. to £72 15s. (last week, £72 to £72 10s.).

**Companies Struck off Register.**—The names of the following have been struck off the register of joint stock companies:—Electrical and Mechanical Exhibition; Electric Coin Freed Meter Dimming Syndicate; Hirst Magneto Co.; Illuminating Engineering Co.; S.P. (Suchostawer Patents) Syndicate; Schreiber Electric Battery Co., and the Vulcan Dynamo and Motor Co.

**Agency.**—Messrs. Dorman & Smith, switchgear and fittings manufacturers, of Ordsal Electrical Works, Manchester, have made arrangements to be represented in Scotland by Mr. David Alexander, of 43 Mains Street, Waterloo Street, Glasgow. Telephones: Central 4394, Argyle 587; telegrams, "Ohmie, Glasgow."

**Bohemian Concert.**—The space factor of the large hall devoted to the annual Bohemian Concert of the Football Section of the General Electric Company's Athletic Club, in the Talbot Restaurant, on Saturday evening last, must have been extremely high. The stewards were given a very busy time endeavouring to find room for the visitors to the number of about 300 who came to enjoy the long programme, every item of which was thoroughly appreciated. During the evening the Chairman, Mr. L. Byng, announced that the G.E.C. Cricket Club had that day been successful in their first match this season. The "Davis Cup" (competed for by the Electrical Trade) was then presented to the G.E.C. Football Club by the donor, Mr. S. Davis, who also gave medals to the members of the eleven.

### COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &c.

**Nairobi Electric Power & Lighting Co.**—At the meeting yesterday a report was submitted recording a net profit of £2,642 for 1912. The construction of the further stations on the Ruera River has been delayed in consequence of negotiations with the Government.

**British Westinghouse Co.**—The report and balance-sheet for 1912 shows a gross profit of £157,871. A sum of £43,449 is set aside for depreciation, in addition to £6,300 for redemption of prior lien debentures. After deducting debenture and mortgage interest, &c., there is a net profit of £41,074, compared with £20,708 last year. With the balance brought forward, there is a credit of £66,889, which it is proposed shall be carried forward. Reference is made in the report to the successful appeal to the House of Lords with regard to the Lot's Road turbines, and the fact is recorded that the orders received during 1913 show an increase over those of the corresponding period of 1912.

At the annual meeting on Monday, the Chairman emphasised the improving position of the Company, not only as the result of last year's trading, but from the fact that in the first three months of this year they had done very well indeed. With regard to the arbitration concerning the Lot's Road turbines, no date has yet been fixed by the arbitrator to make his award, and until this was given nothing could be said with regard to a reduction of capital. A shareholder asked as to the possibility of a combination of electrical manufacturers in this country with a view to reducing the present excessive competition, but the Chairman pointed out the difficulty of this, and remarked that for years the directors had been trying to bring about an arrangement to avoid the cutting of prices.

**Derbyshire & Notts Electric Power Co.**—At the annual meeting last week, Mr. A. R. Holland, the Chairman, stated that by the introduction of new capital the Company's outstanding liabilities have been liquidated, and sufficient has been subscribed for the proper development of the Company's power area. A contract has been entered into amounting to £89,750 for additional plant and machinery, including sixteen miles of new cables and the equipment of seven sub-stations, and already a 1,000-kw. turbo-generator set has been supplied, whilst a further 2,500-kw. set is on order. A contract has been entered into for supplying a new tramway running from Ripley to Nottingham. The accounts for the half-year to December 31st show a balance of £739, which is carried forward.

# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 333 [Vol. IX., No. 20]  
*All rights reserved.*

THURSDAY, MAY 15, 1913.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES and TECHNICAL COLLISION ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

*Other Advertisement Rates on Application.*

#### Latest Times for Receiving

Letters for Insertion, Tuesday first post.

Small Advertisements and Official Announcements, Wednesday first post.

Displayed Advertisements, Tuesday first post.

Corrections in Standing Advertisements, Monday first post.

All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 303-306, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Circling, Fleet, London." Telephone No.: 5509 Holborn.

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

THE question of textile mill driving was dealt with in a group of papers recently published in the Journal of the Textile Institute. The relative merits of steam turbines, reciprocating steam engines, gas engines, and Diesel engines were discussed, and another paper dealt with the special requirements of different classes of textile machinery as regards driving, and showed how these could be met by electrical methods more perfectly than in any other way. The advantages of individual drive were particularly insisted upon. (Page 271.)

A CORRESPONDENT calls attention to the similarity of Prof. Dussaud's "cold light" system to certain early experiments with carbon lamps, and is very sceptical as to its ultimate success. (Page 271.)

AN interesting lecture on the electrical state of the atmosphere and methods of ascertaining it was given by Prof. E. Rutherford at a recent meeting of the Manchester Local Section of the Institution of Electrical Engineers. (Page 272.)

MR. A. E. HADLEY's Paper on the electric power supply system to the Rand mines has been further discussed by the Glasgow Local Section of the Institution of Electrical Engineers. (Page 272.)

A NEW electric cooking outfit of low current consumption is illustrated on page 273.

RESULTS of some experiments by Dr. Michie, described in a Paper read recently before the Newcastle Local Section of the Institution of Electrical Engineers, attribute the formation of deposit in transformer oil to partial oxidation. (Page 273.)

SOME designs of switchgear which can be connected up direct to armoured cable without the use of "tails" are illustrated. (Page 274.)

PROBLEMS connected with three-phase supply and with the testing of mining apparatus are propounded in our Questions and Answers Columns. (Page 275.)

SOME interesting electrical instruments, including recorders, portable instruments, pyrometers, and insulation and resistance testing sets, are referred to. (Page 275.)

AN enclosed switch panel, designed with special interlocking arrangements to render it mistake-proof, is described. (Page 276.)

THE premiums and scholarships awarded by the Council of the Institution of Electrical Engineers are announced. The "Institution" Premium has been awarded to Mr. A. E. Hadley for his Paper on "Power Supply on the Rand." (Page 277.)

A NEW automatic telephone exchange system, the Betulander, is being introduced by the Marconi Co. It possesses features different from other automatic systems, and these are described and illustrated.—Mr. Marconi has at last been called before the House of Commons Committee, which is inquiring into the Imperial wireless telegraph scheme, and has corrected a number of mis-statements which have been made by previous witnesses. He maintains, among other things, that the Admiralty is using the Marconi system pure and simple, in spite of their claim that they have improved it. (Page 277.)

THE Specifications published by the Patent Office on Thursday last include one for submarine cables loaded on the Pupin system, and four important ones relating to the manufacture of tungsten lamps. Our "Patent Record" also contains notes on some Opposition and Amendment cases. (Page 278.)

SIX electric vehicles took part in the parade of commercial motor vehicles organised by the Commercial Motor Users' Association on Whit Monday—Large sums are being transferred to relief of rates by the Leeds and Belfast Tramway Departments. (Page 279.)

AN important scheme of street electric lighting is to be carried out in Manchester.—A report on street lighting by electricity is to be presented to the Bombay Corporation.—The Birmingham Gas Department claim that better results would be obtained with gas engines than with steam turbines for the new electric power

station.—Broughty Ferry is to be incorporated with Dundee.—The coal bill for next year at Nottingham is estimated at £8,000 more than in 1912 owing to increased prices.—An economy of £2 10s. per night in the fuel bill is reported at Bray through the use of Diesel engines. (Page 279.)

THE Leeds Corporation contemplate an expenditure of £168,000 on their electricity undertaking.—Switchgear instruments are required by the Melbourne Corporation; mains and services at Belfast; and switchgear at Lyttelton (N.Z.).—Generating plant is required for a Bulgarian coal mine; high and low tension cables by the London County Council; and loans of £33,400 and £10,000 are contemplated by the Rhondda and Wellington (South Africa) Councils respectively.—Wireless telegraph stations are required in Spain and Indo-China, and an electric lighting scheme at a cost of £18,000 is being prepared for Ilkley. (Page 281.)

A VERY satisfactory year's working is reported by Callender's Cable & Construction Co., a dividend of 10 per cent. being declared for the year, together with a bonus of 5s. per share.—Messrs. Willans & Robinson also show improved results for 1912, there being a small profit of £154, and the Directors' report states that a greater volume of work is being dealt with, and that prices are improving.—A 10 per cent. dividend is declared by the Chloride Electrical Storage Co. (Page 282.)

**Strike of Electrical Wiremen in Leicester.**—In order to arrive at a settlement of the wages dispute between the employers and the electrical wiremen in Leicester, a conference was held on Thursday at the Town Hall, with the result that both sides have agreed to submit a basis of settlement to their respective associations.

## ARRANGEMENTS FOR THE WEEK

MONDAY, MAY 19TH.

*Institution of Electrical Engineers: Newcastle Students' Section.*  
7.30 p.m. Annual General Meeting at Armstrong College.

TUESDAY, MAY 20TH, TO SATURDAY, MAY 24TH.

*Institution of Electrical Engineers.*

Meeting in Paris.

FRIDAY, MAY 23RD.

*Royal Institution.*

9 p.m. Evening Discourse: "The Secret of the Permanent Magnet," by Prof. S. P. Thompson, F.R.S.

### The London Electrical Engineers.

(To-day) THURSDAY, MAY 15TH. *C. Company.*—Infantry Drill, 7 to 9 p.m. Technical Instruction for all Members on the Sixth Rate and for all Candidates for Higher Rating, 7 to 9 p.m. Musketry Instruction, 9 to 10 p.m.

FRIDAY, MAY 16TH. *D. Company.*—As for Thursday, 15th.

SATURDAY, MAY 17TH.—Annual Musketry at Purfleet. Headquarters open from 10 a.m. till noon.

MONDAY, MAY 19TH. *A. Company.*—Infantry Drill, 7 to 9 p.m. Technical Instruction for all Members on the Sixth Rate and for all Candidates for Higher Rating, 7 to 9 p.m. Musketry Instruction, 9 to 10 p.m.

TUESDAY, MAY 20TH. *B. Company.*—As for *A. Company*, May 19th.

WEDNESDAY, MAY 21ST. *All Companies.*—Annual Musketry at Purfleet Rifle Ranges. Railway tickets will be sent to those notifying Headquarters of their intention to attend.

THURSDAY, MAY 22ND. *C. Company.*—As for *A. Company*, May 19th.

FRIDAY, MAY 23RD. *D. Company.*—As for *A. Company*, May 19th.

SATURDAY, MAY 24TH. Headquarters will be open from 10 a.m. till noon.

**The National Physical Laboratory.**—The annual report for the year 1912 has now been issued, but the annual inspection, instead of being held as usual in March, has been postponed till June 26th, when Mr. A. J. Balfour will open the new buildings recently erected. These buildings complete a scheme initiated in 1909 to provide laboratories in metallurgy and optics with administrative offices, and their cost is being defrayed partly from a generous gift of the late Sir Julius Wernher, partly from a Treasury grant, and from other sources. Additional funds are still needed to provide adequate equipment. The block of buildings for optics and administration is now nearly complete, and it is to open these that Mr. Balfour has promised to be present on June 26th.



"GUARANTEED COAL."

(See page 263 of our last issue.)

CALORIMETRICAL ASSISTANT (from the laboratory upstairs): Is this semi-bituminous pseudo-anthracite washed peas with a calorific value of 13,350 British Thermal Units?

STOKER: No, sir; it's COAL!



## ELECTRIC DRIVING IN TEXTILE FACTORIES

IN the last number of the *Textile Institute Journal*, which contains the proceedings of the Congress held in September last at Hawick, a discussion on a group of papers on power in textile mills is reported. In an introduction to the papers reference is made to the joint committee of the Yorkshire Local Section of the Institution of Electrical Engineers and the Textile Institute, which was formed some time back to investigate the claims of different methods of driving textile factories. It will be remembered that this committee was disbanded before very much useful work had been done, as the Textile Institute, on going into the matter, considered it desirable that the rival systems should be reported on, independently of the great engineering institutions, and finally a committee was formed composed exclusively of members of the Textile Institute. The papers read at the Congress served as a general introduction to more detailed work of the committee, who had up to that time only settled certain standard nomenclature and bases for estimating to assist in comparing the data obtained.

The first Paper, by Mr. G. B. Storie, was on steam power in textile mills, and dealt in a large measure with steam turbines, which are now adopted by some of the larger concerns in this country for driving their mills. A list of forty-two mills with steam turbine installations was given in the Paper, all in conjunction with electric drive, and all except two were examples of alternating-current systems. No case of mechanical transmission from turbine drive was mentioned, and incidentally the Paper was striking evidence of the way that electric transmission had rendered the advantages of the turbine available to textile mills. The author praised particularly the steadier speed of the turbine over that of the reciprocating engine, a feature of special importance in textile work, whatever method of transmission is adopted, and the freedom of the exhaust steam from oil, which rendered it suitable for heating work throughout the mill, instead of the live steam through reducing valves. Other advantages of the steam turbine and the possibilities opened up by exhaust and mixed pressure turbines were gone into.

The second Paper, by Mr. T. R. Wollaston, was on gas power in textile mills, and scarcely touched the question of electrical driving beyond remarking that everything which the author had to say in favour of gas power for mechanical driving in textile mills, applied with added import in regard to the generation of electrical energy, whether at the mill or at the central station supplying the mill. Another Paper, by Mr. F. Carter, put forward the claims of the Diesel engine for mill driving. These engines seem to be used to a considerable extent for the purpose in India, and a list of twenty Diesel engine-driven mills, of which the four largest employ electrical transmission, was given.

Electric driving *per se* was taken up in the last Paper of the group, by Mr. J. F. Crowley. At the outset he referred to the rapid strides that are being made in the application of electric driving. Eight years ago the horse-power of the motors thus employed in Great Britain was a few hundreds, practically all at one mill. Four years later it had increased to 28,000, and to-day, he said, the joint textile load of three power supply companies would practically total this figure, which was less than the advertised sales of textile motors of any one of several electrical manufacturing companies. He said that with modern mills the case for electric driving did not rest mainly on a saving in transmission losses (although when there was any complication in the drive the saving was considerable), but on the steadiness of the drive, resulting in higher maintained speeds, increased production, improved quality of material and certain specific advantages in individual drive, resulting in still greater production and improvement in quality. So far as speed variation, the mule was the worst offender, and tachograph records had shown variations of 25 per cent. in the speed with mechanical drive, corresponding to 19 per cent. for D.-C. motor drive, or 6 per cent. for A.-C. motor drive. The very unequal power curve of the mule affected the running of every machine in any way connected with the shafting. On electric drive, mules may be group or individually driven, an important principle to be borne in mind being that, as far as possible, constant speed should be maintained during the "draw" on the actual spinning portion of the cycle. A given variation in speed where mules are group driven is liable to be far more serious than a variation of similar range with individually-driven mules. With individual drive, the speed fluctuations would naturally result from the variation in load of the mule itself, and would therefore follow the cycle of operations of the mule. With individual drive not only is less power required, but production is increased by at least 5 per cent. over that of

the same machines driven in groups. For mule driving the motor should have good efficiency over a wide range of load and high overload capacity. It is, however, in the case of ring spinning and doubling frames that electric driving has scored the most conspicuous success. As is well known, when a ring frame is driven at constant speed, the yarn is subjected to varying tension, and as the speed at which the machine can be run is determined by the maximum tension the yarn will stand, it must be such as to prevent this tension being exceeded at any moment; consequently, with a constant speed, considerable loss in production occurs. The only satisfactory solution to this, writes Mr. Crowley, so far has been the electrical one, which gives not only a low speed during the forming of the base of the cop, but also an automatic variation of the speed during the cyclic movement of the ring rail. For this purpose single and three-phase commutator motors of special design have been developed. Tests are quoted showing increases in output due to this method of driving, of 15 and in one case of 18 per cent. In a similar way the speed at which looms can be driven can be increased by the adoption of individual motor drive, and the great variations in speeds experienced with mechanical drive at different distance from the engine avoided. Tests show increases in speed of the machines of 9 per cent., without any increase in breakages, with improvement in the material and improvement in the load factor, bringing up the increase of production to over 15 per cent. Somewhat more power was, of course, required to drive the looms, but in weaving the power costs were but a small percentage of the whole, so that the increase had little effect on the cost of the product. The latter part of the Paper dealt with the choice of generating plant, transformers and switchgear, and a few words were added on outside power supply, which, when available, is often economical. For the usual cotton mill load factor of 25 to 29 per cent. can be purchased at about 0.5d. per unit, and in one area some manufacturers actually obtain current at 0.3d. per unit.

The discussion turned largely on the prime mover side of the question, but there was some criticism of the claims of electric driving. In one case it was argued that for the money spent on electrical equipment extra looms might be bought and an equal increase in output obtained. Some speakers thought that the variations in speed with mechanical drive had been exaggerated, and the defenders of mechanical transmission called attention to the excellent efficiencies obtained by modern ball-bearings and chain drive. Confirmatory testimony was also given by those who had experience of the excellent results obtained by electrical driving.

## CORRESPONDENCE

## "COLD LIGHT."

To the Editor of ELECTRICAL ENGINEERING.

SIR,—The report in this week's issue of ELECTRICAL ENGINEERING of Prof. Dussaud's proposal for furnishing light by means of incandescent lamps, to which current will be delivered intermittently, is a revival of a very old thing, which was proposed in the very early days of the carbon filament lamp. Immediately it was seen, in the early days of the 50-volt lamp, that the filament preserved its condition of incandescence for a certain period after the current was switched off, and that it took a certain time after the current was switched on to raise it to incandescence, many minds were turned to the possibility of saving current. I may confess to have dabbled a bit in the matter myself; but what I found was, and I think what earlier experimenters found was, that there was nothing gained. If you eliminated the flicker in the lamp, you lost in other directions, in the apparatus required to cause the current to be delivered intermittently; so that you had an additional apparatus, costing a certain amount, and requiring looking after, without any equivalent advantage.

The metallic filament lamp has the advantage that its resistance increases with the temperature, and *vice versa*; but I should be strongly inclined to think that our experience of 30 years ago would be repeated in Prof. Dussaud's apparatus.

Bath, May 8th, 1913.

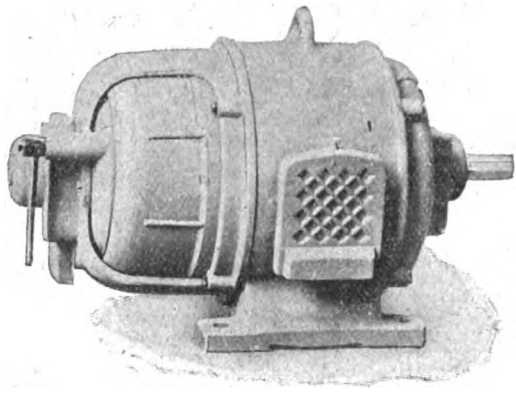
SYDNEY F. WALKER.

**Obituary.**—Many of our readers will be sorry to hear of the bereavement of Mr. L. M. Waterhouse, Managing Director and Engineer to Simplex Conduits, Ltd., who has just lost his wife. Mrs. Waterhouse, who died on Wednesday of last week after a short illness complicated by a chill, was a sister of Mr. A. W. Robinson, Manager of the Company's Publicity Department.

## SMALL INDUCTION MOTORS FOR ALL CLASSES OF WORKSHOP DRIVING.

PROMPT DELIVERY IN SIZES FROM  
½ TO 10 H.P. AT ALL THE USUAL  
SPEEDS AND PRESSURES.

OPEN, PROTECTED & ENCLOSED TYPES.



HIGHEST GRADE MATERIAL and  
WORKMANSHIP.

**BROWN, BOVERI & CO., Limited**

CAXTON HOUSE, WESTMINSTER, LONDON, S.W.

And at MANCHESTER, GLASGOW,  
and NEWCASTLE.

### THE ELECTRICAL STATE OF THE ATMOSPHERE

AFTER the Annual General Meeting of the Manchester Local Section of the Institution of Electrical Engineers on April 8th, Prof. E. Rutherford, F.R.S., gave an interesting lecture on the above subject, illustrated by experiments. Interest in the electrical state of the atmosphere might be said to date from Franklin's experiments in 1749, which resulted in the introduction of the lightning rod. Some time later it was first observed that the potential of air to earth was usually positive, while the potential gradient is about 100 volts per metre.

Passing on to methods employed for measuring the potential of a point in space, Prof. Rutherford gave a demonstration of the use of the Kelvin water-dropper and electrometer, and afterwards substituted for the water-dropper a radio-active substance emanating  $\alpha$ -rays. This gave much quicker results. Ionium was the best substance to use, as it emitted only the  $\alpha$ -rays, and not the  $\beta$ - and  $\gamma$ -rays. It had been used very successfully by Simpson in the *Terra Nova* expedition. The proximity of buildings might modify very considerably the results obtained when determining the potential of the air at a given place, and the results should be checked by determinations in the open. Simpson made use of a horizontal insulated wire carrying the tube of ionium and having one end connected to the electroscopes in his determinations. The potential of a given place has been found to vary during the year, the minimum value being found in midsummer and the maximum about January. There was also a diurnal variation, and from some results taken at Kew it was found that the minimum occurs there about 4 a.m. and 2 p.m., the maximum being reached at about 9 a.m. and 9 p.m.

In some places, however, no variation has been found. For instance, in the Arctic Simpson found no variation, nor is any found on the Eiffel Tower or on mountain peaks.

It is found that the potential gradient decreases with altitude, as the following figures show:—

Height: Feet ...	0	824	1060	2080	2820	3136	4085
Potential Gradient:							
Volts per metre	150	37	43	21	20	19	13

Although pure air is a perfect insulator, the ordinary atmosphere has a marked conductivity. This is due to the presence of ions in it, some of which were small and moved swiftly, and some large and moved very slowly. Prof. Rutherford demonstrated the presence of the ions by experiments. Unless the ions were being continuously produced and maintained by some agency, it is probable that they would disappear completely in a very few hours, as 8 per cent. of positive electrification dissipated in one hour. There were, however, many agencies at work keeping up the supply of ions. The Bunsen flame, for instance, was highly ionised. The origin of ionisation was due, in Prof. Rutherford's opinion, to radio-active material.

In experiments it usually appeared that the positive ions were apparently in excess of the negative ions, but as it can be shown that an excess of only 1 per cent. of positive ions over negatives would account for the whole phenomena of terrestrial electricity, it is clear the apparent excess of 20 per cent. is due to errors and inaccuracies in the apparatus employed in the experiments.

If the ions were set up by emanations from the earth it might be expected that the ionisation over the sea would be less than over the land, but in the North Atlantic it was found to be about as much as on the land. Simpson, however, on the Antarctic expedition found that as the land was passed and its influence decreased, the drop in ionisation was very pronounced.

Prof. Wilson, of Cambridge, had calculated that the total vertical current passing from the atmosphere to the earth over its whole surface was about 1,000 amperes. It was obvious that there should be a return current of equal value passing back to the air somewhere, but at present there was no acceptable explanation to offer as to how this return current goes back.

### POWER SUPPLY ON THE RAND

THE Paper by Mr. A. E. Hadley, describing the power system of the Victoria Falls and Transvaal Power Co. and the Rand Mines Power Supply Co., read in London on March 13th (see *ELECTRICAL ENGINEERING*, March 20th, p. 159), was further discussed by the Glasgow Local Section of the Institution of Electrical Engineers on April 15th.

Mr. W. McWHIRTER referred to the use of earth guard-wires, but said that although they serve as a great protection against lightning, they do not protect from static discharges. He advocated a high resistance between the line and earth as the only solution to the periodical breakdowns.

Mr. BUNTON (Bruce, Peebles and Co.), commenting on the load dispatchers, remarked that it is a particularly interesting thing to see in a large transmission scheme the method of controlling the whole of the large transforming station so that the attendant knows exactly when all the intercommunicating switches are open or closed.

Mr. SAM MAVOR (Mavor and Coulson) was particularly interested in the portion of the Paper dealing with compressed air.

Mr. W. L. SPENCE said that the figures with regard to efficiency in air distribution were open to suspicion, but if correct the scheme of distribution justified itself.

Mr. MACLEOD (Clyde Valley Electric Power Co.) referred to the boiler-house arrangements and the dependence on fans to provide induced draught. He favoured spare motors and the adoption of direct current to provide a more flexible arrangement. He condemned the use of overhead lead-covered wires for operating the balancing protecting gear, and the possibility of the telephone wires being energised in the event of a series transformer failing.

Mr. ROBERTSON (Clyde Valley Electric Power Co.) asked the comparative loss per mile on an 80,000-volt distribution and a 10,000-volt distribution.

Mr. D. A. STARR (Clyde Valley Electric Power Co.) said that the system of control described in the Paper was very similar to that used in Newcastle and the Clyde Valley Co.

**City and Guilds (Engineering) College.**—Our attention has been drawn to the fact that in the description of the traction plant of this Institute appearing in *ELECTRICAL ENGINEERING*, May 1st, p. 247, the equivalent tramcar inertia obtainable by the adjustable flywheels was given as 5, 10, or 15 tons, whereas the actual values are 10, 15, or 20 tons.

**The Junior Institution of Engineers.**—A week-end excursion, July 4th to 7th, has been arranged by this Institution to Brussels for the purpose of visiting the Ghent Exhibition. The party will leave London on Friday, July 4th, and visit the Exhibition on the Saturday. For the Sunday excursions will be arranged to Dinant, the Valley of the Meuse, the Field of Waterloo, or Antwerp, and on the Monday, places of interest in Brussels will be visited, the party returning to London in the evening.

## A NEW FORM OF ELECTRIC COOKER

A novel form of electric cooker, which, on account of its low initial cost and small current consumption, is particularly suitable for small households, has been designed by Simplex Conduits, Ltd. (116 Charing Cross Road, W.C.). The "Plexsim" cooker takes 600 watts as a maximum, but



FIG. 1.—PLEXSIM COOKER, OPEN.

facilities provided for regulation, and the manner in which the heat is retained by means of the special mode of construction adopted, result in the average demand of the oven being considerably less. With the assistance of one or two auxiliary hot-plates, or self-contained utensils, it will carry



FIG. 2.—PLEXSIM COOKER, CLOSED.

out all the functions of the ordinary cast-iron cooker of the gas-stove type. It is calculated that such a complete equipment should be sold within the region of £5, and that the maximum demand of the complete set would not exceed 2,000 watts. Such a set is now in course of preparation.

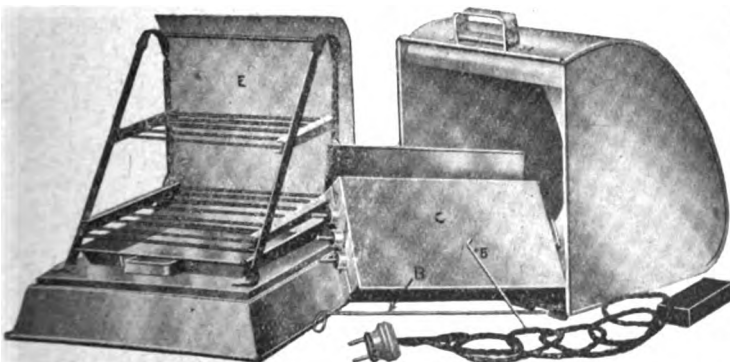


FIG. 3.—PLEXSIM COOKER, DISMANTLED FOR CLEANING.

The "Plexsim" cooker which is now being introduced has undergone exhaustive and severe tests under practical working conditions in the Company's experimental kitchen in Birmingham.

The general construction of the apparatus is well shown in the three figures. The way in which the Dutch oven-shaped cover containing the heating elements when swung away from the heat-rack retains its hot air, owing to the presence of the screen, E, avoids heat losses when examining the food being cooked, and the shape of the oven ensures very even distribution of heat. The cooking temperature is reached in five minutes, and a good roasting action is given by the heating elements, which are run to incandescence. As shown in Fig. 3, the apparatus is easily dismantled for cleaning by withdrawing the pins, B.

## TRANSFORMER OIL

A PAPER by Dr. Michie entitled, "The Formation of Deposits in Oil-cooled Transformers," was read before the Newcastle Local Section of the Institution of Electrical Engineers recently. The Paper dealt with some of the chemical changes which occur in transformer oils during use, and more particularly with the formation of the solid matter which deposits on the windings and other parts of transformers. These deposits vary in appearance from pale yellow soft sludges to dark brown or black hard masses, and their presence materially affects the circulation of the oil and leads to overheating of the windings. Various theories have been offered to explain their formation. They have been supposed to be due to the deposition of solid paraffins from the oil, to the separation of suspended solid particles under the influence of electrical stresses, to the disintegrating action of the oil on the varnishes and other materials used on the windings, and to the polymerisation of the oil under the action of heat. Experiments had, however, shown that electrical stress alone did not produce any deposit. In some cases, chemical analysis of deposits revealed traces of lead or manganese, which substances are used in the varnish on the coils, but the quantity of deposit is too great to be obtained from the varnish alone, and appears to be due to oxidation of the oil, a theory confirmed by experiments where oils were subjected to currents of air at elevated temperatures. Different oils behaved very differently. The presence of ozone in the air greatly increases the rate of sludge formation, and by using ozonised air a heavy deposit was obtained from an oil in a comparatively short time at 90° C. The rate of sludge formation is accelerated by the presence of certain metals, notably copper. The quantity of sludge which separated out in the oxidation process is largely dependent on the degree of refinement of the oil. As a general rule the more an oil is refined the more stable it becomes towards oxidising agents. Although several transformer oils are on the market, which when subjected to the oxidation test give no deposit after 45 hours, no oil has been met with which did not give rise to deposit after prolonged treatment. If the formation of deposit is to be minimised, the following conditions should be avoided: overheating, undue access of air to the oil, conditions likely to give rise to the formation of ozone, and contact of the oil with clean surfaces of copper, iron, and lead.

Mr. P. V. HUNTER (the Newcastle Electric Supply Co.) pointed out that it was most difficult to ascertain whether a transformer was sludging without lifting it out of its case. The Newcastle Supply Co. was one of the first to experience trouble due to sludging, and he thought that this was probably due to the fact that they used transformers which depended upon ducts for rapid cooling, whereas the earlier transformers had no ducts. He asked if cotton covering had any effect on preventing sludging, as he had recently come across a case of a larger low-tension furnace transformer which sludged very rapidly, and he could only put this down to the large amount of exposed copper.

Mr. MOORHEAD asked if an oil which had sludged and then been filtered had its flash point reduced, and also whether a filtered oil would sludge in the same proportion as previously.

Mr. SCHUL (A. Reyrolle & Co.) asked if it was possible that the minute traces of acid and alkali left in oils after purification would have any effect upon the contact surfaces of oil switches. It was an undoubted fact that small quantities of sulphur, such as was used for fixing insulators and other parts in oil switches, dissolved in oil and gave rise to various troubles.

Mr. G. STONEY said that the Paper explained the black deposits frequently found in turbine bearings.

Mr. W. C. MOUNTAIN (in the chair) said that sludging seemed to be largely a question of price, and, so far as it could be seen, it could also be prevented by rating transformers within reasonable limits.

Messrs. Wilson, Vernier, and F. O. Hunt also spoke.

Dr. MICHIE (in reply) said that cotton covering evidently had the effect of minimising sludging. As a rule oil which had been filtered was liable to form further quantities of sludge.

## CATALOGUES, PAMPHLETS, &c., RECEIVED

**TURBO-ALTERNATORS.**—Bruce, Peebles & Co., Ltd., have just issued a specification sheet dealing with their standard turbo-alternators. On the front page is given an illustration of the enclosed type of machine, which is the standard arrangement for all, excepting the two smallest sizes, which are made of the open type. Very full information is given with regard to winding and insulation, brush gear, ventilation, &c., and, although a short reference is made to the exciter, it will be noted that a full specification regarding the exciters is to be found on a separate sheet.

**CINEMATOGRAPH GENERATING SETS.**—Some convenient self-contained petrol-driven portable generating sets for cinematographs are dealt with in an illustrated list from Fyfe, Wilson & Co. (155A St. Vincent Street, Glasgow). The set complete with switchboard is mounted on a four-wheel hand-truck, and is made in several sizes. Stationary sets are also listed.

**LAMPS AND LAMP HOLDERS.**—New lists from the Electrical Co., Ltd. (122-124 Charing Cross Road, W.C.) deal respectively with radiator lamps, and "Goliath" screw holders for high candle-power lamps.

*Readers desiring copies of catalogues or pamphlets should apply to the firms in question, referring to the notice in "Electrical Engineering."*

**WASHING MACHINES.**—Leaflets and pamphlets from Seear, Page and Co. (16 and 17 Devonshire Square, E.C.) describe the "Maytag" electrical washer. The wringer is adapted to swing into any position, and provision is made for using the motor to drive other domestic appliances.

**DRY CELLS, INSULATING TAPE, &c.**—A booklet from Turners & Manville, Ltd., Hopetoun House, Lloyd's Avenue, E.C.) deals with dry cells of the "J. M." pattern, adhesive insulating tapes, asbestos listing and fireproof tape, "Niagrite" fireproof tape, and other specialities supplied by the firm.

**GOODS TRANSPORTATION.**—The enterprise of the Great Central Railway Company, which has shown itself in divers ways, has just resulted in the publication of a well-bound, copiously illustrated book of about 270 pages, entitled "Per Rail." The subjects dealt with include descriptions of the Company's warehouses, siding and dock accommodation in the various important towns in the United Kingdom, together with notes on the productions of these towns and other interesting matter. A description of the recently opened deep-water dock at Immingham is also given, and the magnitude and convenience of this is brought home to the reader by a large coloured bird's-eye view. In addition there are two useful folding maps, one showing rail communication between different towns, and the other by a convenient colour scheme shows at a glance the present position of coal-bearing strata and iron ore, &c., in the Midlands and North of this country. A list of receiving offices and stations between which the Great Central Railway Company carries merchandise traffic terminates the volume, which will be supplied to any trader on application to the Publicity Department (216 Marylebone Road, N.W.).

## SWITCHGEAR WITHOUT TAILS

IT is a pity that so many installations are spoilt by an untidy, and sometimes unsafe, conglomeration of cable connections round about the switchgear. There is no need for it if proper thought and attention be given to the method of leading the connections in and out of the switches. So often it has been the practice to procure switches without a thought about the fact that these have to join on to a multi-core cable, and so when the ends of the cable are brought near to the switch terminals a box is put on to the cable and a set of tails join the box to the switch. Then, again, when the switch has to be joined up to the motor, how often do we find straggling single leads where a well protected and neat armoured job might have been adopted with very little extra expense? Messrs. A. Reyrolle & Co. (Hebburn-on-Tyne) have for years made the design of dividing boxes a study in a line with the design of switches and switchgear, and they have shown how neat and how complete an armoured system can be made. For instance, Fig. 1 shows a 3,000-volt three-phase switch which was to be placed direct in a cable run, and the dividing boxes are accordingly fixed in a horizontal position. The space occupied by this arrangement is much smaller than would be the case if tails were used, and, moreover, the job is solid and the live conductors are inaccessible. In another case the leads come in and out from overhead (Fig. 2). In this instance a coned gland is used to pinch on to the armouring of the cable. Innumerable examples might be given to demonstrate the

useful combination of the study of the switchgear terminal and the cable end, and if this is thought out carefully in

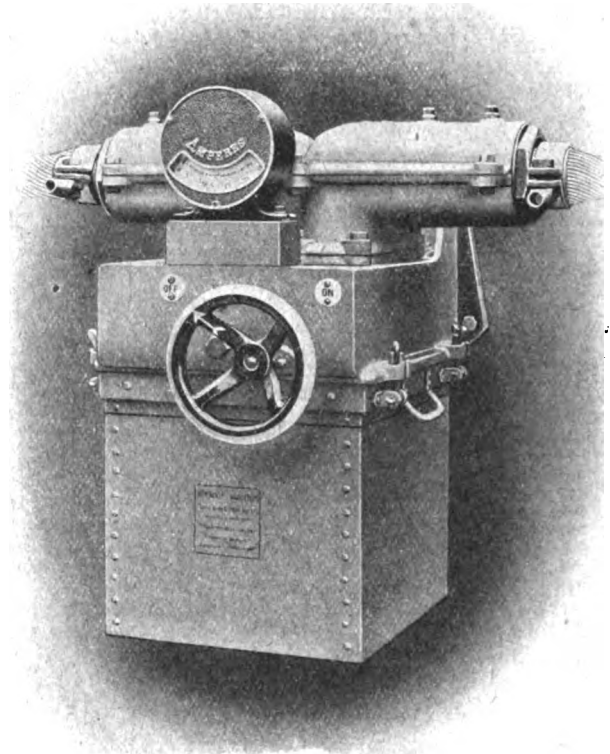


FIG. 1.—OIL SWITCH WITH HORIZONTAL ARMOURD CONNECTIONS.

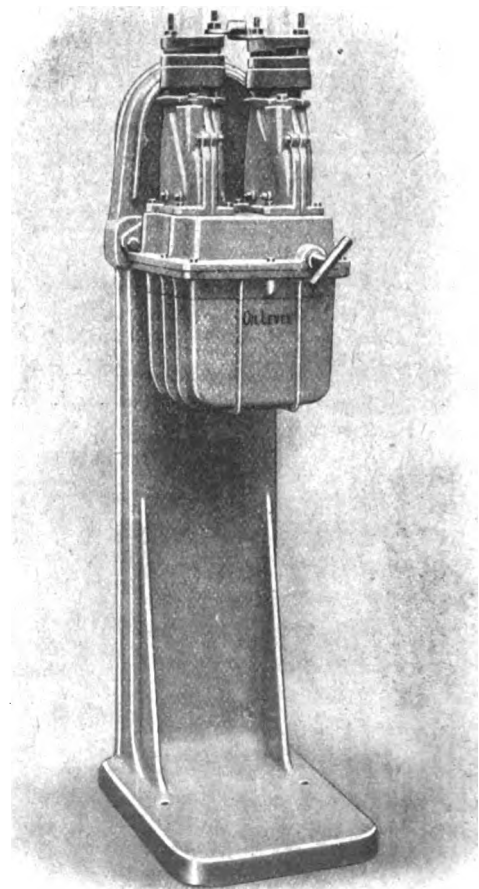


FIG. 2.—MOTOR PANEL WITH VERTICAL ARMOURD CONNECTIONS.

each case there would be no necessity for tails to intervene between these component parts of any installation.



## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelopes.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

#### QUESTION No. 1,339.

From an E.H.T. three-phase supply, with static transformers, three phase, six-phase primary delta connected, secondary star connected, it is required to take a large amount of power—single-phase L.T. and H.T.—without unbalancing the three-phase supply. What is the best way to do this, and is it possible without using rotating machinery? Also, could a small amount of single-phase power be taken without using rotating machinery, and, if so, how much? What is the effect of unbalancing a three-phase circuit?—"TRANSFORMER."

(Replies must be received not later than first post, May 22nd.)

#### QUESTION No. 1,337.

Coal Mines Act Electrical Rules.—Rule 14, C (1), requires "the thorough examination of all apparatus (including the testing of earth conductors and metallic coverings for continuity) as often as may be necessary to prevent danger; and (2) the examination and testing of all new apparatus, and of all apparatus re-erected in a new position in the mine before it is put into service in the new position." Under ordinary circumstances how often will it be advisable to test earth conductors and metallic coverings, and what other "examination and testing" is necessary on the following plant? How may we prove that we have continuity and suitable carrying capacity of all armour and earth conductors? We have two 2,000-kw. generators, 3,000 volts, 40 cycles, three phase; current is transmitted at this pressure to three seams at different depths. In these seams we have haulages working direct at 3,000 volts; also in each seam we have transformers stepping down to 440 volts for pump motors and small haulage, and small lighting transformers 440 to 110 volts. The cable from the H.T. switch-board in the power-house to each seam is three-core, paper-insulated, lead-sheathed, and double-wire-armoured; it is fixed to sides of shafts by wooden cleats, and the shaft is comparatively wet. We use the lead sheath and armour as our main earth connection to surface earth plate. The shaft cable is led to a distribution board in each seam, from which all cables in use are also double-wire armoured, and the armour in every case is used as main earth wire between each motor, &c., and main cable armour to surface. I may mention here that in some places the cables are buried in the ground. We have two C.I. earth plates at the surface, and one in the sump at each seam. We transmit about 600 kw. into each seam. The depths of the seams below surface are 400 yards, 500 yards, and 680 yards. At each motor we connect up the switch, controller, motor frame, &c., to a common copper earth wire, and this to armouring of cable by means of W.I. clamps, as, of course, we cannot solder terminals on here underground.

"ASSISTANT ELECTRICIAN."

As no reply deemed sufficiently complete for an award has been received, this question will remain open for replies till May 29th. Competitors should not only indicate the necessary tests for earthing arrangements, armourings, &c., but should also indicate what examination is required of other apparatus, including motors, switches, distributing boards, gate-end boxes, &c.

## ANSWERS TO CORRESPONDENTS

**P. STUART.**—The arrangement you suggest with Leclanché cells will not work. We should recommend you to make inquiries from the Corporation Electricity Department whether they can make arrangements for charging a small battery of accumulators for you if they cannot bring a main to your house. Alternatively a small water-motor would be the best to use to drive your dynamo for supplying a few small lamps occasionally. Any good firm of electrical contractors in Birmingham would probably be able to advise you on this.

**W. H. BROWN.**—In reply to your inquiry as to a method of neutralising electric charges formed on silk or woollen materials during the process of manufacture, probably a similar apparatus to the "Chapman" neutraliser, which is used for a like purpose in printing and paper-making machinery would suit your purpose. This apparatus "Neutraliser" consists of a small motor with slip-rings to supply an alternating current to a high-voltage transformer, one terminal of the secondary of which is connected by rubber-insulated cable to a series of needle-points placed just above the sheet as it enters and leaves the press. A brush discharge is produced, and this apparently causes the paper to lose its charge. One transformer will supply a number of machines. The sole agent for this device in this country is Mr. John Robertson (Wardrobe Chambers, 146 Queen Victoria Street, E.C.).

### ELECTRIC SIGNS.

**T**HERE has been very great improvement lately in the construction of electrically-illuminated signs, which are proving a very successful method of advertising. The expense of running these has been greatly reduced by the employment of metal filament lamps, such as the Osram, with its strength, life, retention of illuminating power and low consumption of current. The General Electric Co., Ltd., send us particulars of a fine example in a sign which has been built for Messrs. Mann, Crossman and Paulin, Brewers, on the Marshes, Stratford, E., and is said to be one of the largest of its character in this country. The length of the sign is 100 ft. and the height from the bottom of the hoarding to the top of the figure of the girl is 42 ft. It stands 10 ft. out of ground, so that the total height is about 52 ft. The number of Osram lamps used for illuminating the sign is as follows: 100 250-volts 32-watts, 176 105-volts 10-watts, and 2 205-volts 17-watts. In the winter months these lamps are kept burning at least six hours each day, and during the summer months three and a half hours per day, approximately 1,700 hours per annum. The lamps are fully exposed to all conditions of weather, and, we understand, have given every possible satisfaction. The sign was erected by the Borough Theatre Billposting Co., Ltd., of Romford Road, Stratford, London, E., and the electrical work in connection with it was carried out by the West Ham Corporation Electrical Department.

**Newcastle Local Section of the Institution of Electrical Engineers.**—The following list of officers for the next session is submitted by the committee:—*Chairman:* Mr. C. Vernier (Mains Engineer, Newcastle Electric Supply Co.). *Vice-Chairmen:* Messrs. P. V. Hunter (Merz & McLellan) and J. H. Holmes. *Past Chairmen:* Messrs. C. Faraday Proctor, C. S. Vesey Brown, and W. C. Mountain. *Committee:* Mr. W. McLellan, Mr. R. P. Sloan (N.E.S. Co.), Mr. C. Turnbull (Tynemouth Corporation), Mr. G. Stoney (C. A. Parsons & Co.), Mr. A. H. Marshall (Cleveland & Durham Power, Ltd.), Mr. J. R. Andrews (P.O. Telegraphs), Prof. W. M. Thornton (Armstrong College), Prof. H. Stroud (Armstrong College), Mr. J. R. M. Elliott (P.O. Telegraphs), Mr. A. P. Pyne (Palmer's, Ltd.), Mr. G. L. Drury (N.E.R. Co.), Mr. J. A. Anderson, Mr. C. H. Davidson (C. A. Parsons & Co.), Mr. E. Fawcett (N.E.S. Co.). *Hon. Treasurer:* Mr. W. A. Clatworthy. *Hon. Secretary:* Mr. H. W. Clothier. *Assistant Hon. Secretary:* Mr. W. G. Guns. *Hon. Auditors:* Mr. H. L. Riseley and Mr. F. O. Hunt. The annual general meeting will be held on May 26th.

**A Turbo-generator Burst.**—A 5,000-kw. Zoelly turbo set in the Essen power station of the Rheinisch-Westfälische Elektrizitätswerke flew to pieces on March 8th last, shortly after being switched off the bus-bars. The set ran at 1,000 r.p.m., and generated at 5,250 volts. An intermittent noise, with a simultaneous variation in the load taken by the generator, was noticed just before the machine was taken off the bars, and almost immediately afterwards it flew to pieces. According to the *Elektrotechnische Zeitschrift*, the various parts of the generator were thrown in all directions, but no one was injured. A portion of the stator, weighing several tons, flew through the wall out on to the street and tore up the tramway lines. Five of the poles of the rotor, weighing nearly a ton each, were thrown through the roof of the station, while the remaining seven were found in various parts of the engine room. A 5,000-kw. machine adjacent to that destroyed was set on fire, but none of the other machines were seriously damaged, and the supply was interrupted for only five minutes.

### SOME ELECTRICAL INSTRUMENTS

THE issue of four new catalogues by Evershed and Vignoles, Ltd. (Acton Lane Works, Chiswick), gives us an opportunity of reviewing a few features of some of the beautifully-made apparatus which has been developed by the firm.

Taking first their recording instruments, we find that the principal feature is the use of the Murday patent pen, somewhat resembling a drawing-pen held nearly horizontally, and carried on knife edges in a stirrup at the end of the hand. The motion of the latter being at right angles to that of the chart, the pen is adapted to mark equally well in either direction. The use of this pen gives to the chart record rectangular co-ordinates (in the roll-chart and drum-chart forms), instead of the usual curved hour-lines. In the disc-chart form the hour-lines become radial straight lines, a fact which makes the disc-chart type for the first time a practical instrument. In the circular-chart recorder (Binstead's patent) the paper disc is supported at its centre on a vertical axle, which is rotated by the clock and carries with it the chart. The chart would thus be horizontal, but as the only portion which is required to be so is the diameter on which the pen is recording, the front and back portions of the chart are bent downwards and are kept in position by guides. This arrangement causes the chart to be very rigid at the portion where the record is being produced, and also enables the recorder to be quite compact. Both the drum and disc patterns of recorders are listed as ammeters and voltmeters with movements of the moving coil and moving iron patterns. Portable as well as switchboard patterns are made.

The list of portable indicating instruments contains a considerable number of patterns of moving coil voltmeters, ammeters, and combined ammeters and voltmeters, many of which have several different ranges. Special cell-testing voltmeters are included, as well as ammeters and voltmeters on the moving iron principle. Another special feature is a range of portable dynamometer-type ammeters, volt-meters and wattmeters. These, when used for alternating currents, are sometimes combined with portable current transformers.

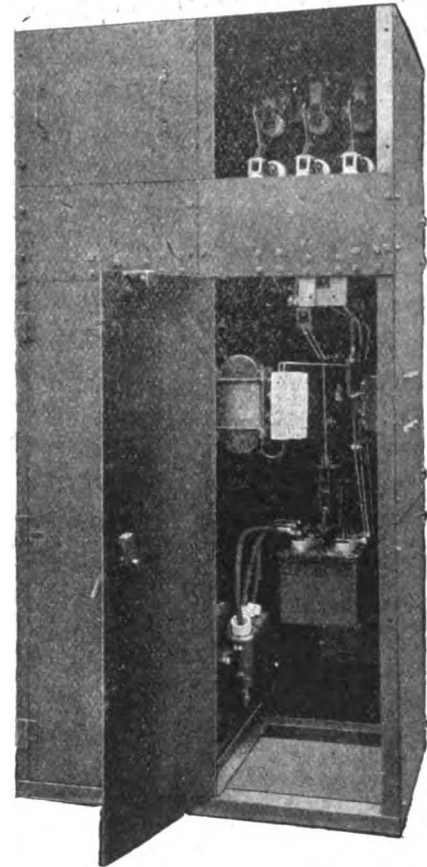
Another list gives particulars of "Foster" pyrometers in practical forms designed for the use of engineers. These are of the thermo-junction type with direct-reading indicating instruments or recorders. The couples are made from "Hoskin's" alloys, one member consisting of an alloy of nickel and chromium and the other of an alloy of nickel and copper. For the very highest ranges the latter is replaced by pure nickel. Among the purposes for which they may be used are to measure temperatures of superheaters; hot-air mains of blast-furnaces; galvanising, tinning or lead-baths; recalcence points of steel; hardening, tempering and carbonising furnaces, and molten brass, gunmetal or iron.

Last, but not least in importance, we have a new catalogue of the famous Evershed testing-sets for insulation and conductor resistance, including the whole chain of instruments from the Megger, with its self-contained generator for measurement at or above working pressure of the highest insulation resistance, conveniently measurable in ohms, the Bridge-Megger set with auxiliary resistance-box for lower resistances, conveniently measured in ohms, to the more recently introduced form of potential ohmeter—the Ducter—for still smaller resistances, conveniently measured in microhms. Descriptions of all these instruments have been published, and it is unnecessary to recapitulate their many ingenious details here. Those desiring full information as to their uses, particularly of the Megger, are recommended to apply to the firm for a copy of the interesting catalogue which we are reviewing.

### AN ENCLOSED SWITCH PANEL

A NEW line of "Mistake-proof" panels has recently been designed by the General Electric Co., of 67 Queen Victoria Street, E.C., embodying several points of interest. As will be seen in the figure, the isolating links and 'bus bars are contained in a separate compartment situated on top of the cubicles. In some earlier types of gear there was the possibility of coming into contact with some live section of the 'bus bars or links when access was gained to the cubicle. In this improved pattern the 'bus bars and the live contacts of the isolating links are partitioned off the remaining portion of the main cubicle by solid metal barriers, thus making it impossible for anybody to accidentally come into contact with live metal: cleaning and adjusting can

therefore be carried out in safety. The second point of importance is that the isolating links are firmly locked in position during the time the panel is in commission. The operation of the links from the front of the board is a feature which will be appreciated by engineers, this doing away with the necessity of opening the cubicle doors to isolate that particular cubicle. The interlocking of the



G.E.C. "MISTAKE PROOF" SWITCH PANEL.

various pieces of apparatus is arranged in such a way that it is impossible to open or close the circuit with the links—the opening and closing of the circuit can only be done with the oil switch, a point which is of the greatest importance. As in previous patterns of G.E.C. high-tension panels, neither marble or slate enter into the construction of the board, the 'bus bars, terminals and isolating links being supported on porcelain insulators. The framework and panels are of boiler plate, rendering the whole fire-proof. No special foundations are required, and this, together with the fact that the whole of the gear is concentrated in the panel, reduces the erection cost to a minimum.

**Sterilisation of Milk.**—We learn from the *Electrical Review and Western Electrician* (Chicago) that the use of ultra-violet light for the sterilisation of milk has been the subject of an investigation carried on in the Bureau of Animal Industry, Washington, by S. Henry Ayers and W. T. Johnson, jun. The milk was picked up from a trough in thin layers by two drums revolving at adjustable speeds. The ultra-violet light was produced by a quartz-tube mercury-vapour lamp taking 3.5 amperes from a 220-volt D.C. circuit. This tube was four inches above the surface of the drums. The average thickness of the layer of milk was 0.1 mm., and the time of exposure was about two seconds at the slower speed of the drums, and one second at the higher speed. While great reductions in the number of observed bacteria were obtained by this apparatus, in which the temperature of the milk during exposure was never higher than 30° C., the results indicated that it is not possible to sterilise milk completely by this means with lamps of the present power and construction. It was further found that when the milk was exposed under conditions suitable for a large reduction in the bacterial content, there was also produced an abnormal, disagreeable flavour, which would render milk unsaleable.

## THE INSTITUTION OF ELECTRICAL ENGINEERS

THE following awards of premiums and scholarships have been made by the Council of the Institution of Electrical Engineers:—

The *Institution Premium* (£25) to Mr. A. E. Hadley, for his paper, "Power Supply on the Rand"; the *Ayrton Premium* (£10) to Mr. F. H. Whysall, for his paper, "The Use of a Large Lighting Battery in connection with Central Station Supply"; the *Fahie Premium* (£10) to Mr. A. J. Aldridge, for his paper, "Practical Application of Telephone Transmission Calculations"; the *John Hopkinson Premium* (£10) to Dr. E. Rosenberg, for his paper, "Self-synchronising Machines"; the *Kelvin Premium* (£21) to Messrs. C. C. Paterson, E. H. Rayner, and A. Kinnes for their paper on "The Use of the Electrostatic System for the Measurement of Power"; the *Paris Premium* (£10) to Mr. J. S. Peck, for his paper, "Earthed v. Unearthed Neutrals on Alternating-current Systems"; an *Extra Premium* (£10) to Mr. M. Solomon, for his paper, "Yellow Flame Arcs"; an *Extra Premium* (£5) to Dr. A. C. Michie, for his paper, "The Formation of Deposits in Oil-cooled Transformers."

Two Salomons Scholarships (£50 each) to Mr. G. G. Dawson, of University College, London, and Mr. Robert Burleigh, of the City and Guilds (Engineering) College, South Kensington, and a David Hughes Scholarship (£50) to Mr. J. H. Lee, of King's College, London.

*Students' Premiums*:—Mr. H. R. Constantine, £10, for his paper, "Time Limits"; Mr. J. Hacking, £10, for his paper, "Phasing Out of Alternating-current Apparatus"; Mr. C. H. Goulden, £5, for his paper, "Low and Mixed Pressure Turbine Plants"; Mr. S. N. C. K. Whitehead, £5, for his paper, "Individual Electric Driving in a Modern Weaving Shed"; Mr. P. Grice, £5, for his paper, "Heating and Cooling of Electrical Machinery"; Mr. A. T. Robertson, £5, for his paper, "Winding of Electrical Machinery."

### TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

Another new automatic telephone system is being introduced into this country. It has been developed in Sweden, and bears the name Betulander. The rights in the system for every country except Sweden have been acquired by Marconi's Wireless Telegraph Co., who will manufacture the apparatus in England, and Mr. C. B. Clay (late London Superintendent of the National Telephone Company) is managing the business for them. The Betulander system has some points of similarity with the Strowger, but the horizontal field of the Strowger switch is not employed, and each line selector and connector switch is removable from the rack without even the loosening of a screw being necessary; connection is made by contacts on the mounting plates registering with springs fitted on the rack. This should greatly facilitate and accelerate repairs and maintenance, especially in small exchanges. The finger-plate dial is not advocated for the subscriber's instruments, but a set of levers, one for each digit, are set, and the removal of the telephone from the switch hook releases them and they make the necessary successive contacts. Fig. 1 shows the construction of the subscriber's set. At the exchange a set of

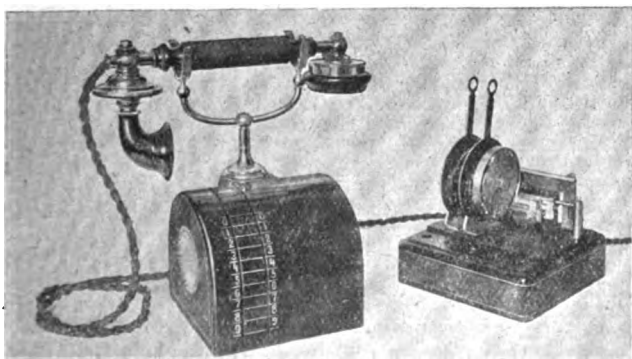


FIG. 1.—SUBSCRIBER'S SET, OPENED.

four relays are allotted to each subscriber. One of these is used only to connect the ringing current to the subscriber's line when he is called, and the other three are for receiving the impulses from the "actuator" of the subscriber's set and

transmitting them to the various selectors. The first of these is a pre-selector, which chooses an idle trunk to a group selector for the first digit, and this works very rapidly, as the vertical arm holding the wipers falls by gravity; a wheel passes over a set of horizontal wires, to which the trunks are connected, and as soon as it reaches an idle one a magnet operating against a strong spring is de-energised and the wipers are pressed hard against the wires in question. Each group selector has an auxiliary selector permanently allocated to it, the function of which is to seek for an idle selector in the next group, which in its turn responds to the next series of impulses sent out from the actuator, and so on through the whole of the selectors necessary to find the called subscriber.

The general construction of the pre-selectors, the group selectors, and the unit's selectors is similar, and they only differ in small details. Fig. 2 shows a pair of group selectors;

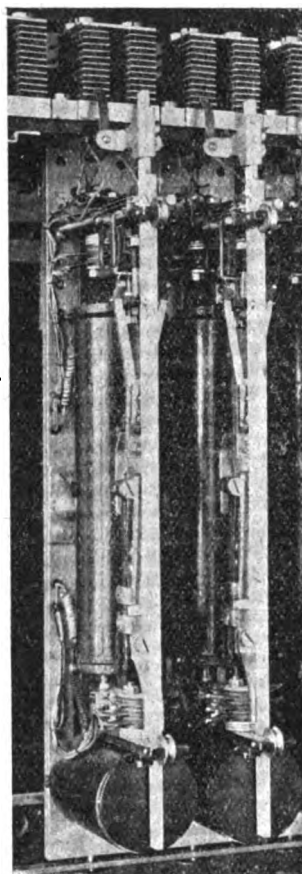


FIG. 2.—A PAIR OF GROUP SELECTORS.

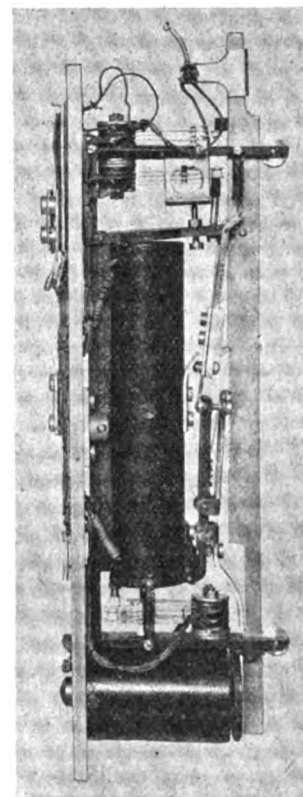


FIG. 3.—GROUP SELECTOR IN SIDE ELEVATION.

the magnet is seen at the bottom, and the set of contacts and wipers on the top. Fig. 3 shows a group selector in side elevation.

It is seen that the system is simple and extremely flexible, and that it allows the equipment to be in exact agreement with the actual number of working subscribers' lines, which is a great advantage. Another feature of the system is that, when the wanted line is engaged, the selector immediately restores it to the normal without waiting for the subscribers to hang up their telephones, so that a low percentage trunking can be employed.

A model exchange is on view at Marconi House (Strand, W.C.), and a 1,000-line plant is on exhibition at 38 rue Lepelletier, Paris.

Negotiations are still proceeding between the Hull Corporation and the Postmaster-General in regard to the ultimate fate of the Hull Corporation telephone undertaking. At the last meeting of the Telephone Committee it was stated that the negotiations are being conducted amicably, although several matters are outstanding. The underlying idea of the negotiations is that the Corporation should purchase from the Post Office the plant required by them from the National Telephone Co. in the Hull area, and continue to work the Hull system there itself.

At the last meeting before the Whitsun recess of the Marconi Committee, Mr. Marconi gave evidence in which

# "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

## Specifications Published May 8, 1913

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

27,793/11. **Advertising.** H. K. HARRIS. A number of advertisements, &c., are mounted on bands or frames, and the position of these can be controlled from a distance by selectors from the central station. For this purpose two circuits, or a single circuit with polarised magnets, may be used, the contacts being controlled by a Wheatstone telegraph tape, or Jacquard or other means. Twenty-one figures.

6,550/12. **D.C. Transformation.** BROWN, BOVERI. To transform high-pressure direct current to low pressure or into mechanical energy, a high-pressure series motor is used, on which is also an exciting winding fed in shunt from a low-pressure dynamo coupled to the high-pressure motor. The dynamo excitation is provided by a shunt winding and an auxiliary winding in series with the motor series winding, so as to ensure self-excitation on starting up and to raise the dynamo E.M.F. at heavy loads. Modifications embracing a Ward-Leonard set may also be used. Five figures.

9,309/12. **Pupin Loaded Cables.** W.E. Co. (W.E. Co., U.S.A.). Pupin coils for loaded submarine telephone cables are made up in long moisture-proof cases. These are joined into the cable during laying, and the end plugs which close the casing are welded to it after the coils and connections are in place. To this end the plugs are provided with recessed faces for the application of water-jackets during welding. Six figures.

9,644/12. **Self-synchronising Machines.** E. ROSENBERG. The method of starting and synchronising synchronous machines described by Dr. E. Rosenberg in a recent I.E.E. Paper (ELECTRICAL ENGINEERING, April 24th, p. 225).

11,439/12. **Drawing Tungsten Filaments.** DEUTSCHE GAS-GLÜHLICHT. During the process of hot-drawing tungsten filaments, the heated wire is passed through dehydrated acids or their salts which are viscous at the temperature of the wire as it enters the die. The use of boric and phosphoric acids is claimed.

11,455/12. **Squirted Tungsten Filaments.** J. A. SCOUAR and DICK, KERR & Co. Viscous sodium silicate solution is used as a binding agent. The intimate mixture is calendered, squirted and dried. The raw filaments so formed are baked in an inert atmosphere and sintered in one operation in an electric resistance furnace.

16,865/12. **Filament Holders.** M. BAUM. Metal wires with a low fusing-point, after being annealed in a reducing gas, are electrolytically coated with chromium and chromous hydroxide and again annealed in a reducing gas at high temperature.

19,288/12. **Rendering Tungsten Ductile.** WESTINGHOUSE METALLFADEN GLÜHLAMPENFABRIK. The metal is heated to over 2000° C., and placed in an inert gas at between 50 and 150 atmospheres, where it is allowed to cool very slowly—during five to ten hours.

## Specifications Published To-day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, E.C., at the price of 8d. each, post free.

Names in italics indicate communicators of inventions from abroad. Summaries of some of the more important of these patents will appear in our next issue.

**Arc Lamps:** BLONDEL [Electrodes] 14,741/12; GENERAL COMPOSING Co., Ges., 28,503/12.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** W.E. Co. (W.E. Co., U.S.A.) [Moisture-proofing cord conductors] 16,152/12; B.T.-H. Co. (G.E. Co., U.S.A.) [Circuit protective gear] 20,663/12; HENLEY'S TELEGRAPH WORKS and NICHOLS [Joint-boxes] 28,094/12.

**Dynamos, Motors, and Transformers:** MOWER and HALE Supplying filtered air] 19,792/12; SCOTT [Commutators] 20,828/12; PINTSCH'S ELECTRIC MFG. Co. and VIDAL [Brush-rockers] 21,433/12.

**Heating and Cooking:** KIRKWOOD [Temperature regulation of electric heating and cooking apparatus] 9,515/12; LOFQUIST [Heating houses] 25,104/12.

**Ignition:** KETERING [Starting systems] 1,424/12; JOHNSON (F.I.A.T.) [Starting systems] 15,069/12; RIKER [For motor vehicles] 22,197/12; BOSCH [Automatic timing] 24,665/12.

**Incandescent Lamps:** WESTINGHOUSE METALLFADEN GLÜHLAMPENFABRIK [Metal Filaments] 26,289/12.

**Switchgear, Fuses and Fittings:** REID [Time switches] 1,693/12; TROOD and DALE [Ceiling roses] 9,910/12; WYNNE [Switches] 13,455/12; FONTECHA [Motor starters] 13,781/12; CHRISTIANS [Fuses] 19,533/12; POOLE [Control of pressure and current regulators] 1,765/13.

**Telephony and Telegraphy:** DEWHIRST [Disinfecting telephones] 9,338/12; JENSEN [Type-printing telegraphs and circuit-selecting apparatus] 18,985/12; MOLINA [Controlling apparatus for automatic telephone systems] 21,008/12; SIEMENS BROS. (Siemens & Halske) [Telegraph tape perforators] 942/13.

**Traction:** LEITNER [Petrol-electric] 9,416/12; McCLOSKEY [Railway block instruments] 20,254/12; TYER & Co., FIRTH and LEAKE [Railway signalling] 29,890/12.

**Miscellaneous:** BLOXAM (Russische Ericsson) [Devices for controlling mechanisms] 7,168/12; GRAY and BURNSIDE [Gyroscopes] 8,952/12; PORTER and ISAACS [Fire-alarm systems] 10,278/12; DENNEY [Fire, and police call boxes] 13,198/12; MALSON [Blasting detonators for coal mining] 15,600/12; ARMORDUCT MFG. Co., JEARY and ANNACKER [Vacuum cleaners] 20,269/12; B.T.-H. Co. (G. E. Co., U.S.A.) [Manufacture of quartz articles] 415/13; PAUL [Gyroscopic position indicators] 5,965/13.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Arc Lamps:** HALBERTSMA, 8,597/13.

**Incandescent Lamps:** MOORE LICHT A.-G. [Moore vacuum lamps] 1,218/13 and 8,712/13; VEREINIGTE GLANZSTOFF FABRIKEN [Manufacture of filaments from cellulose] 2,992/13; JUST [Filaments] 8,966/13.

**Switchgear, Fuses and Fittings:** HELFENSTEIN [Tramcar collectors] 8,267/13; CLOBIUS [Contact and alarm device] 8,741/13.

**Telephony:** PALMER [Transmitters] 8,841/13; SIEMENS & HALSKE [Registering circuits for automatic systems] 9,168/13.

**Traction:** GALLUSSEY [Electrically controlled air-brake valve] 8,865/13; ANGUS [Railway signalling] 9,090/13 and 9,103/13.

**Miscellaneous:** SOC L'ECLAIRAGE ELECT. [Electric driving mechanism for textile machinery] 3,759/13; NATHORST [Magnetic separators] 8,485/13; KEEN [Combined moving-mark target and automatic indicator] 8,603/13; HANTIER [Gyroscopic apparatus for power transmission] 8,846/13.

The following Amended Specification may now be obtained.

27,697/11. **Burglar Alarms.** A. RICHON.

## Amendment of Specification allowed

20,107/11. **Telegraphy.** W. S. STELJES. This specification has been amended practically as required. It deals with receivers of column or tape printing telegraphs, in which the various operations are effected or assisted by the energy stored in springs by the transmitted signal.

## Opposition entered to Grant of Patent

16,821/12. **Adjustable Lamp Fitting.** J. M. WALLWIN. An adjustable telescopic lamp fitting for sewing machines.

## Expired Patents

The following are the more important Patents that have become void through non-payment of renewal fees.

**Dynamos, Motors, and Transformers:** W. T. STUTCHBURY and C. GORICK [Step-down transformer for heating, especially for melting type metal] 1,948/02; B.T.-H. Co. (G.E. Co., U.S.A.) [single-phase commutator motors: an auxiliary stator winding short-circuits the rotor brushes] 1,483/04; R. K. MORCOM and J. M. WALSH [Adjustable choke coil to give varying power factor, especially for testing alternators] 1,517/07; B.T.-H. Co. (J. E. Voeggerath, U.S.A.) [Collector rings for homopolar dynamos] 1,709/08.

**Electrochemistry:** F. SALZER [Obtaining chromium by electrolysis of chromic acid and chromic oxide] 1,344/08.

**Ignition:** H. PRIEPER [Spark intensity is varied by an adjustable-series inductance] 1,699/06; L. A. GIANOLI [Magneto ignition for V-twin-cylinder engines] 1,952/07.

**Incandescent Lamps:** H. KUZEL [Attaching filaments to leading-in wires] 25,994/06; B.T.-H. Co. (G.E. Co., U.S.A.) [Filament mounting machine] 1,585/07.

**Meters:** F. CONRAD [Construction and winding of A.C. induction meters] 923/05.

**Switchgear, Fuses, and Fittings:** C. A. PARK and C. L. MASON (L.N.W. Rly.) [D.P. electro-magnetic switch for train lighting] 1,596/07.

**Traction:** C. I. EARLE [Tramcar trolley retrievers or catchers] 1,224/05; R. BROWN [Surface contact stud switches] 1,818/06; SIEMENS DYNAMO WORKS and F. LYDALL [Preventing over-running of signals] 1,517/08.

**Miscellaneous:** W. T. STUTCHBURY and H. R. SCHULTZ [Electro-magnetic space control in type-casting and composing machines] 1,983/02; W. T. STUTCHBURY and C. GORICK [Details of electric type-casting and composing machines] 1,985/02; A. F. BERRY [A.C. pot-type electromagnets] 2,067/06; R. BERRENBURG [Combined motor rotary pump and whistle] 1,601/08; J. H. FAULENER [Signalling intended movements of a vehicle] 16,293/08.



# ADAMS IGRANIC

CONTROL GEAR FOR COMPRESSORS.

ADAMS  
M<sup>FG</sup> C<sup>O</sup> L<sup>TD</sup>  
BEDFORD  
AND  
LONDON

he detailed the development of the Marconi system since his application for his first patent in 1896. Largely, of course, this was a tribute to his own scientific and commercial progress, and did not bear so directly on the point before the Committee, but in respect of the agreement for the Imperial wireless telegraph scheme, Mr. Marconi expressed the view that the Marconi long-distance system of to-day comprises a number of patents quite as important for their purpose as the famous No. 7,777 of 1896, and it was, he said, the benefit of these, together with the benefit of his own experience and that of some 200 engineers associated with his company, which the Government would receive under the agreement. The rest of Mr. Marconi's statements consisted of comments upon previous evidence. He first complained of the Admiralty statement that their wireless system is an improved Marconi system, and stated that a battleship installation which he inspected in September, 1911, was the Marconi system pure and simple. Much also had been made of the fact that the Marconi system was the spark system, and that there were advantages in other systems which did not employ a spark, but Mr. Marconi informed the Committee that there is now at Clifden a system utilising continuous waves and employing no spark whatever, yet it was still a Marconi system. Dealing with the automatic working which the Committee had been led to believe was new, it was used by him in his Atlantic service, and it was only out of use to-day because the demands of the traffic did not need it. Immediately it was required it would be put into use for transmitting and receiving across the Atlantic. Coming to the report of the Technical Committee, Mr. Marconi commented upon the statement that the Poulsen Co. might be able to erect a 2,000-mile station with the advice and assistance of the Government technical experts. In view of the Post Office statement that they have not the staff for this work, Mr. Marconi assumed that any such advice would come from the Admiralty; if so, it would be a violation of the terms of the present agreement between the Admiralty and the company. Mr. Marconi's next point was that nothing had been said to the Committee by witnesses who knew, of the working of the Coltana station of the Marconi Company in Italy over a distance of more than 2,000 miles over tropical lands. Indeed, Sir Henry Norman, who had actually been in the station at a time when it was so communicating, told the Committee that he did not know of the existence of any station working over 2,000 miles in tropical countries. Finally, Mr. Marconi emphatically protested against the inquiry by the Committee into the affairs of his company which have no bearing on the Committee's terms of reference, and regretted that the services which his company have rendered to the various British Government departments had not been deemed worthy of higher consideration, a remark which was received by loud applause in the Committee room. Only a few questions were asked of Mr. Marconi by the members of the Committee, but the fact was elicited that the terms of the original agreement cannot now hold for various reasons, among them being an increase in the price of raw materials.

In the House of Commons just before the recess, Sir J. D. Rees asked the Postmaster-General whether the Technical Committee which had reported as to the Imperial wireless telegraph scheme had expressed any opinion for the Postmaster-General's guidance supplementing the cautious expression of opinion contained in the report. He also wished to know what evidence there was as to the estimated cost of equipping stations on the Marconi, Poulsen and Goldschmidt systems, and the relative cost of working by each. The reply on behalf of the Postmaster-General was that he had no further information beyond that contained in the report, and that the question of cost did not come within the terms of the Technical Committee's reference.

A meeting of the Liverpool and District Amateur Wireless Association was held on May 8th at the Creamery Café, 56 Whitechapel, for general discussion and exhibition of apparatus. This Association, the subscription to which is 5s. per annum, besides holding fortnightly meetings, arranges visits to works, &c., and among its objects are the purchase

of apparatus for the use of members and eventually to equip a central club with a complete outfit. The hon. secretary is Mr. S. Frith, 6 Cambridge Road, Crosby, Liverpool.

New wireless telegraph regulations have been made, according to the *Board of Trade Journal*, regarding islands in the Western Pacific, requiring, except in the New Hebrides, that licences be obtained from the High Commissioner before a station can be established. Certain rules have also been issued for regulating the use of wireless telegraph apparatus on merchant ships in the Western Pacific.

A decree has been published (which may be seen at the Commercial Intelligence Branch of the Board of Trade) providing for the Government organisation of wireless telegraphy in Brazil. The international stations will include one at Belem and one at Cape Santa Martha, with a range of 4,000 miles, and another at Rio de Janeiro with a range of 2,000 miles.

The Seattle-Sitka cable was put into working order on 6th inst., and the lines of the Indo-European Telegraph Company between Kertch and Soukhoumkaile were repaired on the 7th inst.—The Otranto-Valona cable was restored on 11th inst.

## ELECTRIC TRACTION NOTES

The Leeds Corporation Tramway accounts for the year ended March 31st, 1913, show a net profit of £61,874 after providing for capital charges and the sum of £41,752 for permanent way renewals. The surplus is to be paid over in relief of rates.

The result of the past year's working of the Belfast Corporation Tramways is a net profit of £16,393, after meeting capital charges and adding £13,000 to depreciation.

Out of the 372 vehicles which took part in the annual parade of commercial motor vehicles organised by the Commercial Motor Users' Association on Whit Monday were six electric vehicles, comprising two "Edison-Anderson" vans, entered by the Edison Storage Battery Co., and four "Walker" vans, entered in the new vehicle section by Harrods, Ltd.

By an agreement drawn up by the Manchester Electricity and Tramway Committees, the price to be paid for tramway energy is, for a period of three years, to be at the rate of 1d. per unit for coal 11s. per ton, with an increase or decrease of 0.02d. per unit in respect of each shilling increase or decrease in the price of coal. This charge is to apply to a consumption up to 3,000,000 units per annum, and all supply beyond this quantity will be at the prevailing rate charged to industrial power users under similar conditions of supply.

## LOCAL NOTES

**Birmingham: New Power Station.**—The Electricity Committee's report, referred to in our Tenders Invited column last week, has been adopted by the Corporation. During the discussion upon it, it was suggested that if the advice of the Gas Department had been sought, a better result might have been obtained, apparently from the point of view of reducing the possibility of the smoke nuisance, the argument being that gas engines should be used. The Chairman of the Electricity Committee, however, pointed out, from the detailed investigations carried out by the Committee, it was clear that the results from gas engine plant would not be so good as from steam turbines.

**Electricity Accounts.**—The balance sheet of the electricity undertaking for the year ended March 31st shows a net profit of £27,000, notwithstanding reductions in the power charges which amount to £28,000 for the year. It has been decided to transfer £21,634 to relief of rates and add the balance to renewals account.



## A BIG BILL FOR MATERIALS

ENTIRELY OBIATED

IT ISN'T THE MATERIAL  
THAT'S USED THAT UPSETS  
THE PROFITS—IT'S WHAT IS WASTED.

BUT WHY WASTE ?

### CRANE'S SPRAYERS

will help you to effect vast economies  
in the use of paints, lacquers,  
varnishes and other liquids.

Your interests are greater than ours; it may  
mean a sale to us, but it means "all the time"  
economy to you.

**FREDK. CRANE CHEMICAL CO.,**  
ARMOURY CLOSE, BORDESLEY GREEN,  
BIRMINGHAM.

(Central Depot, 22, Newhall Hill.)



WRITE  
FOR  
COPY OF  
THE  
CRANE  
LIST C

PRICES  
FROM  
45/-

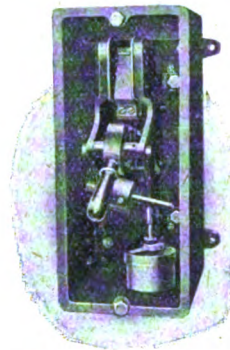


## SWITCHGEAR & COWANS, L<sup>TD</sup>.

Salford,  
MANCHESTER

50 Amps.  
to  
5,000 Amps.

Max.  
Reverse.  
No. Volt.



Large  
Stock  
Kept.

## CIRCUIT BREAKERS

# MICA

**BRITISH MICA CO., LD.**  
Contractors to  
H.M. Government.

Lebanon Road Works,  
Wandsworth, S.W.  
Tel.—405 P.O. Putney.  
Tele.—"Micamini," London.

Plate Tubes,  
Rings, &c., in

**MICANITE**

## GLASS TUBES AND RODS

FOR ELECTRICAL PURPOSES

**GUILBERT-MARTIN**  
9, Edmund Place, LONDON, E.C.

MICA MICANITE FIBRE.  
OILED FABRICS LEATHEROID

## INSULATION

The Micanite & Insulators Co., Ltd.  
Walthamstow, London, E.

## ELECTRICAL PORCELAIN

OF  
HIGHEST QUALITY

APPLY TO

**JAMES MACINTYRE & CO., LTD.,**  
BURSLEM.

## CRYSELCO ELECTRIC LAMPS.

**KEMPSTON WORKS, BEDFORD.**  
Telegrams: "Cryselco," Kempston.  
Telephone: 3377 Bedford.

## F. WIGGINS & SONS,

FOR

## MICA INSULATION

102, 103 & 104, MINORIES, LONDON.

# BABCOCK & WILCOX

Patent LTD.

## WATER-TUBE STEAM BOILERS.

Over { 9,500,000 H.P. LAND TYPE } Installed  
{ 2,400,000 H.P. MARINE TYPE } or on order.

BABCOCK & WILCOX also Manufacture

White-Forster Water-Tube Marine Steam Boilers.  
Steam Superheaters. Water Softeners. Steel Works Chargers.  
Mechanical Stokers. and Purifiers. Structural Steel Work.  
Economisers. Electric Cranes. Steam Piping Plants.  
Feed-Water Heaters. Coal Conveyors. Steel Chimneys.

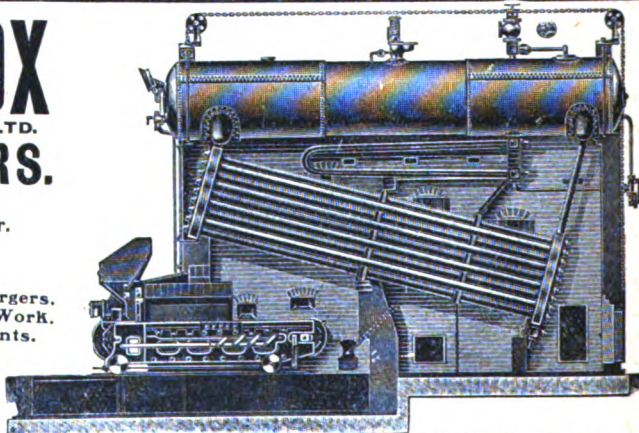
Telegrams:  
"BABCOCK, LONDON."

Head Offices:

Telephone No.  
5540 HOLBORN (8 lines)

**ORIEL HOUSE, FARRINGTON ST., LONDON, E.C.**

Works: RENFREW, SCOTLAND.



Babcock & Wilcox Land Boiler fitted with Patent Superheater and Chain Grate Stoker.

## BLAKE & INSULATING STAPLES

Write for Samples and Prices.

**MOSSÉS & MITCHELL,**

Chiswell Works, 122-124, GOLDEN LANE, E.C.

## ARC LAMP LOWERING GEAR

THE LONDON ELECTRIC FIRM  
CROYDON.

SEND FOR LISTS,  
CONTACT DEVICES, WINCHES, PULLEYS, WIRE ROPE, ETC ETC

## KAYE'S LATEST PATENT SERRATED STEEL

# SEAMLESS OIL CAN

Sole Makers

**JOSH. KAYE & SONS LTD.**

(Managing Director: W. K. KAYE, M.I.Mech.E.)

**Lock Works, LEEDS,**

And 93, High Holborn, London, W.C.



FITTED WITH  
New Patent Thumb Button  
and Patent Seamless Spout.

Also in Copper or Brass for  
Electrical Purposes.

Contractors to H.M. Navy, War Department,  
Home Office, and Indian State Railways.

When corresponding with advertisers, please mention "ELECTRICAL ENGINEERING."



**Bombay: Street Lighting.**—The present contract between the Gas Company and the Corporation for the lighting of the city expires in 1915, and the City Engineer has been instructed to prepare figures as to the comparative cost of lighting by electricity.

**Bray: Diesel Engine Economy.**—It has been reported to the Council that as a result of the installation of Diesel engines, a saving of £2 10s. per night is being made in the fuel bill.

**Cwmaman: Electric Lighting.**—A Board of Trade inquiry was held here last week, in connection with the Council's application for an electric lighting provisional order.

**Dundalk: Electricity Accounts.**—Following out their usual policy of making the revenue and expenditure of their undertaking more or less balance, the Electric Lighting Committee estimate a surplus of £220 for the current year.

**Dundee: Incorporation of Broughty Ferry.**—The Corporation's Bill for the incorporation of Broughty Ferry has received the sanction of a Committee of the House of Commons, and, assuming that this decision is upheld when the Bill comes before the House of Lords, it will mean that the Broughty Ferry electricity works will come under the control of the Dundee Corporation in due course.

**Harwich: Electric Lighting.**—Dr. C. Liebrand has placed a proposal before the traders of Harwich and Dovercourt for an electric lighting scheme.

**Hessle: Electric Supply.**—The Hull Electricity Committee has prepared an agreement embodying the terms upon which they recommend the Corporation to give a supply of electrical energy to Hessle.

**Manchester: Street Lighting.**—The scheme for the improved lighting of the Manchester streets has now been confirmed by the City Council, and there has been a more or less equal distribution as between electricity and gas. Sixteen streets are to be lighted by electricity, the total length of which amounts to 13,621 yards. The plans are in course of preparation with a view to an early commencement of the constructional work, which will be spread over a period of three years. The capital cost is estimated at £15,000.

**New Zealand: Water Power Scheme.**—The contract has been let for the power house in connection with the Government's water-power scheme at Lake Coleridge. The primary object of this scheme is to supply Christchurch, which is sixty-five miles away.

**Nottingham: Electricity Profits.**—Speaking at the last meeting of the Corporation with regard to the decreased contribution from the electricity undertaking to relief of rates, referred to in our last issue, Sir John Turney, Chairman of the Electricity Committee, said that one of the reasons was an increased expenditure of £3,000 on coal due to increased prices. Further, the granting of a flat rate to small consumers has resulted in a reduced income from this class of consumer of £2,400. The present coal contracts could not be renewed at existing prices, and it was anticipated that the coal bill for next year would be £8,000 more than in 1912.

**Oldham: Electricity Accounts.**—The net profit on the electricity undertaking last year amounted to £1,044, compared with £665 in the previous year. This increased result has been obtained in spite of the extra outlay of £900 for coal.

**Radcliffe: Electricity Profits.**—A net profit of £500 is announced upon the working of the electricity undertaking for last year, notwithstanding the effects of the coal strike. The Committee has decided to place this to the reserve fund.

**Redditch: Position of Electricity Undertaking.**—We announced in our issue for April 3rd that the Advisory Committee which was appointed to inquire into the general position of the electricity undertaking made certain recommendations, and that Mr. Ferguson, the manager of the undertaking, had subsequently resigned. The Committee now recommends that a successor should be appointed at a salary of £250 per annum, but at the last meeting of the Council several members expressed the opinion that a competent manager could not be secured at this salary. After some discussion, it was decided to advertise for a successor to Mr. Ferguson at a salary of £300 per annum.

**Rochdale: Electricity Accounts.**—The gross profit on the electricity undertaking at Rochdale during the past year amounted to £11,740, as compared with £10,644 for the preceding year. The net profit is £2,883. This is the lowest since the department began to pay, with the exception of that in the year 1911-12, and it is due to the increased cost of coal, and to additional interest and sinking fund charges upon extensions, the full benefit of which cannot yet be felt. £2,000 is to be allocated to the relief of the rates, and the balance will be carried to reserve. The Electricity Committee have agreed to supply electricity in bulk to Whitworth for five years.

**Swinton: Electricity Accounts.**—The total number of units sold in the district last year was 206,339, as against 159,182 in the previous year. The deficit for the year was £288, but, with decreasing expenditure, there appear to be prospects of a balance in hand in the near future.

**Toronto: Purchase of Supply Co.**—The City Council is proposing to purchase the Toronto Electric Light Co. and also the traction companies in the city.

**Waterford: Electric Supply.**—A good deal has been heard recently of electric supply installations both by the Council and by the local Gas Company. Apparently despairing of a scheme ever being put into force, the Post Office authorities have decided to put in an independent plant for the General Post Office, the contracts for which have already been placed.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

### Generating Stations, Sub-Stations, Mains, &c.

**Australia.**—The Melbourne Corporation requires switch-gear and instruments. Further particulars from Messrs. McIlwraith, McEachern & Co., Billiter Square Buildings, E.C.

**Belfast.**—A loan for new mains and services is to be applied for.

**Bulgaria.**—Three generating sets are required by the Pernik State coal mine. A copy of the specification may be seen at 73 Basinghall Street, E.C.

**Ilkley.**—An electric lighting scheme at an estimated cost of £18,000 is to be prepared.

**Leeds.**—An application has been made to the Local Government Board for sanction to borrow £38,500 for additional generating plant; £100,000 for mains; and £30,000 for sub-station equipment.

**London: L.C.C.**—High and low tension cables. (See advertisement on another page.)

**New Zealand.**—The Devonport Council has sanctioned a company's proposal to establish an electricity works.

The Lytleton Council require two 500-kw. converters, also switchboard panels. May 22nd. New Zealand High Commissioner in London, 13 Victoria Street.

**Rhondda.**—A Local Government Board inquiry has been held concerning a loan of £33,400 for the purposes of the electricity undertaking.

**South Africa.**—The Wellington Council has decided to raise a loan of £10,000 for electric supply purposes.

**Tullamore (Ireland).**—A report on an electric lighting scheme is being prepared for the Council.

**Uruguay.**—According to the *Review of the River Plate*, the Anglo-Argentine Electricity Co. are about to construct a new power house at Concepcion del Uruguay.

**Valparaiso (Chile).**—Tenders are invited for the construction of a generating station distribution system at the Port. Particulars from the Chilean Legation, 48 Grosvenor Square, W.

### Wiring

The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.

**Berwick.**—Cinematograph theatre.

**Croydon.**—Seventeen houses, Melrose Avenue. W. Aston & Co., Thornton Heath.—Eleven houses, Bingham Road. W. Hawkins, Bingham Road.—Cinematograph theatre, Brighton Road. J. P. Oldacre, Purley.

**Stockport.**—Extension of police buildings. Town Clerk.

### Miscellaneous

**Australia.**—The Board of Trade Journal states that tenders are invited by the Electric Supply Department of the city of Melbourne for 20,000 yds. of 3-in. circular section fibre conduits. Particulars from McIlwraith, McEachern and Co., Billiter Square Buildings, E.C.

## THE RECORD ELECTRICAL Co., Ltd.

LONDON OFFICE:  
CAXTON HOUSE,  
WESTMINSTER, S.W.

Telephone:  
3097 Victoria.  
Telegrams & Cablegrams:  
"Infusion,  
London."

MEASURING  
INSTRUMENTS.  
RECORD'S PATENT.

Write for Prices & Particulars.

WORKS:  
BROADHEATH,  
MANCHESTER.

Telephone:  
164 Altrincham.  
Telegrams & Cablegrams:  
"Infusion,  
Altrincham."

**Indo-China.**—The establishment of a large wireless telegraph station is contemplated at Saigon.

**New Zealand.**—The New Plymouth Council has decided to raise a loan of £55,000 for tramway extensions.

**Spain.**—The Minister of Marine invites tenders for two long-distance wireless telegraph stations, and two experimental installations.

## TENDERS RECEIVED AND ACCEPTED

**Belfast.**—The tender of Messrs. Babcock & Wilcox for the supply of a boiler, superheater, mechanical stoker and pipe-work at £2,805 has been accepted.

**China.**—The General Electric Co. of China has received an order for an electric supply installation for the town of Fatshan, near Canton. The generating plant will consist of three 200-kw. three-phase high-tension generators, driven by Bolinders oil engines. The plant is expected to arrive in China in July.

**Eastbourne.**—The following tenders have been received for the supply of flame arc lamps for public street lighting:—Electrical Co. (accepted); Engineering & Arc Lamps, Ltd.; Maxim Lamp Works, Ltd.; Siemens Bros. Dynamo Works, Ltd.; Oliver Arc Lamp Co.; Jandus Arc Lamp & Electric Co.; G. Brault; Johnson & Phillips; Ridings Arc Lamp Co.; Union Electric Co.; Electrical Engineering & Equipment Co.

**Manchester.**—Orders for paper insulated and rubber insulated cables have been placed with W. T. Henley's Telegraph Works Co., India Rubber, Gutta Percha and Telegraph Works Co., Siemens Bros. & Co., and C. Macintosh & Co.

**South Africa.**—We learn from the *African World* that the Germiston Council has awarded the following contracts in connection with their trackless trolley scheme:—H. Davis & Co., ten Cedes-Stoll cars, £11,400; converter fittings, £1,328, poles £6,899; Telegraph Manufacturing Co. (Colonial), electric mains, £4,064; S. Sykes & Co., motor-converters, £3,272.

## APPOINTMENTS AND PERSONAL NOTES

The following increases of salaries are recommended by the Dublin Electric Supply Committee:—Mr. M. Ruddle, City Electrical Engineer, from £750 to £1,000 per annum, by £50 increments; Mr. L. J. Kettle, Deputy Electrical Engineer, from £400 to £600 per annum, by £50 increments, and Mr. Gilbert Archer, Chief Distribution Engineer, from £350 to £450 per annum by £25 increments.

The post of Head of the Electrical Engineering Department of the Birmingham Municipal Technical School is vacant. (See an advertisement on another page.)

A manager is required for the Redditch electricity undertaking at a salary of £300 per annum.

The salary of Mr. A. D. Chalmers, Borough Electrical Engineer at Gillingham, will, at the expiration of his present agreement in August, continue to be £300 per annum, but his commission on the gross profits is to be increased from 1 to 1½ per cent.

Mr. R. H. Thompson has been appointed Station Superintendent by the Nelson Corporation, and Mr. J. Stanworth Mains Superintendent.

The salary of Mr. H. H. Smith, Superintendent at the Worcester electricity works, is to be increased from £150 to £180 per annum by £10 increments.

Mr. W. E. Bradshaw, of Clapham, has been appointed Mains Superintendent by the Islington Borough Council, in succession to Mr. T. A. G. Margary. The salary is £200, rising to £225 per annum.

The Rt. Hon. Lord Castletown, Chancellor of the Royal University of Ireland, has been appointed Chairman of the Governors of Faraday House Electrical Training College, in succession to the late Earl of Crawford.

A telephone engineer is required with common battery and automatic exchange experience. (See an advertisement on another page.)

Fitter required for Central station on east coast of Scotland. (See an advertisement on another page.)

## MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. G. Smith and Son, of 5 Philpot Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night, was £73 to £73 10s. (last week, £72 5s. to £72 15s.).

**Liquidations.**—A private meeting of the creditors of the Adams Manufacturing Co., Ltd., was held on Friday. Mr. Lewis Hardy, the liquidator, said that the works were full of orders, and he quite believed he was carrying on the business at a profit. The statement of affairs showed that after taking machinery and tools, trade fixtures and fittings, patents and patterns and freehold factories at their book value, there was a surplus of assets over liabilities amounting to £5,860. The creditors expressed extreme dissatisfaction with the position. The liabilities amount to £30,094, and the assets, after paying off debentures and preferential creditors, are estimated at £35,954. The directors hold about £13,000 of the £15,000 debentures. The meeting decided to apply to the Court for the appointment of Mr. G. Corfield and a committee of creditors to act jointly with Mr. Hardy. Among the principal electrical creditors may be mentioned Cutler-Hammer Manufacturing Co., £1,181; Rochdale Electric Co., £280; Electric & Ordnance Accessories Co., £226; *Electrical Times*, £174; *Electrical Review*, £113; Electro-Mechanical Brake Co., £116; Acme Electrical Co., £130; Concordia Electric Wire Co., £118.

**Bankruptcies.**—The last day for receiving proofs in the bankruptcy of Cecil Wray, electrical engineer, late of 24 Simes Street, Bradford, is May 21st. The trustee is W. Durrance, 12 Duke Street, Bradford.

The last day for receiving proofs in the bankruptcy of C. S. Northcote, electrical engineer, 67 Stanthorpe Road, Streatham, is May 23rd. The trustee is Mr. E. W. J. Savill, 132 York Road, Westminster Bridge Road, S.E.

## COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &c.

**Callender's Cable and Construction Co.**—The profit for 1912 was £155,619, which exceeds that of the previous year by more than £20,000, notwithstanding the heavy expenditure during the coal and Thames dock strikes. A sum of £8,924 is added to depreciation, and a final dividend, making 10 per cent. for the year, together with a bonus of 5s. per share, is recommended on the ordinary shares, carrying forward £91,745. The Company's business, both in underground mains and telephone cables, shows further signs of considerable extension, whilst the increase in output last year, especially for the Colonies and abroad, rendered it necessary to provide further capital, which has been obtained by the formation of Callender's Share and Investment Trust.

At the meeting on Thursday the Chairman said that the works are at present filled with orders of the widest range, both from at home and the Colonies, and that unless something unexpected happened, as good, if not better, a balance-sheet would be shown next year.

**Willans and Robinson.**—The accounts for the half-year to December 31st, 1912, show that after allowing for debenture interest, and £3,264 for depreciation, there is a small profit of £154. This improved result is mainly due to the increased volume of work, and as during the opening months of the present year further orders have been obtained at better prices, the directors hope for a continuation of the improved position.

**Chloride Electrical Storage Co.**—A dividend of 10 per cent. has been declared for the past year, carrying forward £8,407.

## NEW COMPANIES

**"CEAG" ELECTRIC SAFETY LAMP CO.** Registered by Cruesemann & Rouse, 85 Gracechurch Street, E.C. Capital £10,000. (This Company's safety lamp was described in our issue for September 5th, 1912, page li.)

**STOLZ ELECTROPHONE CO.,** 85 Fleet Street, E.C. Capital, £60,000.

**BRITISH ELECTRIC HEATER CO.,** 103 West George Street, Glasgow. Capital, £50,000.



# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

NO. 334 [VOL. IX., NO. 21]  
*All rights reserved.*

THURSDAY, MAY 22, 1913.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES AND TECHNICAL COLLEGE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

*Other Advertisement Rates on Application.*

*Latest Time for Receiving*

Letters for Insertion, Tuesday first post.

Small Advertisements and Official Announcements, Wednesday first post.

Displayed Advertisements, Tuesday first post.

Corrections in Standing Advertisements, Monday first post.

All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 208-206, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Circling, Fleet, London." Telephone No.: 5509 Holborn.

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

THE annual report of the Institution of Electrical Engineers has been issued, and records a year of great activity. (Page 284.)

THE British Electrical and Allied Manufacturers' Association has issued a set of standard rules for the rating, &c., of electrical machinery. (Page 285.)

AN article by Mr. E. C. Evans describes a method of testing the condition of storage battery plates by measuring the P.D. between either of them and a piece of cadmium dipped in the electrolyte. (Page 285.)

A PARTY of over a hundred members of the Institution of Electrical Engineers, accompanied by about forty ladies, are taking part in a joint meeting with the Société Internationale des Electriciens in Paris. (Page 286.)

OUR "ELECTRICAL ENGINEERING Literary Section" contains a list of new publications, reviews of a number of technical books, and gives a selected list of recommended works on all branches of electrical engineering. (Page 287.)

A QUESTION relating to the testing of electrical machinery in mines is given in our Questions and Answers Columns. (Page 291.)

A SPRING-CLIP shade gallery is described on page 291.

THE Patent Specifications published last Thursday include some dealing with petrol-electric traction, air-filters, control of heating apparatus, commutators, &c.

A patent has been allowed to J. J. Deschamps for an automatic parcel railway system in spite of opposition. (Page 292.)

A SIMPLE lift controller is described, and an example of electric cathedral lighting is illustrated on page 293.

AN expenditure of £1,600,000 is contemplated upon railway electrification at St. Petersburg.—The L.C.C. has been experimenting successfully with Stevens petrol-electric tramcars, and single-deck cars are being agitated for on the Hagley Road route of the Birmingham Corporation tramways.—A London firm is negotiating with the New South Wales Government concerning an underground railway scheme in Sydney. (Page 293.)

WE give some information as to the Australian Government wireless telegraph stations, and also refer to the reception of messages up to 2,400 miles from the Fort Meyer station by a U.S. battleship. Wireless communication has been established experimentally between Berlin and New York, a distance of nearly 4,050 miles. (Page 294.)

THERE is difference of opinion between the Sheffield Corporation and the local wiring contractors as to the interpretation of the Corporation's powers under their Act of last year.—Mr. E. M. Lacey has reported upon the general position of the Walsall electricity undertaking.—The rateable value system of charging is recommended at Gravesend.—The Hebburn Council are asking for a Board of Trade enquiry concerning the safety of electric cables in their district.—Mr. F. Ayton, the Ipswich Borough Electrical Engineer, recommends a tariff to encourage the use of electric vehicles.—The Leeds electricity accounts for last year show a net profit of £15,508.—A refuse destructor scheme in conjunction with electricity supply is under consideration at Rothsay. (Page 295.)

LOANS have been inquired into as follows:—Bridlington, £5,000; Nelson, £4,000; and Yarmouth, £3,840.—Steam and feed piping, &c., is required at Dundee; generating plant for the Bury St. Edmunds Infirmary; 75 new tramcars at Birmingham; a twelve months' supply of stores at Liverpool; and generating plant in Canada. (Page 295.)

THE British Thomson-Houston Co. shows a net profit of £1,208 for the year 1912.—A 3 per cent. dividend is paid on the preference shares of the Urban Electric Supply Co.; and 3½ per cent. on the ordinary shares of the Cleveland & Durham County Electric Power Co. (Page 296.)

**Railway Classification of Electric Stoves.**—Notice is given by the railway companies of Great Britain of an application under the Railway and Canal Traffic Act, 1888, to reclassify electric stoves and heaters for the purpose of rates and charges for carriage. As will be seen by an advertisement elsewhere in this issue, objections can be lodged against the proposal.

## ARRANGEMENTS FOR THE WEEK

THURSDAY, MAY 22ND, TO SATURDAY, MAY 24TH.  
*Institution of Electrical Engineers.*

Continuation of Meeting in Paris.

FRIDAY, MAY 23RD.

*Royal Institution.*

9 p.m. Evening discourse: "The Secret of the Permanent Magnet," by Prof. S. P. Thompson, F.R.S.

MONDAY, MAY 26TH.

*Institution of Electrical Engineers: Newcastle Section.*

7.30 p.m. Annual general meeting at Armstrong College, to be followed by a lecture on "Gas Engines," by A. P. Pyne.

## The London Electrical Engineers.

(To-Day) THURSDAY, MAY 22ND.—C. Company. FRIDAY, MAY 23RD.—D. Company. MONDAY, MAY 26TH.—A. Company. TUESDAY, MAY 27TH.—B. Company. THURSDAY, MAY 29TH.—C. Company. FRIDAY, MAY 30TH.—D. Company. Infantry Drill, 7 to 9 p.m. Technical instruction for all Members on the Sixth Rate and for all Candidates for Higher Rating, 7 to 9 p.m. Musketry Instruction, 9 to 10 p.m.

WEDNESDAY, MAY 28TH. All Companies.—Annual Musketry at Purfleet Rifle Ranges. Railway tickets will be sent to those notifying Headquarters of their intention to attend.

SATURDAY, MAY 31ST.—Headquarters open from 10 a.m. till noon. Annual Musketry at Purfleet. Members are reminded that this is the last date on which they can fire their Annual Course to make themselves efficient, and should apply early for their Railway Tickets.

**Old Centralians.**—A lawn tennis match between the Old Centralians Tennis Team and the City and Guilds (Engineering) College Lawn Tennis Club was played on Saturday at the latter club's ground, North Ealing. The Old Students were beaten by 5-4. The score was as follows:—Regnard (*Captain College Team*) and Saurback lost to R. Burton (*Captain Old Centralians*) and H. T. M. Kent, 3-6, 7-5, 4-6; beat J. V. and P. V. Dupré, 2-6, 6-2, 6-4; beat A. P. Dicksee and R. A. Mack, 6-1, 6-1. Harris and Moore beat Burton and Kent, 6-2, 7-5; lost to J. V. and P. V. Dupré, 1-6, 2-6; beat Dicksee and Mack, 6-1, 6-3. Ryan and Manuel lost to Burton and Kent, 3-6, 1-6; lost to J. V. and P. V. Dupré, 0-6, 4-6; beat Dicksee and Mack, 6-2, 6-3. A return match will be played on June 7th. Old students of the college who are good tennis players are requested to communicate with the match captain (Mr. Richard Burton, c/o Messrs. C. W. Burton Griffiths and Co., 1-3 Ludgate Square, Ludgate Hill, E.C.4.).

**A Shooting Competition.**—On Monday evening last an interesting competition between the Rifle Club of Siemens Bros. Dynamo Works, Ltd., Lamp and Fittings Department, of Dalston, and representatives of the Electrical Press. The competition embraced shooting at a fixed target with Morris tube, and also big-game shooting with a Winchester repeater, 12 shots per minute. In the latter case a springbuck dodged on and off a screen through the agency of the cinematograph, but even in this the Electrical Press were unable to beat the Siemens' team. The scores were: fixed targets, Siemens, 273; Press, 233; and moving targets, Siemens, 61; Press, 54. The maxima possible were 364 and 264 respectively. The competition took place at Life Targets, Ltd. (12 Bow Street, Covent Garden, W.C.), who own the patents for the system. Any suitable cinematograph picture is projected on to a screen consisting of three thicknesses of paper. One is moved horizontally once a day, and serves to keep taut the others, which are moved vertically through about  $\frac{1}{2}$  in. by a solenoid, spring, and ratchet after each shot. As soon as a shot is fired the sound waves, acting on a microphone, cause it to pass a feeble current through a delicate Kramer relay, which in turn instantly stops the cinematograph by applying a brake, which is released after a few seconds by an adjustable dash-pot. The shot perforates the screen, and through the hole so produced a bright light shines. As soon, however, as the cinematograph restarts, the paper is moved forward as stated above, and the picture is ready for the next shot.

**Electric Cooking at West Ham.**—A series of "Tricity" electric cooking lectures and practical demonstrations was commenced by Mr. F. S. Grogan, at the Town Hall, Stratford, on Tuesday afternoon, and, as announced recently in our columns, will be continued daily at 3.30 and 7 p.m. until to-morrow evening. In his usual suave and subtle manner, Mr. Grogan discourses on the unique features of the "Tricity" duplex cooker, its sphere of usefulness, and the adaptability of the various parts for different purposes. Mr. Grogan also points out that it has been conclusively proved that with gas at 2s. 6d. per 1,000 cub. ft., and electricity at 1d. per unit, the costs of cooking by the two systems are the same, while with electricity there is an additional saving of between 20 and 30 per cent. in the weight of meat cooked, the latter, by the way, being cooked uniformly throughout. There are, he said, over 5,000 of these cookers now in use in this country. The West Ham Corporation Electricity Department are evidently making a bid for an increase in their already substantial heating and cooking load, which, with a revised tariff, which we hope to see soon, coupled with the energies of Mr. H. Farndon (Sales Manager), may soon swell to large proportions.

## THE INSTITUTION OF ELECTRICAL ENGINEERS

THE Annual Report of the Institution of Electrical Engineers, which will be submitted to the Annual General Meeting on May 30th, records an increase in the total membership of 547 since last year. The numbers of the various classes of members, &c., are now as follows: Hon. Members, 7; Members, 1,549; Associate Members, 3,535; Associates, 671; Graduates, 260; Students, 1,062; Total, 7,084. There have been during the session fourteen London meetings and sixty-one meetings of Local Sections, as well as meetings at Calcutta and Cape Town. The Students' Meetings in London have numbered nine, and twenty-two have been held in the provinces. The summer meeting last year in Glasgow and the joint meeting now being held with the Société Internationale des Electriciens are referred to, and a list of the premiums and scholarships is given. These were given in ELECTRICAL ENGINEERING, May 15th, p. 277. As already announced, the *Journal* is in future to be published fortnightly, from December to July; it is now stated that it will be of quarto size, and will contain the papers and discussions now published in the *Journal*, notices of meetings of the Institution and of the Local Sections (this will replace the present postcard notices), communications from the Council to the members, and periodical reports on the work of the Council and Committees of the Council.

Notes are given in the Report on the apparatus and facilities available for demonstration purposes in the lecture theatre, and the arrangements whereby members visiting America can use the rooms of the American Institute of Electrical Engineers are mentioned. Other matters dealt with are the scope of the work of the new research committee, the new examination scheme, and the Kelvin memorial window, which will probably be completed in June and handed over to Westminster Abbey in July. Some additions to the Museum and Library are recorded.

The accounts show a margin of income over expenditure of £1,238. Donations and subscriptions to the Benevolent Fund in 1912 amounted to £147.

**Linking Up London Electric Supply Undertakings.**—We referred in our issue for April 17th, p. 212, to a motion by the Battersea Borough Council to restrain the County of London Electric Supply Co. from laying mains in the Borough of Battersea to connect up the Wandsworth and Southwark areas of the Company. This motion was refused, and the appeal came before the Master of the Rolls, Lord Justice Kennedy, and Sir Samuel T. Evans, in the Appeal Court on Tuesday. Under the Electric Lighting Act of 1908 all the London electric supply authorities are authorised to link up their undertakings. Before the passing of the Act the County of London Co.'s Wandsworth and Southwark mains were, and are still, connected by means of mains through the Borough of Lambeth along a route thirteen miles in length. These mains were laid under an agreement with the Lambeth Council, to whom the County of London Co. pay an annual rent of £100. The proposal of the County of London Co. now is to lay a new main between Wandsworth and Southwark through Battersea, the distance being in this case only six miles. The contention of the Battersea Council was that Section 4 of the Act of 1908 only provided for one connecting-link between any two areas, and that when one such link was laid the powers of the Act ceased so far as those particular areas were concerned. Thus it was argued that as a main already existed between Wandsworth and Southwark the Company had no right to lay another. The Appeal Court held, however, that this construction of the words of the Section is wrong, and entered judgment for the County of London Co. with costs.

**Reductions in Cable Prices.**—Reductions in the prices of "Association Grades" of cables have been made by the members of the C.M.A. so that the discounts on 2,500, 600, and 300 megohm grades of C.M.A. and Association pure rubber flexibles are now 27½, 15, and 10 per cent. Reductions are also being made in the prices of non-Association grades, but the new discounts are slightly different from those given above. The India Rubber, Gutta Percha and Telegraph Works Co. and W. T. Henley's Telegraph Works inform us that their discounts for pure I.R. wires and cables are now 7½, 15, and 10 per cent. We also understand that Callender's Cable and Construction Co., British Insulated and Helsby Cables, Ltd., The London Electric Wire Co., and some other firms are making similar reductions in the non-Association as well as the Association cables of their manufacture.

## STANDARDISATION RULES FOR ELECTRICAL MACHINERY

A SET of rules for the standardisation of electrical machinery has been drawn up by a Committee of the British Electrical and Allied Manufacturer's Association, and has been provisionally adopted by the Council.

The first section establishes 50 and 25 cycles per sec. as standard frequencies and 2,000, 3,000, 6,000, 10,000 and 20,000 volts as standard high pressures. The standard generator pressures are given as 115, 230, 460 and 525 volts D.C. and 440, 550, 2,200, 3,300, 6,600 and 11,000 volts A.C., and the standard low pressures at consumers' terminals are given as 110, 220, 440 and 500 volts D.C. and 100, 200, 400 and 500 volts A.C. The section devoted to high-pressure tests and insulation resistance deprecates prolonged tests at high pressure and specifies test pressures of 1,000 volts for rated pressures not exceeding 333 volts; three-times rated pressure with a minimum of 1,500 volts for pressures from 333 to 1,500 volts, 4,500 for voltages from 1,500 to 2,250 volts, and twice the rated pressure for pressures above 2,250 volts. In a similar way very high insulation resistance specification is not recommended since, in order to obtain it, long baking at high temperatures may be required, which may permanently damage the insulating material. The values of one megohm for windings above 350 volts and 0.25 megohm for low-pressure windings are put forward as affording sufficient evidence that the windings are in condition to receive the high-pressure test.

Machines are classified as open, protected, enclosed-ventilated, pipe-ventilated (with or without "forced draught"), drip-proof, totally enclosed or flame-proof. Definitions of these types are given. The section on rating differentiates between "continuous" and "short-time" rating and makes special provisions for the rating of variable-speed machines. Continuous rating of machines is based on a temperature rise after running "until the temperature is practically constant; that is, until the rate of increase of temperature rise does not exceed 1° C. per hour."

The following are the specified temperature rises: Machines with "unobstructed" ventilation; windings or cores in which windings are embedded 40° C., commutators and slip-rings 55° C. These are as measured by thermometer. The rise as measured by resistance of alternator field coil is not to exceed 55° C., and of D.C. shunt field coils 60° C. In the case of machines with "partially obstructed" ventilation the limit is raised to 47° C. for windings, &c., by thermometer, or 65° C. by resistance (for D.C. field coils). A further advance to 55° and 70° C. respectively is allowed for totally enclosed machines. The commutator figure is the same in all cases. The standard temperature rise for transformers is given as 50° C. Special allowances are made for machines for tropical conditions, machines with special heat-resisting insulating materials, and machines for high altitudes. The standard overloads for continuously rated machines are 25 per cent. for machines with unobstructed ventilation, or 15 per cent. for machines with partially obstructed ventilation for two hours for 100 kw. or over, one hour for 25-100 kw., half-hour for 2-25 kw., and five minutes for 2 kw. and under. For totally enclosed machines no overloads are required, except the momentary overloads in connection with commutation tests. Motors on short-time rating are to be capable of 100 per cent. overload for thirty seconds, and transformers are to be capable of 25 per cent. overload for two hours, and 100 per cent. for thirty seconds.

## CADMIUM TESTS ON STORAGE BATTERY PLATES

THE following description of testing the condition of storage battery plates has been sent us by Mr. E. C. Evans. As the maintenance of a battery discharge voltage, and consequently the output, depends on the condition of both the positive and negative plates, it is essential to ascertain that they are always properly charged. The voltmeter readings of individual cells and also the existence of gassing is not always an indication of the completion of a charge, and, therefore, in order to obtain the best efficiency from a battery it is necessary to see that both the positive and negative plates are completely charged. If either are not always fully charged the capacity on discharge will only be equal to that of the least efficient set of plates.

The best method of testing the state of the positive and negative plates in a cell is to obtain voltmeter readings between them and a cadmium stick. A piece of cadmium measuring, say, 3 ins. long and  $\frac{1}{4}$  in. in diameter would be

suitable for the purpose, but it must be free from impurities and allowed to become slightly oxidised before use. As there is a difference in potential between cadmium and cadmium oxide the stick should never be scraped bright during a test, otherwise comparative figures cannot be obtained.

The reading between the cadmium and negative plates will only be small, so that it will be necessary to use a sensitive voltmeter with a finely divided scale in order to obtain accurate results. The ordinary cell-testing type is not suitable as the dial is usually insufficiently graduated for fine readings, and also the resistance of these instruments is generally too low. The reason for using a high-resistance voltmeter is to eliminate errors which would result from polarisation taking place owing to an appreciable current passing between the cadmium test-piece and the plates under test. One of the voltmeter leads should be suitably connected to the cadmium and the latter should be allowed to remain in the acid of the cell for a few minutes before making the test, in order that a coating of cadmium sulphate may form on it. It is also important not to allow the cadmium to dry between taking readings, as this will cause inaccurate results. Care should be taken, also, to see that the cadmium does not come into contact with any of the plates.

The tests should be made with the battery charging at the normal rate, and the readings taken at the beginning as well as towards the end of a charge. At the commencement of charge it will be found that no reading is obtained between the cadmium and negative plates, but as the charge proceeds a P.D. will gradually rise until it reaches the neighbourhood of 0.15 of a volt or over towards the end of charge. The voltaic relations between the cadmium and positive plates and the cadmium and negative plates and also their P.D. values will be as follows, the left hand being the positive side:—

Positive plates and cadmium .....	2.35 volts
Cadmium and negative plates .....	0.18 "
Positive plates and negative plates ...	2.53 "

It will be seen from the above that the cadmium is positive to the negative plates and negative to the positive plates, and that the voltage of the cell is equal to the sum of the two cadmium readings when these are in opposite directions or when the voltmeter leads have to be changed after making one reading before the other is obtained. Should it be found towards the end of a charge that the cell voltage is 2.5 or more and the reading between the cadmium and negative plates is less than 0.15 volt, the charge cannot be considered as complete, and must therefore be continued until it reaches at least the figure mentioned and ceases to increase. If no P.D. is obtained between the cadmium and negative plates the latter are not fully up. Cadmium readings are also very useful in investigating the condition of the positive and negative plates during discharge. In this case the cadmium and negative plates readings are in the reverse direction, the negatives being positive to the cadmium, the cell volts being equal to the difference between the two cadmium readings. During discharge the P.D. between cadmium and negative plates gradually increases until a limit depending on the rate of discharge is reached.

The following table illustrates the various values of the readings obtained from a cell in which the positive and negative plates were in proper condition:—

	Positive and negative plates. Volts.	Positive plates and cadmium. Volts.	Negative plates and cadmium. Volts.
10-hour rate	2 minutes ..	2.07	2.25
	5 hours .....	1.92	2.12
	10 " .....	1.70	1.93
3-hour rate	2 minutes ..	2.02	2.22
	1½ hours .....	1.88	2.10
	3 " .....	1.70	2.00
1-hour rate	2 minutes ..	1.96	2.17
	½ hour .....	1.83	2.09
	1 " .....	1.60	1.93

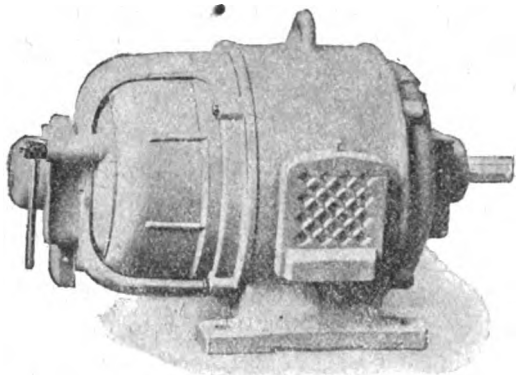
From the above figures it will be noticed that the cadmium readings vary according to the rate and also the period of discharge, the P.D. between the cadmium and negative plates increasing until the respective limits are reached. If it is found that the final voltage of the cell is obtained before the limit for the cadmium and negative is reached, it shows the positive plates are at fault, whilst should the cadmium and negative figure be obtained before the limit for the cell, the result would prove the negative plates to be the least efficient.

## SMALL INDUCTION MOTORS

FOR ALL CLASSES OF WORKSHOP DRIVING.

PROMPT DELIVERY IN SIZES FROM  
 $\frac{1}{2}$  TO 10 H.P. AT ALL THE USUAL  
 SPEEDS AND PRESSURES.

OPEN, PROTECTED & ENCLOSED TYPES.



HIGHEST GRADE MATERIAL and  
 WORKMANSHIP.

**BROWN, BOVERI & CO., Limited**

CAXTON HOUSE, WESTMINSTER, LONDON, S.W.

And at MANCHESTER, GLASGOW,  
 and NEWCASTLE.

### THE INSTITUTION VISIT TO PARIS

ABOUT 110 members of the Institution of Electrical Engineers, accompanied by forty-two ladies, arrived in Paris on Tuesday evening to take part in the joint meeting of the Institution with the Société Internationale in Paris, which commenced yesterday and continues until Saturday. Yesterday six Papers on electric traction were discussed, and the visits included an inspection of the large generating station at St. Denis. The day closed with a banquet at the Palais D'Orsay.

A report of the meeting will appear in our next issue.

**Electric Mill Driving in India.**—Further to our recent notice regarding the motor and transformer equipment for the textile and flour mills in the Bombay district, which are deriving their power from the mains of the Tata Company, we are now enabled to give further particulars of the large contract which has been secured by the British Westinghouse Company. The motors are all of the Westinghouse slipring protected type, for 2,000 volts, three-phase, 50 cycles. There are at present a total of 207 motors of this type on order, ranging from 50 to 500 b.h.p., and running some at 290 and some at 365 r.p.m. In the majority of cases they are coupled direct to the line shafting without the intervention of countershafting. The motor pillars are of the Westinghouse ironclad pattern, which are largely used in mining and other industrial work in this country, and starting is effected by liquid controllers. The transformers are three-phase, oil-immersed, self-cooled units, and reduce the supply from 6,000 volts to 2,000 volts for the motors. They number 64 in all, and are of four sizes, thus: 22 of 50 k.v.a., 12 of 500 k.v.a., 21 of 700 k.v.a., and 7 of 900 k.v.a. The mills in which the above-mentioned equipment is to be installed are as follows:—Pearl, Finlay, Simplex, Baigum, Swan, Bombay Cotton, Jamshed, Nahomedbhoy, Pabaney, Crescent, Fazulbhoy, David No. 1 and 2, Down, Standard, Phoenix, Gold Mohur, Jubilee, Crown, Western India, Apollo, Ripon, Dharamsey, Hope, Alliance, Natildas Goculdas, New City of Bombay, Colaba, New Great Eastern, Sun, Bombay Flour, Merchants' Flour, and Union Flour. These brief particulars we present above will give some idea of the importance of this immense stride in textile electrification.

### CATALOGUES, PAMPHLETS, &c., RECEIVED

**ALUMINIUM.**—New leaflets from the British Aluminium Co., Ltd., 109 Queen Victoria Street, E.C., deal with aluminium feeders for electric railways and connectors for stranded aluminium conductors.

**MOTORS.**—A list of small continuous current motors, ranging from  $\frac{1}{2}$  to  $7\frac{1}{2}$  h.p., is to hand from Higgs Bros. (Sherbourne Road, Balsall Heath, Birmingham). These motors are fitted with ball bearings, and are listed both as open and semi-enclosed machines.

**CABLES AND RUBBER GOODS.**—A new list of electric cables and safety insulating appliances is to hand from The St. Helens Cable & Rubber Company, Ltd. (Warrington). In addition to containing full details of the company's well-known "cab tyre" sheathed cables, "Association" cables, flexibles, &c., the list introduces some new items, including a patent electrically heated vulcaniser, specially designed for jointing and repairing cab tyre sheathed cables. Other novelties are insulating gloves, with cab tyre facing, and insulating shoes of a design in which the amount of wear is readily apparent, and a buckle allows for various sizes of feet being used in the same shoe. Rubber switchboard matting is also included. The company announce a reduction of about  $7\frac{1}{2}$  per cent. in the prices of all rubber insulated cables. The illustrations show the large business which the firm is doing with colliery cables, both of the "Dialite" and cab tyre sheathed types.

*Readers desiring copies of catalogues or pamphlets should apply to the firms in question, referring to the notice in "Electrical Engineering."*

**RESISTANCES.**—An effective card from the Schniewindt Electric Co. (40 and 41 Staniforth Street, Birmingham) calls attention to the company's special net resistances.

**FANS.**—A catalogue from Pitters' Patents, Ltd. (20 Bishopsgate, E.C.), deals with Pitters' Patent multiblade fan, for which a much higher efficiency is claimed over ordinary fan blades.

**BELL PUSHES.**—A number of artistic and novel bell pushes are illustrated in a new leaflet from the General Electric Co., Ltd. (67 Queen Victoria Street, E.C.). Two of the prettiest ones have mounted on them little statuettes named Pierrot and Pierette.

**WATER HEATERS, BILLIARD IRONS, &c.**—New leaflets from Siemens Brothers Dynamo Works, Ltd. (Supplies Department, 38 and 39 Upper Thames Street, E.C.), draw attention to water heaters, saucepans, irons, &c., of similar design and construction to those shown in the general catalogue, except that the elements are easily renewable. In a new design of toaster the inside of the falling doors is fitted with nickel-plated rods so that the bread does not touch the doors, and moisture can readily escape.

**PLEXSIM COOKERS.**—A novel leaflet dealing with the advantages of Plexsim Cookers, as compared with the ordinary coal range, has just been got out by Simplex Conduits, Ltd. (116 Charing Cross Road, W.C.). Most of the matter is reproduced from a humorous article in a daily paper, and is embellished with a cleverly arranged folding picture. The leaflet is intended for contractors and central station engineers, and supplies may be obtained overprinted with their names and addresses.

**HEATING APPARATUS.**—A leaflet from the Sun Electrical Co. (118-120 Charing Cross Road, W.C.) describes a series of electrically heated boiling pots, jugs, &c., made of stoneware, which have recently been put on the market at very moderate prices. Another pamphlet deals with the "Rawlplug," already illustrated in our columns, for which the company are wholesale distributing agents.

### Scottish Local Section of the Institution of Electrical Engineers.

—A summer outing has been arranged at Inversnaid on June 17th. The party will leave Glasgow at 11.9 a.m. The inclusive price of tickets, including rail, steamer, lunch, &c., is 10s. 6d. By the courtesy of the Glasgow Corporation Water Department, those so desiring will be shown over the works at Loch Arklet.

**Annual Report of the I.E.E. Students' Section.**—The Report of the I.E.E. Students' Section for the session 1912-13 states that the average attendance at the eleven meetings held during the year was 36 with a maximum of 51. In Manchester there have been eight meetings, Glasgow five, and Newcastle nine. The average attendances were 38 in Manchester, and 15 in Glasgow. In London the average number of speakers was seven, and in Glasgow six. It is stated that arrangements are being made to hold a tour from July 2nd until July 5th, in the Newcastle district, and it is hoped that owing to its short duration the tour will be well supported. The Informal Electric Dinner recently held at The Tricity House was a great success, and it is hoped, states the report, to repeat such functions.



# "ELECTRICAL ENGINEERING" LITERARY SECTION

## NEW PUBLICATIONS

- "Electricity Made Plain," by G. R. Peers. 183 pp. 7½ in. by 4½ in.; 54 figures. (Manchester: John Heywood, Ltd.) 1s. net; by post, 1s. 3d.
- "Theory and Calculation of Electric Currents," by J. L. La Cour and O. S. Bragstad. Translated by S. P. Smith. 482 pp. 9 in. by 6¼ in.; 404 figures. (London: Longmans, Green and Co.) 16s. net; abroad, 17s.
- "Directory of Paper Makers of the United Kingdom. 1913." 236 pp. 10½ in. by 7½ in. (London: Marchant Singer and Co.) 1s. net; by post, 1s. 4d. Abroad 1s. 8d.
- "Worm Gearing," by H. K. Thomas. 86 pp. 9½ in. by 6¼ in.; 33 figures. (New York: McGraw-Hill Book Co.; London: Hill Publishing Co.) 6s. 3d. net.
- "Electricity and its Practical Applications," by Magnus MacLean. 492 pp. 9 in. by 6½ in. 354 figures and one plate. (London: Blackie and Son, Ltd.) 10s. 6d. net; abroad, 11s. 10d.
- "The Present Law and Practice Relating to Letters Patent for Inventions," by H. Fletcher Moulton. 450 pp. 10½ in. by 6½ in. (London: Butterworth and Co.) 30s.; abroad, 31s. 4d.
- "Single-Phase Commutator Motors," by F. Creedy. (Electric Mechanism, Part I.) 113 pp. 8½ in. by 5½ in. 98 figures. (London: Constable and Co., Ltd.) 7s. 6d. net; abroad 7s. 11d.
- "Electric Furnaces in the Iron and Steel Industry," by W. Rodenhauser and I. Schoenawa. Translated by C. H. vom Baur. 419 pp. 9½ in. by 6 in.; about 135 figures. (New York: John Wiley and Sons; London: Chapman and Hall, Ltd.) 15s. net; abroad, 15s. 9d.
- "Storage Batteries: The Chemistry and Physics of the lead Accumulator." By H. W. Morse. 266 pp. 7½ in. by 5 in. 106 figures. (New York: The Macmillan Co.; London: Macmillan & Co., Ltd.) 6s. 6d. net; abroad, 6s. 10d.
- "The Motor Manual." 266 pp. 7½ in. by 5½ in. About 245 figures. (London: Temple Press, Ltd.) 16th Edition. 1s. 6d. net; by post, 1s. 9d.
- "A Laboratory Manual of Alternating Currents," by J. H. Morecroft. 247 pp. 9 in. by 5½ in. 175 figures. (London: Longmans, Green & Co.) 7s. 6d. net, abroad, 8s. 2d.
- "Introductory Electricity and Magnetism," by C. W. Hansel. 373 pp. 7½ in. by 5 in. 283 figures. (London: W. Heinemann.) 2s. 6d. net; by post, 2s. 10d.
- "Manual of Wireless Telegraphy and Telephony," by A. F. Collins. 300 pp. 7½ in. by 5 in. 129 figures. (New York: John Wiley & Sons; London: Chapman & Hall, Ltd.) 3rd edition. 6s. 6d. net; abroad, 7s.
- "Wiring Diagrams of Electrical Apparatus and Installations." 253 pp. 9½ in. by 6½ in. 439 figures. (New York: McGraw-Hill Book Co.; London: Hill Publishing Co.) 8s. 4d. net.
- "Dynamo Laboratory Outlines for Students in Electrical Engineering," by J. F. Wilson. 129 pp. 7½ in. by 5½ in. 84 figures. (New York: McGraw-Hill Book Co.; London: Hill Publishing Co.) 4s. 2d. net.
- "American Telegraph Practice," by D. McNicol. 507 pp. 9½ in. by 6½ in.; 418 figures. (New York: McGraw-Hill Book Co.; London: Hill Publishing Co.) 17s. net.
- "Mathematical Physics." Vol. I. Electricity and Magnetism. By C. W. C. Barlow. 312 pp. 7 in. by 5 in.; 130 figures. (London: University Tutorial Press, Ltd.) 4s. 6d.; abroad, 4s. 10d.

**An Astronomical Calculator.**—A convenient little piece of apparatus for enabling anyone to determine time, bearings, latitude, longitude, &c., by observations of the stars, has been devised by our friend, Mr. McBean, the less serious side of whose nature is well known to our readers from our cartoons. The appliance is published by George Philip and Son, Ltd. (32 Fleet Street, E.C.), under the name of the Boy Scout Astro-nomical Calculator, at the price of 6d., and consists of two card-board discs suitably graduated with scales of mean and sidereal time, latitude, the calendar, &c., and provided with convenient pivots and pointers. The arrangement is ingenious and very simple to use, and the apparatus has a considerable educative value in addition to its utility.

## REVIEWS OF BOOKS

- Electric Furnaces in the Iron and Steel Industry.** By W. Rodenhauser and I. Schoenawa. Translated by C. H. vom Baur. 419 pp. 9½ in. by 6 in. About 135 figures. (New York: John Wiley and Sons; London: Chapman and Hall, Ltd.) 15s. net; abroad, 15s. 9d.

As indicated by the title, this treatise is devoted exclusively to electric furnaces for the iron and steel industry, and to the electro-metallurgy of the resulting products. The book, which is intended for the practical man, is divided into two parts, the first dealing with construction, and the second with the practical use of the furnaces. After a short historical introduction, some space is devoted to a consideration of electrical laws and phenomena in so far as they affect the operation of furnaces, which are then dealt with, first, generally, and secondly, specifically. In this connection those more extensively used, such as the Stassano, Héroult, Girod, Kjellin, and Röchling-Rodenhauser furnaces, are described in considerable detail, so that their behaviour, limitations, and most suitable applications, as compared with the ideal furnace, are brought out, and may be readily compared. The more important modifications of the above, together with proposed or little tried furnaces with possibly a future for certain classes of work, are briefly described in a chapter headed "General Review." Part I. concludes with a long list of the larger furnaces already in successful operation, and to which, no doubt, many more, it is to be hoped in this country, will have to be added shortly, now that electric power can be obtained at a very low price, and the products of the furnaces have been demonstrated to be of such very high quality. Part II. contains a quantity of very useful information, largely obtained from the personal experience of the authors, relating to the materials used in construction and the costs of operation for different purposes, together with some electro-metallurgy whereby the properties of materials made by different processes are rendered more easily intelligible.

- Theory and Calculation of Electric Currents.** By J. L. La Cour and O. S. Bragstad. Translated by S. P. Smith. 482 pp. 9 in. by 6¼ in.; 404 figures. (London: Longmans, Green and Co.) 16s. net; abroad, 17s.

It will be of advantage to those desiring to make a complete study of heavy electrical engineering to be able to purchase in one cover an exhaustive mathematical investigation into a multitude of the known phenomena of alternating currents. As a text-book, this work will appeal to some advanced students and others, but its sphere of usefulness is somewhat limited, though it should find a place on the shelves of most technical reference libraries. No fault can be found with the arrangement of the contents, nor the somewhat artificial treatment as a branch of mathematics, but it would have been an advantage to give a complete list of the symbols and signs used for easy reference. The subjects embraced include alternating currents and circuits and their representation, and the method chosen is the "symbolic" one, though vector diagrams are extensively used as well. Their effects in different practical installations is studied, and machines, measurements, the magnetic properties of iron, are treated, as well as electrostatics and its application in practice. For those not familiar with the symbolic method of representation of complex quantities, this is clearly outlined at the beginning of the volume. Unless one has a highly developed mathematical mind, however, the long expressions containing uncommon signs, with affixes, suffixes, dots below (which get mixed up with full-stops, &c.) and bars above, together with the more common conventions, will not prove as easily intelligible as they are to the authors. No very new or epoch-making result is arrived at, but some of the later chapters on dielectrics, transmission lines, and the capacity and conduction of cables, iron losses, and alternating-current instruments, are very useful and instructive.

**The Present Law and Practice Relating to Letters Patent for Inventions.** By H. Fletcher Moulton. 450 pp. 10½ in. by 6½ in. (London: Butterworth and Co.) 30s.; abroad, 31s. 4d.

Like other questions of law, those relating to Letters Patent daily become more involved, and since the passing into law of the Patents and Designs Act, 1907, many fresh questions have arisen on which enlightenment may be required by patentees and the many others interested in the ambit of patent specifications. The appearance, therefore, of this treatise, which deals with the law as it stood at the end of 1912, is to be welcomed, especially as it is very conveniently arranged and contains copious references to reported decisions in the various Courts where patent cases are heard, so that it is eminently suitable for quick reference. The matters dealt with include property in letters patent, novelty and subject-matter, public knowledge, sufficiency, disconformity, Patent Office practice and procedure, licenses, non-working, &c. The Act of 1907, and the copies of the forms on which applications, petitions, and other matters incidental to actions for infringement and similar cases, are also set forth. Stress is laid on the necessity for a clear and uniform system of drafting specifications, and some suggestions are given as to a suitable method to follow.

**Electricity and Its Practical Applications.** By Magnus MacLean. 492 pp. 9 in. by 6½ in.; 354 figures and 1 plate. (London: Blackie and Son, Ltd.) 10s. 6d. net; abroad, 11s. 10d.

The title of this work, as it appears on the title-page, indicates in a measure the nature of the contents. The word "electricity" is printed in large characters, and the continuation "and its practical applications" is added in smaller lettering. Thus the book treats mainly of electricity from an abstract point of view, while the real engineering applications take second place. The origin of the work explains the sharp line of demarcation between the two ingredients, which, although mixed up as regards position in the sequence of chapters, are distinct in style and treatment; almost as if two packs of cards had been shuffled together. The theoretical or historical—perhaps we had better call it *academical*—section is admittedly based on our dear old friend *Deschanel*, and bristles with the classic woodcuts of Faraday's net being turned inside out, Coulomb's torsion balance, Schweigger's multiplier, and other matters which used to delight our youth. The practical or engineering portion is adapted from that encyclopædic work, "Modern Electric Practice," of which, it will be remembered, Dr. Maclean was the general editor. Their origin and the reputation of the present author are guarantees that these constituents are both of excellent quality in their way, the treatment is sound and the style is readable; but what we miss are the connecting-links between the two. The student—and the book is really addressed to first-year students—will be liable to confuse the two parts. He will be inclined to think, for example, that a Bunsen battery is a practicable source of electric current, and will be inclined to call a Röntgen-ray tube an "electric egg." The historical order of development of a subject is not necessarily the most suitable logical sequence for the student to build up his knowledge of cause and effect. For example, the fact that some aspects of electrostatics were developed at an earlier period than the phenomena of currents is no reason why that part of the subject should be the best for the foundation on which the student is to build his ideas. There is, however, much that is excellent, and much that is admirably presented in the book, and here and there the old-fashioned nature of the treatment is a charm rather than a detraction.

**Single Phase Commutator Motors (Electric Mechanism, Part I.).** By F. Creedy. 113 pp. 8½ in. by 5½ in. 98 figures. (London: Constable & Co., Ltd.) 7s. 6d. net; abroad, 7s. 11d.

The author states that "the development of a new method of alternating-current analysis, independent of all others, with a suitable notation and conventions to accompany it, is no easy task, and has involved an amount of labour quite out of all proportion to the size of the volume." This is without doubt a fact, and advanced technical students and teachers will certainly revel in the new treatment presented, but how many professional designers will appreciate the efforts of the author is another matter. The treatment presented involves the abandonment of the phase diagram and the building up of a new vector diagram, in which the direction of the vectors represent directions in space and not in phase.

## CROSBY LOCKWOOD & SON'S

### NEW and STANDARD BOOKS

Just Published. Fourth Edition Revised and Considerably Enlarged. 450 Pages with 195 Illustrations. Price 10s. 6d. net.

## Wireless Telegraphy

### ITS THEORY AND PRACTICE

A Handbook for the use of Electrical Engineers, Students and Operators.

By JAMES ERSKINE-MURRAY, D.Sc.

### THE MECHANICAL ENGINEER'S POCKET BOOK OF FORMULÆ, RULES, AND DATA.

A Handy Book of Reference for Daily Use in Engineering Practice. By the late D. K. CLARK, M.Inst.C.E. 1913 Edition, revised throughout and enlarged by N. H. P. POWLES, A.M.Inst.C.E. 700 pages. Limp Cloth. Small 8vo. 4s. 6d. net. [Just Published.]

### THREE-PHASE TRANSMISSION.

A Practical Treatise on the Economic Conditions governing the Transmission of Electrical Energy by Underground and Overhead Electrical Wires. By WM. BREW, M.I.E.E. 185 pages, 82 Illustrations. Demy 8vo, cloth. 7s. 6d. net.

### ELECTRICAL ENGINEERING.

A First Year's Course for Students. By TYSON SEWELL, A.M.I.E.E. Fifth Edition, revised, with Additions. Large Crown 8vo, cloth. 460 pages, with 278 Illustrations. 5s. net.

### FACTORY ACCOUNTS: Their Principles and Practice.

By EMILE GARCKE and J. M. FELLIS. Sixth Edition, revised and enlarged. Demy 8vo, cloth. 314 pages. 6s. net.

### ELECTRIC TRACTION AND TRANSMISSION ENGINEERING.

By SAMUEL SHELDON and ERICH HAUSMANN. 317 pages. 127 Illustrations. Large crown 8vo, cloth. 12s. net.

### ELECTRIC WIRING, DIAGRAMS & SWITCH-BOARDS.

By NEWTON HARRISON. Crown 8vo, cloth. 5s. net.

### ELECTRICAL & MAGNETIC CALCULATIONS.

By A. A. ATKINSON. Crown 8vo. 9s. net.

### ELEMENTARY ELECTRICAL ENGINEERING.

In Theory and Practice. A Class Book for Junior and Senior Students and Working Electricians. By J. H. ALEXANDER. 220 pages. 181 Illustrations. Crown 8vo, cloth. 3s. 6d.

### WIRELESS TELEPHONES: and How they Work.

By J. ERSKINE-MURRAY. Second Edition 1s. 6d. net.

### DYNAMO, MOTOR, AND SWITCHBOARD CIRCUITS FOR ELECTRICAL ENGINEERS.

A Practical Book dealing with the subject of Direct Alternating, and Polyphase Currents. By WILLIAM R. BOWKER. Second Edition, revised. Medium 8vo, cloth. 109 Diagrams. 7s. 6d. net.

### ELEMENTARY ELECTRICAL CALCULATIONS.

A Manual of Simple Engineering Mathematics. By T. O'CONNOR SLOANE. 314 pages. 43 Illustrations. Crown 8vo, cloth. 9s. net.

### STANDARD ELECTRICAL DICTIONARY.

By T. O'CONNOR SLOANE. 7s. 6d. net.

### ALTERNATING AND DIRECT CURRENT DYNAMOS.

A Text-Book on their Construction for Students, Engineer Constructors and Electricians-in-Charge. By TYSON SEWELL, A.M.I.E.E. 328 pages. 230 Illustrations. Large Crown 8vo, cloth. 7s. 6d. net.

### ELECTRIC MOTORS: Their Action, Control, and Application.

By F. B. CROCKER and M. ARENDT. 10s. 6d. net.

### ELECTRIC POWER CONDUCTORS.

By W. A. DEL MAR. 9s. net.

### WIRELESS TELEPHONY: in Theory and Practice.

By ERNST RUHMER. Translated from the German by J. ERSKINE-MURRAY. Demy 8vo, cloth. 10s. 6d. net.

Complete Catalogue post free on application.

London: Crosby Lockwood & Son  
7, Stationers' Hall Court, E.C., & 5, Broadway, Westminster, S.W.

This necessitates the introduction of a large amount of co-ordinate geometry, especially of the ellipse, as this is in general, as is known, the distribution of flux and current in these machines. A further result is that the differences due to the various combinations of rotor and stator coils are brought out and readily compared. Whether, however, the method calls to mind any more clearly than the older methods the physical actions taking place is rather a matter for individual readers to decide. The method is certainly confusing at first, but might have been made clearer if a better system of diagrams had been used and if each diagram had been supplied with a short footnote.

**A Laboratory Manual of Alternating Currents.** By J. H. Morecroft. 247 pp. 9 in. by 5½ in.; 175 figures. (London: Longmans, Green and Co.) 7s. 6d. net; abroad, 8s. 2d.

The title of this book, which is of American origin, hardly does justice to its contents. Not only does it give in some detail instructions for carrying out series of tests, with diagrams of connections and particulars of the apparatus to be used, but a short and lucid discourse on the theoretical points of each test gives the reader an idea as to what results he should expect, and the accuracy which ought to be obtainable. The sequence of experiments is well chosen, so that the knowledge obtained from the earlier ones may be employed to advantage in those following. One of the benefits of this method of presentment is that the student has a considerable amount of thinking to do for himself, thereby gaining in self-reliance and initiative. Apart also from its value in the laboratory, this book should prove useful to a large number of students, not necessarily at technical colleges, who have a knowledge of D.C. work, and a fair knowledge of A.C. The behaviour of instruments and machines under divers practical conditions are set forth and explained in a clear and not too hypothetical way. To give an idea of the scope of the book, one may note that the experiments deal, amongst other matters, with wave forms and A.C. meters, and the accuracy of measurement; alternator regulation, efficiency and parallel working; transformers and phase transformation, &c.; synchronous motors, rotary-converters, induction motors and commutator motors, and the mercury arc rectifier. In addition there is an appendix dealing with the oscillograph and its many uses, while a large number of instructive photographic records are reproduced.

**Storage Batteries: The Chemistry and Physics of the Lead Accumulator.** By H. W. Morse. 266 pp. 7½ in. by 5 in.; 106 figures. (New York: The Macmillan Co.; London: Macmillan and Co., Ltd.) 6s. 6d. net; abroad, 6s. 10d.

Much useful information for both the student and practical man is contained in this conveniently arranged work. Seeing that there are numbers of men who should, but who do not, know very much about the physics and chemistry of the storage cell, it is gratifying to be able to welcome this contribution to the rather meagre literature on the subject. The author does not indulge in some of the more speculative theories as to the exact quantity or quality of unstable compounds which may be formed, but of whose presence the evidence is more or less circumstantial, but in an easy and convincing style presents a theory which fits well with established facts, though it may be amplified if necessary. Towards the end of the book a quantity of information on the physical characteristics of different cells as influenced by all the factors obtaining in practice is clearly set forth. The different kinds of plates, their formation and the best fields for their application, are given, as well as the manufacturing tendencies in different parts of the world for different services. Although the chemistry and physics of the Edison or iron/potassium hydroxide/nickel peroxide cell have not yet been thoroughly investigated, some interesting comparative notes are included.

**Manual of Wireless Telegraphy and Telephony.** By A. F. Collins. 300 pp. 7½ in. by 5 in.; 129 figures. (New York: John Wiley and Sons; London: Chapman and Hall, Ltd.) 3rd edition. 6s. 6d. net; abroad, 7s.

This book is addressed principally to wireless telegraph operators and those about to take up this class of work. Although of American origin, and therefore dealing here and there with apparatus, methods, and even codes, more used in the United States than in other parts of the world, there is much to make it of interest to all who desire more really practical information than is to be found either in the scientific treatises or semi-popular handbooks that abound on both

## BLACKIE'S LIST

### ELECTRICITY & its Practical Applications.

By MAGNUS MACLEAN, D.Sc., M.Inst.C.E., M.I.E.E., Professor of Electrical Engineering, Royal Technical College, Glasgow. Demy 8vo. 10s. 6d. A new work for engineers and science students.

### ELEMENTARY PRINCIPLES OF ALTERNATING CURRENT DYNAMO DESIGN.

By A. G. ELLIS, A.C.G.I., A.M.I.E.E. Demy 8vo. 12s. net.

"A most reliable, up-to-date, and satisfactory treatise. The author is to be congratulated upon his method of treatment."—*Electricity*.

### MAGNETISM AND ELECTRICITY, and the Principles of Electrical Measurement.

By S. S. RICHARDSON, B.Sc., Lecturer in Physics, Municipal Technical School, Liverpool. 5s. net.

### ELEMENTARY ELECTRICAL ENGINEERING.

By J. W. SHAXBY, B.Sc., Demonstrator and Assistant Lecturer, University College of Wales, Aberystwyth. Profusely illustrated with Photographs and Diagrams. 3s. net.

### ELECTRICAL ENGINEERING MEASURING INSTRUMENTS.

For Commercial and Laboratory Purposes. By G. D. ASPINALL PARR, M.Inst.E.E., Head of the Electrical Engineering Department, University of Leeds. A fully illustrated, classified, descriptive, and technical account of the many available measuring instruments. Demy 8vo, 9s. net.

"We can heartily commend this work."—*Electricity*.

## BLACKIE & SON LIMITED

50, OLD BAILEY, LONDON, E.C.

sides of the Atlantic. The general principles are explained with admirable clearness by the study of a simple experimental set, and the elaboration in actual commercial apparatus of greater range are subsequently gone into in considerable detail. The hints on adjusting and operating the instruments should be found most useful, and throughout the work care has been taken to avoid confining the particulars to any one system, so that the student should not be strange to the functions of the widely differing component parts of any commercial equipment which he may have to take charge of. There is, perhaps, more diversity of apparatus in use in America than here, and this characteristic has ensured a broader treatment than might otherwise have been adopted. It should be remarked, however, that some of the descriptions of commercial sets are not quite up-to-date. A short final chapter on wireless telephony, by Mr. Newton Harrison, describes the Collins arc method, which appears to have made more progress than is realised over here, and an excellent bibliography and a glossary complete the book.

**Introductory Electricity and Magnetism.** By C. W. Hansel. 373 pp. 7½ in. by 5 in.; 283 figures. (London: W. Heinemann.) 2s. 6d. net; by post, 2s. 10d.

The author has managed to cram a large amount of good matter between the two covers of this conveniently-sized manual, which is divided into three sections, as follows: magnetism, electrostatics, and current electricity; but over half of the available space is devoted to the last. The subject is developed experimentally, and the earlier chapters in each section deal with qualitative phenomena, while the later chapters are quantitative in character and naturally more advanced. In this connection it may be said that the reasoning is clear and concise, and the remarks are qualified by reference to surrounding conditions. The chapters in each section contain useful information, both practical and theoretical in character, and the experiments have been well chosen, and in most cases can be performed with simple apparatus. The large number of diagrams are clear, but somewhat crude. Although there are many similar books available, this one may be thoroughly recommended to those preparing for elementary examinations in electricity and magnetism.

**Bells, Indicators, Telephones, Fire and Burglar Alarms, &c.**

By J. B. Redfern and J. Savin. (Electrical Installation Manual.) 123 pp. 6½ in. by 4½ in.; 85 figures. (London: Constable and Co., Ltd.) 1s. 6d. net; by post, 1s. 7½d.

The wireman whose work is mainly electric light and power wiring frequently feels that he is on somewhat uncertain ground when called upon to carry out even comparatively simple bell and telephone installations. To this class of worker this small and unambitious volume will be of great utility. It is clearly written, and judicious use is made of the limited space at the disposal of the authors.

**Descrizione di una Macchinetta Elettro-magnetica.** Del Dr. A. Pacinotti (Associazione Elettrotecnica Italiana).

The happy thought occurred to the Italian Electrotechnical Association of publishing in book form a reprint of the original article by Dr. Antonio Pacinotti, written in June, 1864, and published in the *Nuovo Cimento*, together with translations into other languages by eminent writers. The original Italian text is preceded by an excellent photogravure portrait of Pacinotti, and is followed by a translation into French by Paul Janet, a translation into English by Silvanus P. Thompson, translation into German by Gisbert Kapp, and a translation into Latin by P. Rosi. The important historical position taken by Pacinotti's work is not as fully realised as it ought to be, and we hope that the publication of this little book may help to make it better appreciated.

**Methods of Measuring Electrical Resistance.** By E. F. Northrup. 389 pp. 9½ in. by 6½ in. 158 figures. (New York: McGraw-Hill Book Co.) 17s. net.

Every student of electrical engineering must learn how to measure electrical resistance. The acquisition of this knowledge, however, represents but a small portion of his complete training in elementary electrical matters, and he can hardly be expected to tackle or to pay for a book of 389 pages, and costing 17s., devoted to this subject alone. On the same scale, a complete library for an electrical student would fill a house, and cost a little fortune, and by the time he had diligently read it through he would have reached the age at which most men retire from business. The great length of this volume, however, is not so much due to the amount of matter given to the reader for assimilation as to the large number of words employed to wrap the matter up, and we cannot regard the persistent abbreviation of the word through to "thru" as any compensation for this. It is evident that the author possesses a considerable amount of knowledge and experience of the subject upon which he writes, and it is to be regretted that the form in which he presents it in his book is not likely to prove attractive either to the student or to the busy man engaged in actual practical work.

**Psychology and Industrial Efficiency.** By H. Münsterberg. 321 pp. 8½ in. by 5½ in. (London: Constable & Co., Ltd.) 6s. net; abroad, 6s. 5d.

To use the author's own words, his aim is to sketch the outlines of a new science intermediate between the modern laboratory psychology and the problems of economics—psychological experiment systematically placed at the service of commerce and industry. The methods suggested, some of which have actually been used and have been found to give correct results, are extremely interesting and worthy of careful study by those who have the control of large industrial undertakings. Moreover, the author is an authority in this comparatively new subject, and his book is fascinating reading even for those to whom it may not be of actual practical service. Among the illustrations given is a test worked out for some tramway undertakings in the United States to predetermine the suitability and adaptability of candidates for motormen's duties; another is a series of tests to aid in the selection of telephone operators. In addition to the chapters on "The Best Possible Man," there are others on "The Best Possible Work," the most interesting and suggestive of which is on "The Economy of Movement," and "The Best Possible Effect," which, however, seems rather more academic and less convincing.

**Electricity made Plain.** By G. R. Peers. 133 pp. 7½ in. by 4½ in. 54 figures. (Manchester: John Heywood, Ltd.) 1s. net; by post, 1s. 3d.

It is difficult to see what useful purpose this little publication is intended to serve. It is supposed "to explain the various and many uses of Practical Electricity in a general way sufficiently intelligible to the average reader without scientific knowledge." A large number of the applications of electricity are touched on in a scrappy way, and where engineering terms are introduced they are either not explained or else the explanation is inadequate; in some cases, too, the reasoning is weak. Nearly all the illustrations used are culled from manufacturers' catalogues, and the too large proportion of the book devoted to medical electricity reads in places like an advertisement for beauty parlours and similar institutions. Unfortunately, too, the author makes the grievous mistake of dismissing electric heating and cooking in less than a page, as he says its expense is too great.

**Iron and Steel.** By O. F. Hudson, with a Section on Corrosion by G. D. Bengough. 173 pp. 9 in. by 5½ in. 47 figures. (London: Constable & Co., Ltd.) 6s. net, abroad 6s. 6d.

The constitution of steel and cast-iron and the effects of heat treatment on their properties are fully discussed in the light of the latest researches and theories. The letter-press is embellished with a large number of clear micro-photographs of the construction of the different alloys. A valuable chapter is that devoted to the iron carbon alloys from the consideration of alloys being composed of pure metals, compounds either of metals with non-metals or metals with metals, and solid solutions. "Equilibrium diagrams" are given. Practical details of the methods of production are not considered—electrical furnaces are dismissed in a few lines. The chapter on corrosion, like the other parts of the work, embodies the results of recent investigations and sets forth the most feasible theories as to the actions taking place in a straightforward manner. From a study of these actions, preventive courses may be adopted.

**Worm Gearing.** By H. K. Thomas. 86 pp. 9½ in. by 6½ in. 33 figures. (New York: McGraw-Hill Book Co.; London: Hill Publishing Co.) 6s. 3d.

In view of the high efficiency which this form of transmission gear has now reached, and its rapidly extending use, the issue of the book is well timed. The theory of worm-gear is dealt with in a clear and simple manner, without the use of complicated mathematics. The recent interesting tests of the Lanchester gear by the National Physical Laboratory are only referred to in a footnote, otherwise the book appears to contain all that may be expected of it from its title. Choice of material and methods of manufacture receive due attention, and the simple formulae for use in practical designing will be found useful. The differences between the Lanchester or "diabolo" form of worm and the straight worm are discussed, and on this question we may quote Mr. Thomas, as follows:—"It may be observed that in the case of a straight worm . . . a double thrust bearing should be provided at one end, the other can then be left free to expand or contract with the differences of temperature which occur when running. In the case of the hour-glass pattern worm, it is difficult to say what happens when it has to expand; presumably the casing expands too, and in that case a single thrust bearing at either end is the better arrangement." All this goes to show that the author, in specialising on worm gear, has brought much common sense to bear on the subject.

**The Motor Manual.** 266 pp. 7½ in. by 5½ in. About 245 figures. (London: Temple Press, Ltd.) 16th edition. 1s. 6d. net; by post, 1s. 9d.

The sixteenth edition of this deservedly popular manual has been to a large extent re-written and re-illustrated, and is thoroughly up to date in all matters of detail. The space given to the magneto in the ignition section has been enlarged, as that form of ignition is now becoming practically universal. The information regarding the care and charging of accumulators is very practical, and a section is included on car-lighting dynamos, but on account of the comparative novelty of the subject this is not treated with quite the degree of detail as characterises the rest of this excellent little work, nor do we find any reference to electrical engine starters.

**ELEMENTS OF ELECTRICAL ENGINEERING.**

Edited by J. L. LA COUR, Technical Manager, Allmanna, Svenska Electrical Co., Sweden.

JUST PUBLISHED. 16s. net.

**THEORY AND CALCULATION OF ELECTRIC CURRENTS.**

By J. L. LA COUR, Vesteras, and O. S. BRAGSTAD, Trondhjem.

Translated by STANLEY P. SMITH, D.Sc., Assoc. M.Inst.C.E., &c. With Diagrams. 8vo.

LONGMANS, GREEN and CO., 39, Paternoster Row, London, E.C.



## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,337.

**Coal Mines Act Electrical Rules:**—Rule 14, C (1), requires "the thorough examination of all apparatus (including the testing of earth conductors and metallic coverings for continuity) as often as may be necessary to prevent danger; and (2) the examination and testing of all new apparatus, and of all apparatus re-erected in a new position in the mine before it is put into service in the new position." Under ordinary circumstances how often will it be advisable to test earth conductors and metallic coverings, and what other "examination and testing" is necessary on the following plant? How may we prove that we have continuity and suitable carrying capacity of all armour and earth conductors? We have two 2,000-kw. generators, 3,000 volts, 40 cycles, three phase; current is transmitted at this pressure to three seams at different depths. In these seams we have haulages working direct at 3,000 volts; also in each seam we have transformers stepping down to 440 volts for pump motors and small haulage, and small lighting transformers 440 to 110 volts. The cable from the H.T. switch-board in the power-house to each seam is three-core, paper-insulated, lead-sheathed, and double-wire-armoured; it is fixed to sides of shafts by wooden cleats, and the shaft is comparatively wet. We use the lead sheath and armour as our main earth connection to surface earth plate. The shaft cable is led to a distribution board in each seam, from which all cables in use are also double-wire armoured, and the armour in every case is used as main earth wire between each motor, &c., and main cable armour to surface. I may mention here that in some places the cables are buried in the ground. We have two C.I. earth plates at the surface, and one in the sump at each seam. We transmit about 600 kw. into each seam. The depths of the seams below surface are 400 yards, 500 yards, and 680 yards. At each motor we connect up the switch, controller, motor frame, &c., to a common copper earth wire, and this to armouring of cable by means of W.I. clamps, as, of course, we cannot solder terminals on here underground.

"ASSISTANT ELECTRICIAN."

(Replies must be received not later than first post, May 29th.)

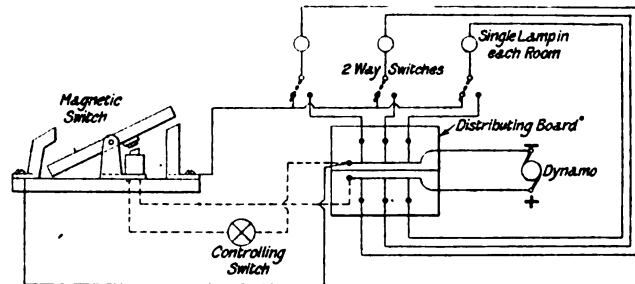
## CORRESPONDENCE

### BURGLAR ALARMS.

To the Editor of ELECTRICAL ENGINEERING.

SIR,—With reference to the letter addressed to you in connection with the diagram I submitted to you re burglar alarms, I would thank your correspondent Mr. C. W. Von Roemer for calling attention to an error which I made in the diagram. Instead of single-pole switches being shown, these should have been ordinary two-way switches, the common terminal being connected to the lamps, the two switch points being connected to the distribution board and the common terminal of the magnetic switch respectively. This obviates the necessity of numerous contact arms on the magnetic switch. I enclose a

further diagram for reproduction if you consider it necessary for making the matter quite clear. In working, the two-way switches would permanently keep the burglar lamps connected to the magnetic switch, so that when occasion arose for the control



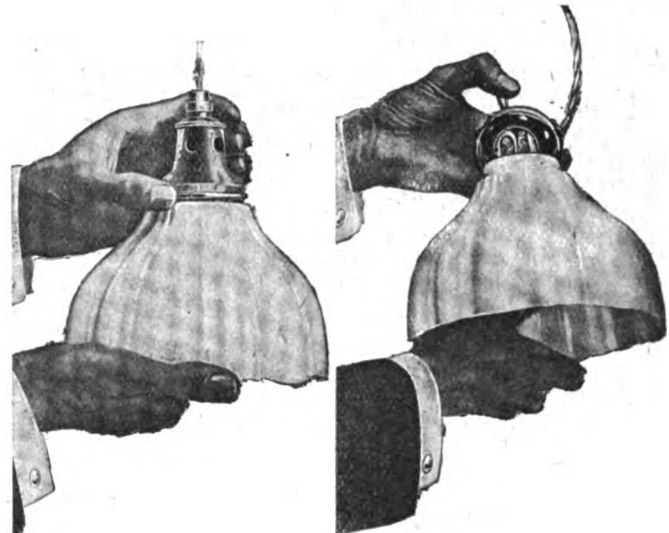
switch to be turned on these lamps would immediately light. So long, however, as the control switch remained off, each of these burglar lamps could be worked independently by means of the two-way switch.

ALARM.

May 13th, 1913.

### A SPRING CLIP GALLERY

THE ordinary carrier-ring method of attaching shades to lamp holders has had a long and evil reign, and has been responsible for much inconvenience. Even with thumb-screw galleries there is a risk of gripping the glass too tightly, or of getting the shade out of centre. The B.T.H. spring-clip gallery, for use with Veluria, Opalux, Holophane, or any other standard types of reflectors, is a great improvement. It is provided with a spring-clip consisting of a wire ring attached to the interior circumference, which enables the reflector to be securely fixed in a few seconds. This ring



B.T.H. SPRING CLIP SHADE GALLERY, SHOWING METHOD OF ATTACHING THE SHADE.

can be expanded or contracted by means of a lever. To attach a reflector it is only necessary to place the neck inside the gallery and to contract the spring-clip over it by pushing the lever with the thumb. This method of attachment is not only secure and quick and positive in action, but it is impossible for the reflector to be gripped too tightly, or to be out of correct focus with the lamp. Again, the flexible spring-clip allows for the expansion of the glass. These galleries are made of stamped brass, and can be supplied in various finishes. They are made in two neck diameters and in three depths.

**Yorkshire Local Section of the Institution of Electrical Engineers.**—At the annual general meeting of the Yorkshire Local Section of the Institution of Electrical Engineers, held at Leeds last week, the following officers were elected:—*Chairman:* Mr. W. B. Woodhouse (Chief Engineer, Yorkshire Electric Power Co.). *Vice-Chairmen:* Mr. H. H. Wright and Dr. R. Pohl (Phoenix Dynamo and Motor Co.). *Hon. Sec.:* Mr. J. D. Bailie (C. A. Parsons & Co.). For the four vacancies on the Committee, Messrs. W. M. Rogerson (Borough Electrical Engineer, Halifax), H. A. Nevill (Electrical Engineer to the Corporation of Wakefield), W. Lang (Callendar's Cable & Construction Co.), and F. J. Lowe were elected to take the places of Messrs. Barker, Bailie, Pohl, and Wilkinson, who retire by rotation from the Committee.

## "ELECTRICAL ENGINEERING" PATENT RECORD

*(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)*

### Specifications Published May 15, 1913

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications. Names in italics indicate communicators of inventions from abroad.

9,416/12. **Petrol-electric Traction.** H. LEITNER. In this system the engine drives a generator with two commutators, one of which supplies the power current at a variable voltage, while the other provides the excitation. This is varied by shifting auxiliary brushes. A separate constant voltage variable-speed generator is also provided for the lighting and other auxiliary services. Four figures.

9,513/12. **Heating Apparatus.** J. C. P. KIRKWOOD. The heat is regulated by an automatic regulator actuated by the differential expansion of dissimilar metals, which cuts out sections of the heating element as the temperature rises. Two figures.

13,455/12. **Plug Switches.** A. WYNNE. A switch inside the socket is operated by the insertion and withdrawal of a wall plug, which carries an extra plunger for the purpose. It is so arranged that the switch is not closed till the plug contacts are well home, but is opened (with a quick break action) well before they are fully withdrawn. Two figures.

19,792/12. **Air Filter.** G. A. MOWER and K. O. HALE. The ventilating air for turbo-generators, &c., is passed through a washer containing numerous spraying nozzles and eliminating plates to prevent spray being carried over by the air. Three figures.

20,663/12. **Fuses.** B.T.-H. Co. (*G.E. Co., U.S.A.*). These fuses are for low-current circuits, and consist of pads of yielding refractory material with a number of fusible rods or threads passing through them, arranged in various ways, sometimes in conjunction with blocks of carborundum or other material of negative temperature coefficient of resistance, which vary the proportion of the current passing through the fuse according to its magnitude. Three figures.

20,828/12. **Commutators.** W. H. SCOTT. A method of constructing radial commutators with the segments held by an external band and an inner ring expanded by force from inside. Two figures.

25,104/12. **Electric Heating System.** H. LOFQUIST. A heating system for houses in which electrically heated water circulates in pipes, and a combined switch controls the circulating pump motor and the heating elements. Three figures.

26,289/12. **Metal Filaments.** WESTINGHOUSE METALFADEN GLUHLAMPENFABRIK. Metal filaments of great length are made compact by forming into a helix prevented from liability to stretching by the inside diameter of the helix being not greater than the diameter of the filament.

### Specifications Published To-day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, E.C., at the price of 8d. each, post free. Summaries of some of the more important of these patents will appear in our next issue.

**Arc Lamps:** B.T.-H. Co. (*G.E. Co.*) [Electrodes] 18,689/12; KÖRTING & MATHIESEN [Blow magnet] 318/13.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** MEIROWSKY [Insulators] 13,365/12; W. E. Co. (*W. E. Co., U.S.A.*) [Cable sheath] 16,153/12; B.T.-H. Co. (*G. E. Co., U.S.A.*) [Protective gear] 17,680/12.

**Dynamos, Motors, and Transformers:** BROWN, BOVERI [*A.C.*] 7,258/12; PODLESÁK [Magneto] 10,209/12; SUBMERSIBLE AND J.-L. MOTORS and COOPER [Motors] 10,654/12; SUBMERSIBLE AND J.-L. MOTORS and POYNTER [Dynamos] 10,655/12; HILDEBRAND [*D.C.-A.C. transformation*] 17,346/12.

**Heating:** MARKS (*Landers, Frary and Clark*) 10,029/12; [Elements] 24,776/12; E. & O. ACCESSORIES Co., MORRISON and DAVIES [Elements] 10,765/12; MANN [Water-heater] 11,849/12.

**Ignition:** PODLESÁK, 25,646/12.

**Incandescent Lamps:** HANSEN and MOHR [Filament manufacture] 9,941/12; GALLAY [Lamps for automobiles] 27,785/12.

**Instruments:** ARON [Electrical regulation of clocks, &c.] 23,590/12.

**Storage Batteries:** HEIL [Electrodes for primary and secondary batteries] 10,541/12.

**Switchgear, Fuses, and Fittings:** MOLLETT and EDWARDS [Shade supports and lamplocks] 10,753/12; SCHOLÉS [Adjustable pendants] 10,780/12; NALDER BROS. & THOMPSON and HARRIS [Switches] 11,260/12; WILLIAMSON [Portable light fittings] 13,152/12; SIEMENS DYNAMO WORKS and PAYNE [Controllers] 16,343/12; JOHNSON [Regulating devices for lamps] 22,127/12; SCHEINIG [Wall-plugs] 23,588/12; GLENN and BRITISH PNEU-

MATIC RAILWAY SIGNAL Co. [Protective motor switch] 3,446/13; B.T.-H. Co. and BRITTON [Motor controller] 4,093/13; BERGMANN [Reversing polyphase commutator motors] 4,691/13; JOEL [Portable battery lamps] 5,073/13.

**Telephony and Telegraphy:** HACKING [Signalling systems] 27,974/11; GODFREE [Automatic telephone toll recorder] 7,264/12; BECKER [Regulating attenuation on Pulin lines for different frequencies] 7,903/12; HUERTLEY [Telegraphy] 9,733/12; AUTOMATIC TELEPHONE MFG. Co. (*Automatic Electric Co.*) [Impulse transmitters] 10,120/12; TELEPHONFABRIK A.-G. [Branch exchange telephone systems] 10,364/12; MARTIN [Telephone systems] 10,376/12; GALLETT [New wireless system] 10,863/12; AUTOMATIC TELEPHONE MFG. Co., AITKEN, COOPER and REMINGTON [Intercommunicating telephones] 13,963/12; DUBILIER [Wireless] 14,015/12; GOLDSCHMIDT [Reception of wireless waves] 23,734/12; GRISSINGER [Telephonic transmitters] 2,928/13.

**Traction:** BLACKALL and JACOBS [Railway signalling] 17,035/12; EDDON [Simultaneously locking and unlocking railway carriage doors] 24,893/12.

**Miscellaneous:** SUBMERSIBLE AND J.-L. MOTORS and POYNTER [Pumping] 10,653/12; WESTINGHOUSE LEBLANC [Balancing rotating masses] 16,809/12; BRYDONE [Theft alarm boxes] 27,002/12; YARROW [Synchronising for coupling rotating shafts] 27,095/12; ACHENBACH [Primary batteries] 29,847/12.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Dynamos:** MASON 8,128/13.

**Electrochemistry:** LAFFITTEAU [Liquid sterilisation by ozone and ultra-violet light] 9,281/13; [Liquid sterilisation by ozone] 9,282/13.

**Ignition:** MASON 4,670/13.

**Meters:** A. E. G. [Ampere-hour meter] 9,503/13.

**Switchgear, Fuses and Fittings:** Soc. L. ELÉRIOT [Switchgear and switch contacts] 9,592/13.

**Telephony:** STILLE [Telephonic reproducers] 9,644/13.

**Traction:** CASTELLETTI [Electric vehicle brakes] 9,274/13.

**Miscellaneous:** KRUPP [Alarm signal for ordnance] 5,872/13; STILLE [Aluminium-acetone light sensitive cells] 9,060/13 and 9,061/13.

### Application for Amendment

22,342/04. **Arc Lamp Carbons.** KÖRTING & MATHIESEN A.-G. This patent covers a method of ensuring good contact between a metallic core and the surrounding carbon by giving the wire a corrugated form before it is drawn in. The desired amendments include six verbal alterations, having the object of limiting the scope of the claims.

### Grant of Patent Allowed

2,325/12. **Automatic Railways.** J. J. DESCHAMPS. The Comptroller has allowed the grant of this patent in spite of opposition. The system in question is for driverless goods trains. The starting resistances are external to the cars, and are connected to sections of the conductor rail, and an arrangement of automatic points is provided for to shunt cars into sidings where they are automatically stopped.

### Expired Patents

The following are the more important Patents that have become void through non-payment of renewal fees.

**Dynamos, Motors, and Transformers:** B.T.-H. Co. (*G.E. Co., U.S.A.*) [Single-phase motors] 1,670/05; A.E.G. [Single-phase motors] 99/07.

**Heating and Cooking:** H. J. YATES and D. R. MCNEIL [Doors and shelves for electric stoves] 2,343/02.

**Ignition:** E.I.C. and F. H. HALL [Distributors] 1,984/08.

**Incandescent Lamps:** H. ZERNING [Carbon filaments coated with metals or carbides] 2,437/06.

**Instruments and Meters:** H. ARON [Details of meters] 2,466 and 2,467/04; F. J. BEAUMONT [Slot meters] 1,959/08.

**Switchgear, Fuses and Fittings:** R. W. BROWN [Motor starting switches] 2,067/05.

**Telephony and Telegraphy:** E. E. CLEMENT [Coherer call system] 2,598/03.

**Traction:** H. J. JEFFCOATE [Railway cab signalling] 2,109/02; E. A. MITCHELL [Surface contact slides] 11,945/08.

**Miscellaneous:** PHYSIKALISCH-TECHNISCHES LABORATORIUM GES. [Ballast resistances] 2,641/06; I. H. SPENCER [Vacuum cleaners] 2,478/07; G. H. RAYNER and C. WALTON [Rock drills] 2,201/08.

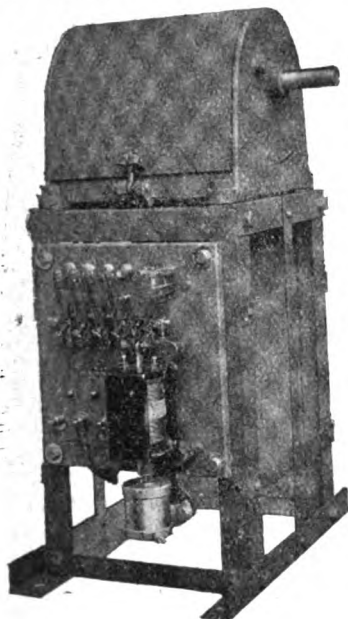
# ADAMS IGRANIC

MOTOR CONTROL GEAR FOR MACHINE TOOLS.

ADAMS  
MFG CO LTD  
BEDFORD  
AND  
LONDON

## A LIFT CONTROLLER

WE illustrate here a new design of controller for small electric hoists and lifts which has just been brought out by the Adams Manufacturing Co. (Balfour House, Finsbury Pavement, E.C.). This lift controller is arranged for rope operation, the pulley for the rope being mounted on the spindle projecting from the top of the apparatus. It consists essentially of a box containing the necessary starting resistance. On the front of the box is mounted one of the new "Z"-type automatic starters, which consists of a number of contact fingers which are brought into operation by the solenoid, and so arranged that the motor starting resistance is gradually short-circuited and the motor brought up to speed, and an adjustable dashpot controls the rate at which this part of the apparatus works. On top of the box is mounted a drum-type reversing switch, which, by the operation of the rope, makes the circuits for the motor to revolve in the required direction, and then energises the solenoid on the "Z"-type starter. It will be seen that the controller is simple and robust, which should go far towards ensuring its reliability.



ADAMS LIFT CONTROLLER FOR ROPE CONTROL.

## CATHEDRAL LIGHTING

WE give here, through the kindness of the General Electric Co., Ltd., an interior view of the choir of York Minster, which has recently been provided with an installation of Osram lamps. The way the lamps are arranged



CHOIR OF YORK MINSTER, SHOWING ELECTRIC LIGHTING ARRANGEMENTS.

shows up the beauty of the carving and tracery to its very best advantage, and the adoption of electric lighting will preserve the fabric of the Cathedral from deterioration caused by the deposits formed by other illuminants.

## ELECTRIC TRACTION NOTES

A further conference has been held between the Postmaster-General and the Tramways and Light Railways Association and the Municipal Tramways Association on the question of guard-wires. The first point raised, says the official circular of the Tramways and Light Railways Association, was that in cases where the Post Office is the second comer the Post Office should pay the whole cost of the guard-wires instead of one half, as at present. The Postmaster-General refused to accept this proposition, and added that if the question is to be reopened he should decline to bear any part of the cost even in "second-comer" cases. The Postmaster-General further refused to consider the suggestion that each party should pay one half of the cost of removing the existing guard-wires and substituting the necessary protection afforded by the use of insulated wires. He agreed that guard-wires might be removed after application to him and at the expense of the tramways undertaking, on the understanding that the Post Office engineers should be employed for removing or insulating the bare wires, the cost to the tramways company being at the rate of 5s. 9d. per wire, or 11s. 6d. per circuit.

The overhead equipment of the Turin-Modane section of the Italian State Railway system is now being erected. The three-phase locomotives to be run on this section are constructed for a 25-cycle supply, and as the available power is at 50 cycles, transformer stations with frequency-changing sets are being installed. These machines will be provided with heavy flywheels with the object of reducing the peak loads on the generating station.

The Hong Kong Tramway Co., which was started in 1902, is able for the first time to pay a dividend on its ordinary shares for last year. This is at the rate of 7½ per cent.

It is stated that Messrs. Griffiths and Co. of London are negotiating with the New South Wales Government with regard to the financing and construction of an underground railway system in North Sydney.

The Hagley Road tramway of the Birmingham Corporation, which has been strongly opposed by the frontagers ever since the line was first promoted, is now completed, but the opposition still continues, and is taking the form of a request for single-deck cars which is thought will reduce the dust nuisance, and also the running of "first-class" cars similar to those now in use in Liverpool.

A sum of £56,352 is to be transferred to relief of rates by the Birmingham Corporation Tramways Department.

A bill providing a sum of £1,600,000 for the electrification of the St. Petersburg suburban railways has been introduced into the Duma.

The sub-committee recently appointed to inquire into the working of the Lowestoft Corporation tramway system has reported against the selling or leasing of the undertaking. They are of opinion, however, that the charge for current is excessive, and suggest that the Electric Lighting Committee should reduce it to 1½d. per unit. The installation of meters on the cars is also recommended with a view to reducing the consumption of current, and it is also suggested that a bonus of 10 per cent. be paid to motor-men and conductors when the month's takings exceed the maximum amount previously taken in any month.

The London County Council has, it is announced, been experimenting successfully with Stevens petrol-electric tram-cars on the South Hackney and West India Dock routes. It is expected that the Highways Committee will return to the subject at the next Council meeting.

The agreement between the Manchester Electricity and Tramway Committees, referred to in our last issue, is for 30,000,000, and not for 3,000,000 units per annum as we erroneously stated.

We understand that Lord Bessborough, Chairman of the London Brighton & South Coast Railway, has just returned from a trip to Germany, where he has been inspecting electric railway systems.



## FARADAY HOUSE.

ESTABLISHED 1889.

(Proprietors: The SYNDICATE OF ELECTRICAL ENGINEERS, Ltd.)

### PRIVATE WORKSHOPS

(Loaned to Inventors and Others.)

Faraday House tests every kind of Electrical Machinery and Instrument, and all Apparatus and Materials used by the Electrical and Allied Industries.

Scale of fees will be sent on application to the Secretary,

THE ELECTRICAL STANDARDIZING  
AND TESTING INSTITUTION,  
62-70, Southampton Row, London, W.C.

Telep. No.: 9999 Central. Teleg.: "Standardizing, Westcent, London."

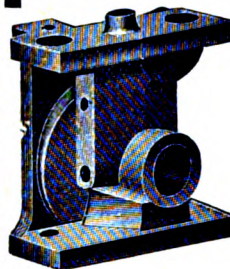
## FARADAY HOUSE.

### Why waste time and money on machining

small intricate pieces when the most complicated parts can be cast in a finished state by

### "PRANA"

### Die-finished Castings



HOLES, SLOTS, etc., CAST to PERFECT SIZE! ABSOLUTE ACCURACY GUARANTEED FOR ALL REPETITION WORK

Send for illustrated booklet, mentioning this paper; or send sample for quotation to

**AERATORS, Ltd**  
UPPER EDMONTON  
LONDON, N.

### ELECTRICAL PORCELAIN

OF  
HIGHEST QUALITY

APPLY TO

**JAMES MACINTYRE & CO., LTD.,**  
BURSLEM.

**TUBES** **PLATES** **RINGS**  
**MICANITE**  
**SEGMENTS**  
THE MICANITE & INSULATORS CO. LD.  
OFFICES AND WORKS -  
WALTHAMSTOW, LONDON E.

ONCE  
USED



ALWAYS  
USED

PRICE: ONE SHILLING PER STICK.

Sole Manufacturer—**S. W. CUTTRISS**, Prudential Buildings, **LEEDS.**

**STEATITE**  
**INSULATORS**  
SUPPLIED  
FOR ALL KINDS OF  
ELECTRICAL WORK  
**WILLIAM SUGG & CO. LTD.**  
WESTMINSTER.

### TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

A new telephone cable is to be laid shortly between Marseilles and Algiers. The core will consist, according to the *Annales des Postes, Télégraphes et Téléphones*, of seven copper strands, each 0.8 mm. in diameter, with three layers of gutta percha, weighing in all 52 kg. per (nautical) mile. The resistance will be 9.2 ohms and the capacity 0.35 m.f. per mile, and the insulation resistance 300 megohms per mile. The armouring of the deep-sea portion will consist of sixteen 2.5 mm. steel wires, that of the intermediate cable twelve 4.5 mm. steel wires, that of the coast section ten 7 mm. steel wires, and that of the shore end, twelve 4 mm. steel wires. The cable will be laid with 4 to 8 per cent. slack.

The United River Plate Telephone Co. has made a profit of £105,082 on the year. A dividend of 8 per cent. is recommended, and to provide for the growth of business a new issue of 54,000 ordinary shares will be offered to existing shareholders at £5 10s. per share.

In connection with the reception of messages up to 2,400 miles from the Fort Meyer wireless station at Arlington, by the U.S. scout *Salem*, reported in our columns, March 27th, p. 179, it is interesting to note in the *Electrical World* (New York) that the equipment of the *Salem* consists of the usual type of antenna 160 ft. long and 40 ft. in width. The sending equipment consists of a 10-kw. motor-generator feeding a transformer at 500 cycles, which steps the pressure up to 12,500 volts. Compressed air condensers and synchronous rotary spark gaps similar to those in use at Arlington (*ELECTRICAL ENGINEERING*, February 27th, p. 120) are used. The receiving circuit contains Fessenden liquid barratter and Nexon crystal detectors. In addition, the heterodyne receiver was used when the signals were faint or when interference from other stations was necessary. Its action depends on the interaction of two persistent high-frequency currents—one local and the other set up by the received wave energy—to produce an amplified audible or other response. This device has now been developed

to the point at which it is said to give increased indications over those normally had on the receipt of fairly well sustained waves, yet, because of its requirement of a considerable degree of persistence for amplification, it does not add to the false signals produced by highly damped atmospheric disturbances. Messages were sent in daylight from the *Salem*, and received at Arlington by two operators simultaneously over a distance of 1,300 miles. The *Salem* was also able, while at Gibraltar, to receive messages at night from Arlington.

The April issue of the *Telefunken Zeitung*, of which Siemens Brothers and Co., Ltd. (Woolwich), have just sent us a copy, opens with an obituary of Prof. Slaby from the pen of Count Arco, and announces that for the first time, at the end of January last, experimental communication was established between Nauen (near Berlin) and New York, a distance of nearly 4,050 miles. Several interesting equipments in various parts of the world are described, and a map is given showing the thirty-three stations which are to be established round the German coasts and frontiers for airships to be able to find their bearings by the "Telefunken Compass." Several wireless telegraph equipments used in the Balkan war are also illustrated.

The rapid progress of wireless telegraphy in Australia is shown by an official communication just issued by the High Commissioners. Of the £50,000 voted for the construction of a chain of wireless stations during the financial year ending June 30th, 1913, £40,000 has already been expended, and stations are now transacting business at Melbourne, Sydney, Fremantle, Adelaide, Hobart, Brisbane, Thursday Island, and Port Moresby. Other stations are practically finished at Cooktown, Rockhampton, Mount Gambier, Geraldton and Esperance, whilst there are still others in course of construction at Roebourne, Wyndham and Broome, and also Port Darwin.

We learn that telegrams to Honduras and Salvador are no longer subject to censorship, and that on the 16th inst. the cable between Madagascar and La Reunion was restored.—The Persian land-lines between Barfrouch and Mechedeser were down on the 17th inst. to 19th inst., and lines in Angola were down on the 18th inst. to Avillengues and Caconda.—The lines between Alep, Bagdad and Diabekir were down on the 19th inst.



## LOCAL NOTES

**Devonport: Electricity Profits.**—There was a net profit of £390 on the working of the electricity undertaking last year, and the whole of this sum is to be placed to reserve fund, which will now stand at £8,274. The coal bill for the year, due entirely to increased prices, was £1,200 more than in the previous twelve months.

**Dover: Electricity Accounts.**—There was a debit balance of £861 on the electricity undertaking last year.

**Supply to St. Margaret's.**—The Board of Trade has sanctioned a supply of electricity being given here by means of overhead cables.

**Gravesend: Rateable Value System of Charging.**—The Borough Electrical Engineer has recommended as an alternative tariff the rateable value system on the basis of 15 per cent. of the net assessable value per annum payable quarterly in advance, plus 3d. per unit for all current consumed.

**Hebburn: Safety of Electric Cables.**—As a consequence of the mysterious explosion, which occurred on March 30th, and which caused the death of two persons (ELECTRICAL ENGINEERING, April 24th, p. 228), the Council has asked the Board of Trade to hold an inquiry into the matter with a view to ascertaining whether any further steps are necessary to be taken to ensure the safety of the public. In the meantime an application by the Northern Counties Electric Supply Co. to lay further high-tension cables in the town has been disapproved of unless the cables are laid in earthenware troughs.

**Ipswich: Electricity Accounts.**—There was a loss of £1,708 upon last year's working of the electricity undertaking. After drawing this amount from the reserve fund, the balance to the credit of the latter is £815. The principal causes which have led to this result are the increase in the cost of coal, heavy capital charges on additional plant which is not at present earning revenue, and the large charge on revenue to cover the wages of permanent employees engaged on work of a capital nature necessitated by the policy of the Local Government Board. In the course of his report, Mr. F. Ayton, the Chief Engineer and Manager of the undertaking, calls attention to the desirability of offering every inducement for the use of electric vehicles in Ipswich now that the Edison battery is being introduced into this country on a commercial scale. The Council is also urged to introduce the hiring of electric cooking and heating apparatus. During the year a further fifty street gas lamps were changed over to electric, bringing the total number of public street electric lamps to 124.

**Leeds: Electric Lighting Accounts.**—The electric lighting undertaking for the past year has again developed at a rate greater than in any preceding period. As the result of reductions in price the revenue from private lighting is £1,747 less than in the preceding year, but the number of consumers has increased from 7,165 to 8,101. The total revenue, however, has increased by £9,751, and the net profit is £15,508 compared with £16,065 in the previous twelve months. This reduction, however, is more than accounted for by an increase of £1,885 in the amount expended out of revenue upon permanent works.

**Norwich: New Plant.**—An official inspection has taken place of the new turbo-alternator and coal-conveying plant, and an opportunity was taken at the same time of holding an exhibition of cooking appliances.

**Nottingham: Electro-Medical Hospital.**—An electro-medical hospital was opened last week, when addresses were delivered by Sir Lancelot Rolleston and Dr. F. H. Humphris, two of the leading authorities on electro-therapeutics.

**Radcliffe: Free Electricity.**—It is stated that on the occasion of the Royal visit the Electricity Committee will give a supply of current free of charge to customers using it for decorative display purposes.

**Rothsay: Position of Electric Supply Undertaking.**—The Council has asked Mr. J. A. Robertson, the Borough Electrical Engineer at Greenock, to report as to the utilisation of steam from the refuse destructor for generating electricity, and also generally on the whole question of electric supply in the Borough.

**Sheffield: The Wiring Department.**—As a consequence of the recent Parliamentary decision the Corporation has sold its contracts for the supply of arc lamps to Messrs. Marsh Bros. for the sum of £125. These contracts bring in a profit of £80 per annum, after meeting all maintenance charges.

Judging from the debate at the City Council meeting last week, there is still some difference of opinion between the Corporation and the contractors in Sheffield as to whether the former are actually carrying out the spirit of the Parliamentary decision in regard to the wiring business generally. Discussions are still taking place between the two parties, and Alderman Styring, a former chairman of the Electricity Committee, hinted during the debate that a greater measure of agreement would be arrived at if the contractors were to adopt a more conciliatory attitude in the matter. The contention of the contractors is that under the Act of last year the Corporation has the right only to keep a showroom for exhibition purposes, and that a printed list of contractors should be kept or delivered occasionally to their consumers. A sub-committee, however, is dealing with the matter, and proposes to submit a recommendation to the Corporation. It is of interest to note that the expenses incurred by the Corporation in respect of the Act last year amounted to £8,749.

**Walsall: Position of Electricity Undertaking.**—With reference to the note on page 155 of our issue for March 13th, we understand that Mr. E. M. Lacey, who was recently called in by the Council, has now reported, and that the Electrical Engineer has also communicated with the Electricity Committee with regard to certain passages in the report in question. The Electricity Committee proposes to hold an early meeting to consider the whole question.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

## Generating Stations, Sub-Stations, Mains, &amp;c.

**Basingstoke.**—The Borough Surveyor has been instructed to prepare plans and estimates in connection with an electric lighting scheme.

**Bridlington.**—The Local Government Board has sanctioned loans amounting to £5,000 for electrical extensions.

**Bury St. Edmunds.**—It is proposed to erect a generating plant for the lighting of the new infirmary buildings.

**Canada.**—The Bowness Improvement Co., Calgary, requires alternators, exciters, switchboard and cable. A specification will shortly be received at 73 Basinghall Street. As the date for receiving tenders is May 31st, the above information will be of use only to firms having agents in Canada who can be instructed by cable.

**Dundee.**—Steam and feed-piping, steam feed-pumps, hot-well tank, &c. City Electrical Engineer. May 30th.

**Nelson.**—A loan of £4,000 is to be taken up for expenditure on mains and services during the next three years.

**Peterborough.**—An inquiry has been held concerning a proposal to borrow £7,000 for extensions at the electricity works. During the course of the inquiry the inspector stated that, after a visit to the works, he had come to the conclusion that it would pay the Corporation to scrap the steam engines there and buy new ones, as half the coal bill could be saved with a modern plant.

**Troon.**—Information is being sought as to the cost of an electric supply installation.

**Yarmouth.**—An inquiry has been held concerning a loan of £3,840 for the electricity undertaking. The new works include a 600-kw. alternator, switchboard, travelling crane, &c.

## Wiring

The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.

**Aberdeen.**—Additions to Robert Gordon's Technical College. Architect, J. O. Allan.

**Altrincham.**—New school.

**Burton-on-Trent.**—Museum and electricity showrooms.

**Croydon.**—Fire station and library in Brigstock Road.

**Dumfries.**—Sanatorium.

**Dundee.**—Extension of the Morgan Academy. J. G. Langlands, 31 Murraygate.

FOR  
STEAM JOINTS  
USE



JOHN HUDSON & CO.'S SUCCESSORS, Mansell St., London, E.

**Neath.**—New school for Glamorgan County Council.  
**Newcastle-on-Tyne.**—New elementary school, Rye Hill. Architect, J. H. Morton, Education Offices, Northumberland Road.

**Portsmouth.**—Electric lighting of workhouse infirmary. Consulting Engineer, R. J. Wallis-Jones, 50 Queen Anne's Gate, Westminster.

**Salford.**—Secondary school in Pendleton. H. Lord, 42 Deansgate, Manchester.

**Shipley.**—Additions at Otley Road school. S. Bradley, Bank Street, Bradford.

**Swansea.**—Three hundred workmen's dwellings.

#### Miscellaneous

**Birmingham.**—The Tramways Committee proposes to purchase seventy-five new tramcars at an estimated cost of £83,000.

**Liverpool.**—Twelve months' supply of stores for the Liverpool Overhead Railway Co. General Manager. June 3rd.

### TENDERS RECEIVED AND ACCEPTED

**Admiralty.**—The Admiralty has placed a contract with the Dussek Bitumen Co. for "Trinitite" Insulating Box Compound, for use in H.M. battleships, dockyards, &c. In order to secure this contract the material had to pass very severe tests, and to comply with a stringent specification, owing to the unusual extremes between heat and cold experienced under naval conditions.

**Ashton-under-Lyne.**—The tender of the Bastian Meter Co. has been accepted for the supply of 10-ampere meters.

Messrs. Chamberlain and Hookham have received a contract for two-rate meters from the Corporation.

**Bedford.**—The following tenders have been accepted:—B.T.-H. Co. for 125 meters; British Westinghouse Co. for 25 meters; Dick, Kerr and Co., for a twelve months' supply of lamps; Siemens Bros. and Co. for a twelve months' supply of cable.

**Belfast.**—The tender of Callender's Cable and Construction Co. for cable has been accepted.

**King's Lynn.**—The following tenders have been accepted:—Browett Lindley and Co. for a 400-kw. high-speed steam engine, £1,289, steam exhaust and feed-pipes, &c., £427; Roes Roturbo Manufacturing Co., rotary jet condensing plant, £305; Phoenix Dynamo Manufacturing Co. for a 400-kw. dynamo, £500.

**Kobe.**—The completion of the delivery of an order for forty-two Warner trucks by the "M and G" Truck and Engineering Co., Ltd., of St. John's House, Minorities, E., for the Kobe tramways, makes forty-two systems upon which the Warner axle has been fitted to date, including ten lines in the United States. The first British passenger coach fitted by the same firm for the Warner International and Overseas Engineering Co., Ltd., has just been completed and successfully run.

**Lowestoft.**—The Corporation has placed a contract with Messrs. Chamberlain & Hookham for car meters.

**Sheffield.**—The following tenders have been accepted in connection with the extensions of the Neepsend power station:—Turbo-alternator (Dick, Kerr) and condensing plant, Willans and Robinson, £23,119; three water-tube boilers, mechanical stokers, superheaters, economisers, pipework, &c., Stirling Boiler Co., £26,208.

**Sunderland.**—The following tenders have been accepted:—Ferranti, Ltd., 50 meters; Cable Accessories Co., 100 sets of street-lighting fittings; and Babcock and Wilcox, steel bends.

**Worthing.**—A contract for extensions to the storage battery at the electricity works has been placed with the Hart Accumulator Co.

### APPOINTMENTS AND PERSONAL NOTES

The Glasgow Electricity Committee recommends that the salary of Mr. W. W. Lackie, Chief Electrical Engineer, be increased from £1,000 to £1,100 per annum; Mr. A. Page, Chief Assistant Electrical Engineer, from £600 to £650 per annum; and Mr. R. B. MacCall, Accountant and Chief Clerk, from £375 to £400 per annum.

There was considerable opposition at the Glasgow Corporation meeting on Thursday to the proposed increases of salaries

of tramway officials, referred to on p. 268 of our issue for May 8th. Eventually all the salaries were increased, with the exception of that of Mr. James Dalrymple, the General Manager.

Professor Gisbert Kapp has been appointed Chairman of the Engineering Section of the British Association, in place of Mr. J. A. Aspinall, who was originally appointed, but has had to resign owing to ill-health.

Mr. P. W. Beatty has resigned the Managership of the River Plate Electricity Co. to take up the post of Chief Engineer to the Lacroze Tramway Co., Buenos Aires.

An Assistant Station Superintendent is required at the MacDonald Road power station of the Edinburgh Corporation. Salary £200 to £250 per annum. Applications by May 30th to Chief Engineer.

Mr. Colbeck, Assistant Mains Engineer at Dover, has resigned, and a successor is to be appointed at a commencing salary of £100 per annum.

Commercial manager required by firm of accumulator manufacturers. (See an advertisement on another page.)

First-class man required for accumulator manufacture. (See an advertisement on another page.)

Experienced battery-makers are required at Bradford. (See an advertisement on another page.)

### MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. G. Smith and Son, of 5 Philpot Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night, was £72 10s. to £73. (Last week £73 to £73 10s.)

**Advertising Agency.**—Mr. E. A. Hill has resigned his position as advertising manager to the Foster Engineering Co., and is starting as advertisement writer and agent on his own account at 26 Stanton Road, Wimbledon.

**Engineering and Arc Lamps, Ltd.**—This firm has now completed the repairs to its Sphere Works, St. Albans, after the damage done by the fire on March 8th. The total damage due to the fire was upwards of £3,600. The works are now in full running order, and in addition to the manufacture of their well-known arc lamps and accessories, the Company undertakes the production of any repetition work, stampings, spinings, &c.

**Change of Address.**—S. Bill and Co., Ltd., Electrical Accessories Manufacturers, have moved to larger premises at 146 Queen's Road, Aston, Birmingham.

**Electric Cooking Demonstrations.**—Gillespie and Beales (Amberley House, Norfolk Street, Strand), sole selling agents for the "Tricity" cookers, are prepared, on behalf of the British Electric Transformer Co., Ltd., to arrange with electricity supply undertakings for cooking demonstrations, by Mr. F. S. Grogan.

**Liquidations.**—A meeting of Electrocars, Ltd., will be held on Monday, June 16th, at noon, at 3 Great St. Helens, E.C., to hear the liquidator's account of the winding-up.

### COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &c.

**British Thomson-Houston Co.**—The balance sheet for 1912 shows a profit of £30,999, and after allowing £20,000 for depreciation of plant and various other items for depreciation, there is a balance of £1,208, and this, added to the previous year's balance, leaves £8,590 to be carried forward. The report calls attention to the fact that the output of the Rugby lamp factory has been largely increased, and on account of the rapid expansion of work in other departments, the Willesden factory, which had been specially erected for the manufacture of Mazda lamps, is now being devoted to switchboard work. The Curtis steam turbine business continues to show satisfactory results, as also does the business in Mazda drawn wire lamps.

**Cape Town and District Gas Co.**—At the annual meeting which was held in London last week, the Chairman had to deal with complaints at the continued absence of dividends, which, so far as the past year is concerned, he attributed to the keen competition of the Cape Town Corporation in the supply of electricity. During the past year the Corporation has reduced its charges from 1s. to 7d. per unit, whilst there is a scale going down to 3d. per unit for large power users.

# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 335 [Vol. IX., No. 22]

*All rights reserved.*

THURSDAY, MAY 29, 1913.

[PRICE ONE PENNY.]

*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

*The Engineering Journal of the Electrical Industry*

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES AND TECHNICAL COLLEGE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

*Other Advertisement Rates on Application.*

#### *Latest Time for Receiving*

Letters for Insertion, Tuesday first post.

Small Advertisements and Official Announcements, Wednesday first post.

Displayed Advertisements, Tuesday first post.

Corrections in Standing Advertisements, Monday first post.

All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 208-209, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Circling, Fleet, London."

Telephone No.: 5509 Holborn.

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

OWING to pressure on our space we have been obliged to omit our usual fortnightly cartoon this week.

THE full programme of the I.M.E.A. London Convention, from June 17th to 21st, is given on page 298.

THE results of an extensive series of tests of metal filament lamps which have been made at the National Physical Laboratory, have been published in a report by the Engineering Standards Committee. Some considerable degree of departure from their nominal rating was found in most makes of lamp. With regard to life the proportion which failed before 1,000 hours is discussed, as well as the reduction in candle-power of those surviving, with a view to framing a satisfactory standard specification. (Page 298.)

AN important feature of the joint meeting of the Institution of Electrical Engineers and the Société Internationale des Electriciens, held in Paris last week, a long report of which occupies a large part of our present issue, was a discussion on electric railway traction, based on six Papers. In one of these M. Parodi reviewed some of the economic aspects of electric traction, illustrating the subject with examples from American practice, and giving incidentally interesting comparisons of steam and electric locomotives. His views inclined to favour continuous current traction, an attitude also adopted by M. Mazen in his description of the new electrification scheme of the Ouest-Etat Railway. M. Gratzmuller took up the controversy of the systems more in detail in his Paper on

high tension continuous current traction, which he supplemented in the discussion with an almost equally warm advocacy of single-phase working. Single phase was also championed by M. Latour, who contrasted different types of motors, and was further illustrated by M. Jullian in his description of the experiments on the Midi railway. In the discussion, the coming British examples of continuous current traction at about 3,000 volts were mentioned by Mr. Roger Smith, and the important question of interference with telephone circuits was raised by Mr. Slingo and others. Another branch of electric traction was dealt with by M. Damoiseau in a Paper on petrol electric cars for railways. The Papers and discussions, taken as a whole, set forth admirably the features and relative advantages and disadvantages of the various systems of electric railway traction, and form an excellent review of the whole subject, especially as the main general points for and against the various systems are conveniently summed up in the discussion. (Pages 299-303.)

WE publish some notes on the two large power houses visited, and an illustration of the 11,000 Brown Boveri turbo-alternator at the St. Denis Station. (Pages 303-4.)

ON the consideration of Mr. Highfield's Paper on the H. T., D. C. series power transmission system, M. Thury himself took a prominent part in the discussion. (Pages 304-5.)

OUR report also deals with the visits made to the tramway and railway depôts in Paris, and the wireless telegraph installation on the Eiffel Tower, with particular reference to the arrangements for sending out international time signals, to which a lecture by Commandant Ferrié was devoted; an account is given of a lecture by M. Claude on the application of tubes of neon gas for lighting; and finally an abstract is given of a Paper by Mr. W. Slingo, describing new traffic-distributing plant which is being installed in London telephone exchanges to level the load curve of the operators. (Page 306.)

METHODS of obtaining single-phase currents from three-phase circuits are discussed in our Questions and Answers Columns. (Page 307.)

A METHOD of obscuring lamp bulbs, and a watertight gland for cables passing through bulkheads, are described on page 308.

A REVISED set of model regulations for the installation of overhead power lines has been issued by the Board of Trade. (Page 306.)

THE Loetschberg tunnel electric railway is to be opened for traffic in June. This marks an important step in electric traction, as it is the first application of the 15-cycle 15,000-volt single-phase system for heavy work.—The House of Commons has passed a motion by

which trolley-buses in London will be subject to the veto of the Borough Councils. (Page 309.)

THE criminal libel action by the Managing Director of Marconi's Wireless Telegraph Co. against Mr. Cecil Chesterton, editor of the *New Witness*, is being heard at the Old Bailey.—Action is being taken against the directors of Marconi's Wireless Telegraph Co. on behalf of some English shareholders to recover a large sum said to be the difference between the par value and selling price of 500,000 shares in the American Marconi Co.—The United States Government has placed an order with the Poulsen Co. for a long-distance wireless station at Colon.—The Marconi Co. are instituting patent infringement proceedings against the American Poulsen Co. (Page 309.)

NOTICE is given that the National Telewriter Co. intend to seek an extension of life of one of their patents, covering some details and the arrangement of telewriter apparatus. The Western Electric Co. are seeking to amend a specification for telephone switch hooks. The specifications published by the Patent Office last Thursday include one for a lead-antimony cable sheathing by the Western Electric Co., and one by the Submersible and J. L. Motors, Ltd., for a submersible induction motor. (Page 310.)

THE Toronto Electric Lighting Co. has offered its undertaking to the Toronto Government for £5,000,000.—The Galashiels Council has decided not to undertake a municipal electricity scheme.—The Suffolk Electricity Co. has made arrangements for wiring tents on the beach at Felixstowe.—Investigations are being carried out at Portsmouth with a view to evolving an attractive power tariff. (Page 311.)

AN expenditure of £52,350 is contemplated on new plant at Leicester; £24,440 at York; £3,750 at Bootle; £25,000 at Norwich; £8,000 at Hammersmith; £6,400 at Darwen; and £6,100 at Limerick.—E.H.T. switch-board is required at Oldham; 1,500-kw. turbo-alternator and condenser at Rawtenstall; an electric tramway system is to be erected at St. Michael's (Azores), and 1,157 street gas lamps are to be converted to electricity at Bristol; quantities of telephone material are required in Servia; transformers at Hammersmith; and four electric gantry cranes at Belfast. (Page 311.)

## ARRANGEMENTS FOR THE WEEK

FRIDAY, MAY 30TH.

*Institution of Electrical Engineers.*

8 p.m. Annual general meeting.

8.30 p.m. "Practical Application of Telephone Transmission Calculations," by A. J. Aldridge.

THURSDAY, JUNE 5TH.

*Institution of Mining Engineers.*

11 a.m. At Burlington House, Piccadilly. Among the papers to be read will be "Insulated and Bare Copper and Aluminium Cables for the Transmission of Electrical Energy, with Special Reference to Mining Work," by B. Welbourn.

## The London Electrical Engineers.

(TO-DAY) THURSDAY, MAY 29TH.—C. Company. FRIDAY, MAY 30TH.—D. Company. MONDAY, JUNE 2ND.—A. Company. TUESDAY, JUNE 3RD.—B. Company. THURSDAY, JUNE 5TH.—C. Company. FRIDAY, JUNE 6TH.—D. Company. Infantry Drill, 7 to 9 p.m. Technical Instruction for all Members on the Sixth Rate and for all Candidates for Higher Rating, 7 to 9 p.m. Musketry Instruction, 9 to 10 p.m.

SATURDAY, JUNE 7TH.—Headquarters open from 10 a.m. till noon.

## THE I.M.E.A. LONDON CONVENTION

THE full programme of the London Convention of the Incorporated Municipal Electrical Association, which will be held from Tuesday, June 17th, to Saturday, June 21st, has now been issued. The headquarters of the Council will be at the Hotel Cecil, and the meetings will be held, with one exception, at the Institution of Electrical Engineers, where an exhibition of cooking, heating, and other electrical appliances will be held during the Convention.

The Convention will be opened by Mr. W. Duddell, President of the Institution of Electrical Engineers, on the Tuesday morning, and the address of Mr. C. E. C. Shawfield (ex-

president of the Association), and a Paper by Dr. S. Z. de Ferranti on "Prime Movers for Electric Power," will be read. In the afternoon visits will be made to the generating station of the London Electric Supply Corporation at Deptford and the Corporation Electricity Works at West Ham.

At Wednesday morning's meeting discussion will be held in camera by members and delegates only on the I.M.E.A. Bill and Heating and Cooking. The London Electric Railway Power Station at Lots Road will be visited in the afternoon, and the Annual Dinner will be held at the Hotel Cecil in the evening.

The Thursday will be spent at Kingston-on-Thames. In the morning, after an address of welcome by the Mayor at the Empire Theatre, Papers will be read by Mr. J. Christie on air filtration, and by Messrs. W. H. L. Watson and R. J. Mitchell on electric vehicles. The latter Paper will be introduced by Mr. A. H. Seabrook, and a demonstration of battery-driven vehicles will be given after the meeting. A river trip, including Weybridge and Hampton Court, has been arranged for the afternoon.

On Friday the Annual General Meeting will be held, and a Special General Meeting to consider alterations in the Articles of Association, and on Saturday morning a visit will be paid to the Humphrey gas pump installation at the new Chingford reservoir.

## RATING AND LIFE TESTS OF TUNGSTEN LAMPS

A REPORT on a long series of experiments on tungsten filament lamps, which have been carried out by the National Physical Laboratory, has been published by the Engineering Standards Committee in two parts, one containing the text and the other curves by which it is accompanied. The tests in question were undertaken at the request of the Sectional Committee on Electrical Plant in order that the sub-committee, which is considering the drafting of a general specification for glow lamps, might have as much detailed information as possible. The experiments were directed mainly upon obtaining data as to the degree of uniformity in batches of lamps of given rating and their behaviour on life tests.

A very large number of lamps were tested, but the names of the makers are not given. The tests of initial rating are plotted in "target diagram" form, and the general conclusion is that individual lamps at present on the market vary considerably from their nominal ratings. The case of one maker, where the lamps were taken from a consignment supplied to a Government Department, is, however, cited as showing what can be done by careful rating. Forty per cent. of the batches tested came within the limits required by the British Standard Specification for carbon filament lamps ( $\pm 12\frac{1}{2}$  per cent. for c.p. and  $\pm 8$  per cent. for watts), and the same percentage fell within certain limits based on watts per candle-power, which have been put forward by some of the British lamp-makers in a suggested draft specification framed on the lines of the official specification employed in the U.S.A. On the basis of watts alone, 48 per cent. fulfilled the Standard Specification and 79 per cent. the makers' requirements.

In the life tests the lamps were all run initially at 1.2 watts per c.p. As this condition was found, by previous experience, to give a diminution of c.p. of about 20 per cent. after 1,000 hours (a basis suggested by the American definition of "life" as the number of hours, until the c.p. decreases to this extent or until the lamp breaks if within that period). In the tests 71½ per cent. of the 220-volt lamps and 32 per cent. of the 105-volt lamps broke before 1,000 hours, and these had average lives of 441 and 540 hours, and those which survived diminished, on the average, 19.1 per cent. and 19.6 per cent. respectively for the high and low voltages. The general bearing of the results of the tests is discussed at some length. It is remarked that the test life of a lamp is terminated either by the burn-out of a filament or by the c.p. falling a certain amount after a specified period. The fall of candle-power is very sensitive to the watts per candle, the burn-out only so to a small extent. Finally, the following way of treating the matter is recommended as preferable to the American specification: namely, to "specify that when the lamps are run at a certain prescribed efficiency, the average fall in candle-power of those lamps which reach 1,000 hours shall not exceed 20 per cent. of the initial candle-power," and "that the average number of burning hours, of all the test lamps of a given rating, up to 1,000 hours, must not be less than a given amount." In this figure, for example, 850 hours is suggested for 100-volt 50-watt lamps, 750 hours for high-voltage 50-watt lamps.



## JOINT MEETING OF THE BRITISH AND FRENCH INSTITUTIONS OF ELECTRICAL ENGINEERS IN PARIS

THE Joint Meeting of the Institution of Electrical Engineers and the Société Internationale des Electriciens was held in Paris last week at the invitation of the latter Society. As was stated in our last issue, over 100 members accompanied by several ladies crossed to Paris on the Tuesday, and others joined the party there. The Members of Council who took part in the meeting were Mr. Duddell (President), Prof. G. Carey Foster (Past President), and Messrs Judd, Snell, Hammond, Highfield, Jenkin, and Roger T. Smith.

The President of the French Society, in opening the meeting on Wednesday, welcomed the visitors and thanked them for coming in such numbers. He added that the Société Internationale des Electriciens had not forgotten the cordial reception given to their members in England in 1906.

### Electric Railway Traction.

Six Papers on electric railway traction by French authors were then formally read in abstract at a very rapid rate in French by M. Joly, the General Secretary of the French Society. We give the main points in the several Papers below. Translations of the Papers, more or less in full, may be obtained from Mr. Rowell, Secretary of the Institution of Electrical Engineers. A short discussion on the Papers took place on Wednesday, and the discussion was resumed on Friday.

#### HIGH-TENSION CONTINUOUS CURRENT.

M. L. GRATZMULLER dealt in the first Paper with the high-tension direct-current system. When the power station is at a considerable distance from the track, three-phase generation, he said, was the obvious solution, but to keep down the weight of the turbo-alternators a frequency greater than 25 was desirable unless rotary converters were to be used in the substations. The motor generator for pressures below 1,200 volts was too expensive. The cascade converter did not show to advantage unless the frequency was high, e.g., 50 cycles per sec., or unless the output was sufficient for the A.C. stator to be supplied with high-tension current. For rotary converters, 50-cycle current could be satisfactorily used, but the continuous-current pressure could not be raised to more than 750 volts. For higher pressures the converters should be put in series.

If the station was so near the track that there was no need for a higher transmission pressure than 1,200 or 2,400 volts, dynamos driven by water turbines would work satisfactorily up to 1,500 volts with a single commutator, and machines with two windings and two commutators could give the higher pressure. With steam turbines he preferred to generate alternating current and to transform it. In this connection, the Author said that more and more interest was likely to be taken in increasing the speed, and consequently the frequency, of turbo-alternators. The mercury converter, whatever might be the frequency, allowed the alternating current to be rectified with a constant fall of pressure. It was being perfected; apparatus of a capacity up to 500 kw. already existed, and for high pressures its efficiency was nearly unity. With regard to overhead conductors, 3,000 volts' pressure would probably be the safe limit for some time to come, but since a current of 500 amperes at this pressure supplied a power of 1,500 kw., it would appear that powerful locomotives could only be utilised where a third rail was installed. Dealing with the motors, the Author inferred that with the same internal diameter, length of iron, and weight of windings it should be possible to obtain the same torque in normal working, whether the motor was wound as a continuous current or three-phase induction motor. Although the single-phase motor was clearly heavier, the difference was not so great as was formerly given, the difference being only 15 per cent., and not  $\frac{1}{\sqrt{2}}$ .

The Author then passed on to a comparison of the shunt and series motor, and the commutation of series continuous and alternating current machines, the result arrived at being that continuous-current motors with distributed compensating windings would probably come to be adopted. There was no special technical difficulty in the design, and it seemed that the pressure of 1,200 volts per motor should be easily reached when multiple units were employed, and 1,500 volts for locomotives. Unfortunately, at low powers it would often require two turns per coil; series winding would naturally be used. A locomotive of 2,000 h.p. at 3,000 volts could thus be constructed with two motors in series or motors having two commutators. The current required would then be approximately 500 amperes. The use of aluminium for the rotors appeared very suitable, and the increase in electrical resistance could be largely compensated for by the increase in peripheral speed for the same centrifugal force. Owing, also, to the recent improvement in gear cutting,

reduction gear could be used, as was done for the locomotives for the Lotschberg. This increase in peripheral speed, coupled with forced ventilation, would enable the weight of the motors to be reduced by about 50 per cent. Comparing enclosed, semi-enclosed, and locomotive motors, the conclusion was that auxiliary fans or water-cooling was not justified; each rotor should act as its own fan, and produce a current of air which would enter near the shaft through a bearing, and pass through the centre of the commutator and the iron stampings of the rotor. Numbers of small passages should be avoided, and the commutator might be provided with vanes.

For the controlling arrangements, any of the well-known systems could be employed; but with the usual American practice of providing two motors, each for half the total pressure, and connecting them in series, it was to be feared that slipping might cause an undue pressure to come on one motor. On the question of braking and regeneration, especially where starting and stopping are frequent, there was the solution in the use of boosters on one or more cars. If  $V$  were the pressure of the line, and the booster pressure varied from  $-V$  to  $+V$ , and if one of the terminals were earthed, no point of the motors could be at a pressure greater than  $\pm V$ . During the periods of regeneration, the only essential point would be that the excitation of the motors should not be provided by putting them in series with the field magnets. It might evidently be obtained, more or less directly, from the boosters, or from an auxiliary exciter attached to the machine. Moreover, for the starting period it was desirable that the motors should retain their series characteristics. If merely varying the excitation of the booster would allow the whole control apparatus to be done away with, and the extra power taken by the dynamo was only equal to the total power of the driving motors, it followed that great peripheral speeds and artificial cooling made this solution the one to be adopted. In this connection, the system due to Messrs. Macfarlane and Burge, using the C.M.B. converter (ELECTRICAL ENGINEERING, Vol. V., p. 629, and Vol. VIII., p. 101), was mentioned, and criticised thus: For equal speeds there was no saving of material in the armature, but the length could be reduced whilst the diameter was increased. On the other hand, there was no longer any symmetry in the machine. The magnetic bridges between the poles had to carry all the flux from one pole, and not half, as in a multipolar machine; moreover, the leakage from pole to pole would be very large, the armature reaction would be unsymmetrical in regard to the short-circuited brushes, and it was difficult to see how to utilise auxiliary poles or a compensating winding in this machine.

In conclusion, the equipment of the principal manufacturers was briefly described, and a list of undertakings working at from 600 to 3,000 volts continuous-current line pressure, including those systems in America using both 600 and 1,200 volts, was given. Finally, it was pointed out that the name high-tension continuous-current traction is not very happy, as it implies an entirely new type of apparatus. As a matter of fact, it only marked steady development. The trains from Villefranche to Bourg-Madame worked at 850 volts. Sections of the Buda-Pesth system were run at 1,000 volts; and locomotives taking current at 2,400 volts were in operation, while 3,000 volts was talked of. This progress was justified by the improvement in commutation and to recent methods of insulation by means of mica and impregnation. The advantages of continuous current were principally the large starting torque, good commutation, and light coaches. The drawbacks were the use of an exposed high-tension rotating part—particularly dangerous in damp localities—the use of a commutator, and the control of the large currents necessary when a large amount of power was required.

#### SINGLE-PHASE.

M. MARIUS LATOUR contributed the second Paper, which was chiefly devoted to a consideration of series and repulsion motors. Referring, first, briefly to mechanical considerations, however, he recommended that the motors should be mounted on springs, so that dangerous resonance effects, such as arise at certain speeds with mechanical transmission, can be avoided, in so far as these arise from fluctuations in the torque. In addition to the mean rotation of the motor, there is an oscillatory movement which is liable to produce a leading wattless E.M.F. in the armature. He then referred to extensive tests which had been carried out by the Compagnie du Midi with the following motors:—(1) the simple repulsion motor (Brown, Boveri) and the compensated repulsion motor (A.E.G.); (2) the series motor with a transverse local field for compensating the electromotive force of short-circuit under the brushes (Jeumont), and the series motor with an elliptical field (French Thomson-Houston Co.), and the well-known Westinghouse series type. The Author remarked that in the repulsion motor at speeds above synchronism the transverse field increases in strength, the iron

# BROWN-BOVERI TURBO-GENERATORS.

*In this issue of "Electrical Engineering" (page 303) a short account is given of the typical BROWN-BOVERI plant at the ST. DENIS POWER STATION, PARIS, in which are installed NINE turbo-generators of 6,000 Kilowatts and one of 11,000 Kilowatts, generating energy directly at 10,500 and 12,300 Volts.*

losses increase, and commutation becomes unsatisfactory, until, at  $\sqrt{2}$  synchronous speed, commutation is worse than that of the series motor. The compensated repulsion motor, on the other hand, works at approximately unity power factor, due to the property of commutator motors with short-circuited brushes of having no inductance at synchronous speed and negative inductance above that speed, even when supplied with simple alternating current. As indicated by the name, the other two types have an additional winding perpendicular to the brush axis connected up so as to give commutating fields. The results of mathematical investigation of these motors are that in all cases the commutator should run at a high peripheral speed, for which gearing is necessary; this is used on the Jeumont and Westinghouse locomotives, and on the Oerlikon locomotive for the Lötschberg, and appears to give entire satisfaction. At a frequency of 15 the repulsion-type motors are heavy, and the efficiency does not improve with lower frequency, whereas with series motors it approaches more nearly to that of a continuous-current machine. With regard to commutation, the narrower the auxiliary poles the smaller the losses. This necessitates a small rotor tooth-pitch. Thus a large number of poles, high speeds, and small air-gaps are required. At a frequency of 15 commutation losses could be reduced to 0.25 per cent.

## ELECTRIFICATION OF THE CHEMIN DE FER DU MIDI.

M. JULLIAN gave some interesting information in this Paper. Some of the track is standard gauge and some metre gauge. When all the proposed electrifications are completed there will be 622 km. of line electrified, of which 327 km. are now working, and 227 are to be electrified under an agreement with the State dated July 4th, 1908, and 68 km. of line crossing the Pyrenees. If the generating stations at Eget and Toulon can supply sufficient energy, it is also proposed to electrify the line from Perpignan to Villefranche, in the eastern Pyrenees. The lines to be constructed in the Pyrenees have steep gradients, chiefly between 1.5 and 3.2 mm. per metre, and the mean practicable speed is about 60 km. per hour. Current at 12,000 volts, 16 cycles, is used throughout. It is generated at 6,000 volts single phase, transmitted at 60,000 volts to five sub-stations, where it is stepped down to 12,000 volts and fed into the overhead conductor. Balancing the extra cost of the generators for single-phase supply over three-phase against the reduced cost for switchgear and transmission lines, the advantage is on the side of the former. In the experimental line from Villefranche to Vernet-les-Bains, six types of overhead equip-

ment have been established: four of these belong to the simple catenary type, one to the double catenary, and one to the rigid type. The spans are 100 metres, 60 metres, or 50 metres, and the longer sections are provided with compensating arrangements. As a result, it was found that on the lines comprising fairly numerous curves of a radius between 350 and 800 metres, and worked over by trains at speeds of between about 75 to 80 km. per hour, but not exceeding 90 km. per hour, the choice should fall upon the simple uncompensated catenary type for spans of between 50 to 60 metres, and with pull-offs on the curves to bring back the overhead conductor towards the centre of the track when necessary. The catenary cable should in this case invariably be anchored to the insulator at each bracket. With regard to poles, those made of reinforced concrete are too expensive and too heavy for existing lines, and the "Midi" type of pole, composed of old rails fastened together, is very suitable for single-track lines. For double track, however, lattice poles must be used. The high-tension transmission lines to be used, generally two in parallel, are of aluminium, and most of the insulators are of glass; some, however, are of porcelain. On the question of cost, on the lines already constructed it comes out to about 19,500 fr. per kilometre for single track, using "Midi" poles, and 21,500 fr. per kilometre for double track.

Tests are still in progress with locomotives and motor-cars. The conditions are that the locomotives must be capable of starting a 400-ton train on an up-grade of 11 mm. per metre, and in addition of hauling a train of 100 tons at a speed of 60 km. per hour, and a train of 280 tons at a speed of 45 km. per hour over the hilly section from Ille to Villefranche, which has long and numerous gradients of 17 mm. per metre, and some even of 21 mm. On a down-gradient these locomotives are to be able to deal, by electric braking alone, with the same loads at speeds capable of being regulated by the driver between the up-grade speeds and one-half of those speeds. The electric braking may be regenerative or else by resistances. The motor-cars must haul a train of 100 tons, motor-car included, over the same gradients at a speed of 65 km. per hour. Three locomotives have satisfied the conditions. They were constructed by the Ateliers de Constructions Electriques du Nord et de l'Est, by the French Thomson-Houston, and Westinghouse Companies. The motor-car constructed by the latter firm also satisfied the conditions. For the protection of telegraph lines from disturbances, apparatus due to M. Girousse has been found successful and adopted, and with regard to the telephone, the Administration is about to replace ordinary insulators by others

of greater insulation resistance, to transpose the two lines every 300 or 400 metres, and to insert transformers between the lines and the receiving apparatus, to save users from risk of shocks.

#### THE PARIS SUBURBAN SYSTEM OF THE (WESTERN) STATE RAILWAYS.

M. A. N. MAZEN commenced his Paper on this subject by some data giving an idea of the magnitude of the Ouest-Etat railway system, which involves some 1,640 trains per day entering and leaving Paris. Due to the mixture of suburban and long-distance traffic and the rapid increase of both, a condition of congestion has been brought about which necessitates increase in the carrying capacity of the lines such as cannot be effected as long as steam traction is used exclusively. The Author says that it is useless to try to exceed a maximum of 12,000 passengers per hour per double track with steam, whereas the well-known advantages of electric traction enable this to be far exceeded. The Métropolitain, with trains of five coaches carrying 500 passengers, is able to deal with an hourly total of 12,000 passengers. With carriages 3 m. instead of 2.40 m. wide, and 22 m. instead of 14 m. long, and assuming eight carriages per train, the enormous figure of 40,000 passengers per hour is reached, or, considering seats only (no standing), that of 20,000 passengers per hour. No section of a steam line, he says, can deal with more than 100 trains in each direction per day, whilst it is agreed that on electrified lines this figure may reach 350. Such developments would also hasten the increase of traffic, and in this connection it is remarked that the electrified line from the Invalides to Versailles has shown traffic increases of from 12 to 13 per cent. per year, while the other steam lines showed increases of barely 2 or 3 per cent. The Author then briefly reviewed the reasons for adopting continuous-current, 650-volt, third-rail system in preference to single-phase or a higher continuous pressure, including the lighter weight of the equipment and the avoidance of trouble with overhead lines and of interference with telephone circuits, &c. The system is also used for all the existing heavy electric traction schemes in Paris. In the scheme, current is furnished by sub-stations receiving energy in the form of alternating three-phase current at 25 cycles, 15,000 volts, by duplicate feeders from two generating stations. To avoid trouble from frost after a thaw, a conductor rail with under collection was proposed. This rail weighs 76 kg. per metre. It is carried by supports of impregnated wood of a type similar to that used on the Invalides-Versailles line. A single type of electric carriage is used, built to contain all the elements required for suburban service, namely, guard's van and first and second class compartments. This coach can carry 100, including "straphangers." During much of the time the service will be carried on by single-coach trains. During the time of heavier traffic, and on the more busy sections, the trains will be composed of several similar coaches. It is also intended to run special electric trains for parcels service. The motor-coaches collect the current by a special universal shoe, either from the upper or under surface of the rail. The sub-stations, placed wherever possible at junctions, contain rotary converters of 1,500, 1,000, and 750 kw. output. Their distance apart varies from 3 to 8 km. A control system allows a variation in the voltage of the supply, and of several sub-stations being put out of action during slack hours. The construction and working of the two power stations at Mouligneux and at Bezons has just been entrusted, after public tender, to an industrial syndicate. They contain turbine units of 5,000 kw., and when the installations are complete will have a capacity of about 60,000 kw., and will furnish about a hundred million kw.-hours per annum. There is a sliding scale of charges under which, when the stations are finished, energy will be sold to the State at an inclusive charge of about 5 centimes per kilowatt-hour. This scale contemplates the ultimate utilisation by the State of the energy coming either from the Rhône or from the coal-mines in the north.

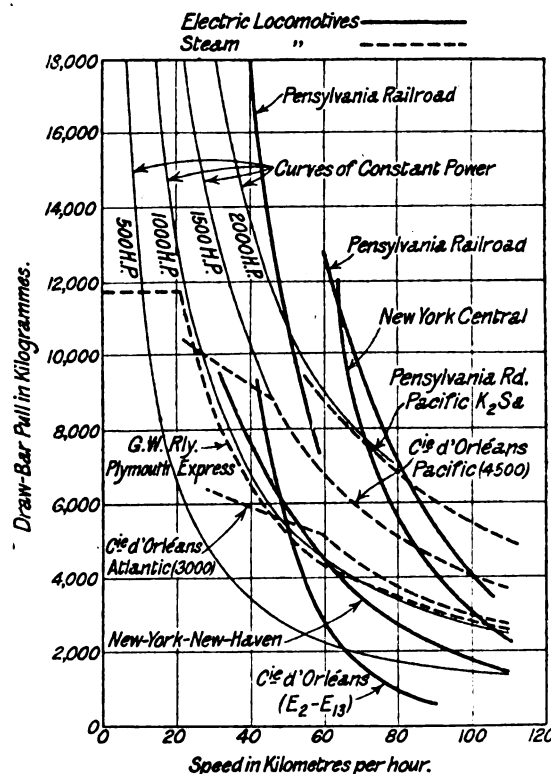
#### PRACTICE IN THE UNITED STATES.

M. H. PARODI in a long Paper sketched, first, the differences between American and Continental conditions, emphasising particularly the greater rate of increase of traffic in the United States, and the reasons why, with the longer distances, larger trucks and heavier trains, merchandise could be carried in America at about half the cost at which it can be in Europe. The question of suburban traffic was also taken up, and the facilities for increasing the frequency of trains afforded by electric traction was particularly dwelt upon. From statistics it appeared that in America the logarithm of the receipts was about proportional to twice the logarithm of the increasing population. Statistics were also given with regard to electric tramways in America, and comparisons were made between single-phase and continuous-current systems, from which it appeared that the cost per car km. on the tramways, which is 0.5 franc for D.C., should come to 0.59-0.60 francs for single-phase, as a result of the greater cost of repairs and maintenance. The differences between these systems of traction as applied to railways would be much greater. The relation between traffic and expenses which must exist for electrification to be remunerative was next investigated. Assuming the net

cost per car km. to be 0.6 franc, and the average cost of transport per passenger km. 0.06 franc, then, if the total annual number of car km. per km. of line be  $N$ , and the average number of passengers per car  $f$ , the relation between the traffic and the annual revenue will be for a ratio of working expenses to receipts of 60 per cent.  $0.60N + 10,000 = 0.06Nf / 100$ .

On this basis, the Author calculates that the passenger traffic of the New York, New Haven, and Hartford Railway, which is quite exceptional, would almost justify a general electrification of the lines of that company, but for the New York Central Railway and the Pennsylvania Railway the electrification should be restricted to those lines where the average traffic per car is sufficient. Comparison follows between the continuous-current working of the New York Central and the single-phase working of the New Haven lines. The former affords a suburban service by means of motor-cars, whilst the latter employ almost exclusively locomotive traction. The four 600-h.p. single-phase motor-cars in service only ensure a few trains a day. There is reason to believe, continues the Author, that the use of single-phase motor-cars has not been extended owing to their weight and high price. Even by admitting that the cost of traction is exactly the same for the two systems, single-phase working will be more expensive than continuous-current working by reason of this extra weight, and the service will certainly be inferior owing to the insufficiency of power of the motor-cars. Figures are then quoted to show the much higher cost of maintenance of the single-phase equipment.

Some questions involved in real main-line service were next gone into. The author thinks that in the future, with continuous current, it is probable that the pressure will be limited to 1,200 volts, at least for the electrification considered by the



New York Central Railway, so as to be able to retain without change the inverted third-rail conductor. As regards ordinary alternating current, he has reason to believe that a method of supplying current will be adopted similar to the three-wire continuous-current distribution by connecting the running rails to the centre of a transformer winding at 22,000 volts, of which the terminals would each be connected to one of the two overhead conductors serving adjacent lines. Trouble with neighbouring telephone lines may be diminished by crossing the outer conductors at intervals. Whatever system of traction is adopted, the ordinary method of working railways ought to be retained, and the trains should be drawn by as powerful, light, and fast a locomotive as possible. Curves given in the Paper of the draw-bar pull of different classes of steam and electric locomotives are reproduced here. It is pointed out that these electric locomotives were really constructed to develop their maximum power at about 60 km. per hour, corresponding with a suburban service. In the United States there are no continuous-current or single-phase locomotives which are really very powerful at their maximum running speed, whereas there are very interesting examples in Europe of three-phase locomotives. The locomotives now in use in the Simplon Tunnel develop at 70 km. per hour a draw-bar pull of 6,000 kg.; the new loco-

motives which are under construction, however, will weigh 86 tons, and will develop 3,000 h.p. at this same speed of 70 km. per hour. The Italian State Railways, also using three-phase equipment, have actually ordered 10 locomotives able to develop 2,000-2,400 h.p. at 100 km. The Author suggests that, while locomotives with a series characteristic are suitable for suburban conditions, something more approaching a shunt characteristic is required for main-line working. In this respect, three-phase locomotives would be far superior to the others, as their weight would be considerably less, being something like 30 kg. per horse-power. The lightest single-phase locomotives that have been built, at least in America, weigh more than 60 kg. per horse-power. In the United States the question which is primarily occupying the manufacturers and the railway companies is what method of drive to adopt for the motor axles; the three companies which have in service locomotives capable of hauling express trains have employed radically different methods, viz., connecting rods, a direct drive, and a drive through gear and a hollow shaft. For high speeds the first seems to be preferred. The obtaining of high-speed locomotives with total adhesion and as light as possible appears to be the vital problem of main-line traction. Two types of locomotive being built are described. One, of the American General Electric Co., for the New York Central, has eight 300-h.p. direct-drive motors on each axle. It is articulated throughout, and the single body rests on two trucks, each with two bogies. The other, being built by the Pennsylvania Railroad, more nearly follows steam practice, and has four driving axles with a very high centre of gravity, and formed in two parts, each part carrying four driving wheels and a supporting bogie. The axles of the wheels are driven through connecting rods, cranks, and intermediate shafts by a 1,000-h.p. motor. The paper concludes with a few notes on mountain railways, including the Cascade Tunnel line of the American Great Northern Railway, and it is mentioned that the Southern Pacific has just entrusted the General Electric Co. with the complete installation of electric traction on a long mountain line near Denver.

#### PETROL-ELECTRIC SYSTEMS.

M. J. B. G. DAMOISEAU, after brief reference to the Heilmann locomotives as the first "mixed" vehicles, and a few general notes, proceeded to describe some typical petrol-electric cars which have been built for railways. That of the Société Anonyme de Locomotion Electrique, built in 1904-5, and the car built about the same time by the North-Eastern Railway, were both really experimental vehicles, and were examples of pure electric transmission with control both by variation of the generator field and series-parallel connection of the motors. A battery was used for excitation and for starting the engine. The first line to be run regularly by petrol-electric cars was the Hungarian Arad-Osanaad Railway, and descriptions are given of the de Dion-Bouton and Westinghouse cars there used. These are controlled partly by variation of the speed of the engine as well as by series-parallel arrangements and field regulation. A large number of the Westinghouse cars are in use in various parts of Europe. Petrol-electric cars made by the A.E.G. and the Bergmann Companies are in use on the Prussian railways. The generating set is carried on one bogie, and the motors on the other. Variable-pressure control is used, and a battery is provided for excitation and auxiliary services. Other cars with purely electrical transmission are the large cars of the American General Electric Co., with their special stream-line bodies, a small car of the B.T.H. Co. in use on the G.W.R., and the cars equipped by Allmänna Svenska Elektriska Aktiebolaget for the Swedish State railways, and driven by Diesel engines. The Pieper mixed transmission method is next described. In this system there is a mechanical connection by a magnetic clutch between the engine and the wheels, and the extra torque required for starting, &c., is supplied by a motor taking current from a battery, which is charged by the same machine acting as a dynamo at times of light load. Finally, the Author describes the Thomas petrol-electric system (see ELECTRICAL ENGINEERING, Vol. VIII., p. 627) in which the former is transmitted partly mechanically by epicyclic gears and partly electrically. This system is in use on the South African railways. The Author dwells upon the advantages of such cars with their flexibility of operation for light traffic, and after a few words as to avoidance of fire risk, compares the different systems, preferring the purely electrical methods, in that the engine is better protected from shock and can be placed irrespective of the position of the axles to be driven, the engines need not be reversible, and for other reasons. He gives the approximate total cost of running, including capital charges, at 0.0177 to 0.0249 francs per ton kilometre, using benzol as obtainable in France. As regards "service efficiency," he quotes the case of cars in Hungary, which have run 50,000 km. without being taken out of service for repair. A list mentions 124 cars in actual use, and as regards the relative merits of petrol-electric and other systems the author concludes his Paper as follows:—"The four types of independent motor vehicles are at present: steam, accumulator petrol with mechanical transmission, and petrol-electric. Accumulator cars have, however, been abandoned, and as the petrol engine with mechanical

transmission has not been found sufficiently flexible, there remain, therefore, at present only the steam motor-car and the petrol-electric vehicle. The characteristics previously enumerated for petrol-electric cars emphasise the shortcomings of the steam motor-car, and the conclusion may therefore be drawn that if the use of independent motor vehicles continues to develop—and there is no reason why it should not—then petrol-electric motor vehicles will preponderate."

#### Discussion.

M. MAZEN opened the discussion by recapitulating some of the points in his Paper, and adding some supplementary remarks. He explained that the problem of the electrification of the suburban lines of the Ouest-Etat Railway was largely governed by the fact that the rush-hour traffic was about eight times that of the dead hours, whereas the usual ratio on suburban lines might be regarded as 3:1. The ease with which the power of each train could be varied was therefore of importance, and in consequence motor coaches have been adopted and trailers not employed; a train will consist of one, two, three, or four coaches. There are no short-radius curves to be dealt with as there are on the Métropolitain, and long coaches could be used; the bodies measure 22.36×2.93 metres on the latest trains. On the Métropolitain the speed is only from 30 to 35 km. per hour; nearly double is wanted on the Ouest-Etat, and the newest trains will have four-motor coaches, and 640 h.p. per coach. At first 2-axle bogies were used, but the latest type are 3-axle, with a geared 160 h.p. motor on the front and back axle of each bogie. This works out to 9 h.p. per ton. On the question of single-phase v. D.C., M. Mazen said that single-phase with an overhead conductor was easy for single track and light traffic, but directly there was a case of a large station with several lines of rails, the gain in using single-phase A.C. was neutralised. The London, Brighton and South Coast Railway in England must have been complicated and dear. But even in the case of ordinary double track the permanent-way engineers were opposed to overhead construction, especially in the form of two trolley wires suspended from span wires, as, in the event of an accident causing a derailment, two or three posts knocked down on either side of the track would stop the whole line, and temporary single-track working during the emergency would be impossible. At Batignolles and St. Lazare on the Ouest-Etat system there were 20 to 30 lines of track respectively. Each track must be absolutely independent of the other, and this was always possible in third-rail working.

Mr. ROGER T. SMITH spoke chiefly on Mr. Parodi's paper, which, he said, was of particular value in showing why the electrification of railways was a different problem in the United States from that in Europe. The Paper, he said, was the clearest statement of the case which he had had the pleasure of reading. For suburban lines the engineering problem of electrification had been solved, and merely the commercial problem remained. Nobody need hesitate to employ the third-rail system for suburban traffic. In the case of hilly districts, he pointed out, there was a critical gradient above which electric driving would always pay, and in spite of the work which had been done in Italy, he thought that either D.C. or single-phase was better than three-phase, owing to the series characteristic torque, and for speeds up to 31 miles per hour they were better than the steam for the same reason. M. Jullian had rightly pointed out that regenerative braking did not spoil the single-phase motor in other respects. There was, he said, an immediate future for electric traction for mineral traffic in hilly districts, and they might expect to see several examples of this in England during the next few years. The North-Eastern Railway were now taking the lead in a line to Middlesbrough, using very high-tension D.C. overhead, and in addition there would be another 3,500-volt line started in England quite soon (see ELECTRICAL ENGINEERING of April 4th, 1912, p. 179). To the curve of tractive effort in M. Parodi's paper he had added another (shown dotted in our illustration); giving the result of a test with a dynamometer car on a 4-6-0 type of locomotive drawing a passenger train from London to Plymouth (226½ miles) without a stop, at an average speed of 54 m.p.h. The train weighed 405 tons, of which the locomotive accounted for 117 (viz., 28 per cent.). At 70 m.p.h. the draw-bar h.p. was 730, and no electric locomotive had yet been built which could give this at such a speed. For general purposes, however, the actual strength of the draw-bar was the limiting factor—it was limited to 12 tons, corresponding to a train weighing 2,500 to 3,000 tons. There were in Great Britain, he said, some 500,000 private freight waggons not under the supervision of, and not made by, the railway companies; they represented a capital of some sixty million pounds sterling, and their draw-gear could not be relied upon to stand more than 12 tons.

Mr. ROBERT HAMMOND, speaking in French, offered his thanks and congratulations to the Authors of the six French Papers. It was very true, as M. Jullian had said, that the question was entirely an economic one, and he considered that it was largely dependent on works costs.

M. BOCHER spoke on M. Damoiseau's paper, and referred to the large variety of uses which existed for "electric coupling."



The discussion then stood adjourned until Friday, when it was re-opened by

M. MARIUS LATOUR, who reviewed some of the points in his Paper, and also dealt generally with the subject. There had, he said, been much discussion on the question of frequency for single-phase traction, but as the contact surface on the commutator depended on the frequency, there was no doubt that the cost of maintenance of a 25-cycle system was nearly double that of a 15-cycle system. He contended that the employment of auxiliary poles in the case of single-phase motors introduced no complication at all. On the question of weight, it was, of course, admitted that the single-phase system resulted in heavier locomotives; but one must not, he said, forget the starting point from first principles, which was that single-phase was introduced to give the advantage of a single contact wire carrying current at high tension. He regretted the dividing up of single-phase systems into two sharply divided schools of practice, and advocated a combination of the best points in all the methods. He touched briefly, but without being very sanguine, on the ultimate possibility of employing a rotary converter on a locomotive, so as to enjoy the advantage of high-tension single-phase at a comparatively high frequency on the trolley and the D.C. motor for driving, and he also referred to the mercury vapour rectifier. As to the immediate practical application of the latter, he was not very optimistic either, but he cited a case in which a 1,200-volt, 1,000-ampere mercury rectifier had been in continuous use for seven days. In connection with the controversy as to frequency, he reminded the meeting that when 15 cycles was employed for 3-phase working nobody had anything against it. This low frequency also diminished telephone disturbances, and, to minimise these, one must aim at a pure sine curve and avoidance of higher harmonics.

M. GRATZMULLER agreed that the main objections to the single-phase system were the increased weight and the increase in the surfaces of commutation. He believed that the repulsion motor might now be ruled out of court, and that the field was left to the series compensated motor. The advantage of single-phase over H.T.D.C. only amounted to 15 per cent. He referred humorously to the effective development of the single-phase system being dependent upon the proper joining up of the ideas of the designers and the experience of the engineers in the shops, and said that the problem was in fact throughout one of joining up, for one of the chief difficulties was in joining the resistance connections to the commutator. There was no doubt that the use of resistances to diminish the E.M.F. between short-circuited segments of the commutator was the correct thing, for by their means the size of the commutator could be enormously reduced. The difficulties were being overcome, and by placing the resistances in supplementary slots leading out of the main slots, and not in the main slots themselves, a satisfactory arrangement was secured without increasing the size of the armature at all. Dealing next with regenerative braking, M. Gratzmuller said that the objection had been raised that this was difficult with single-phase working, but although it might not be quite so good as with 3-phase, the difference was not serious. References to patents brought M. Gratzmuller into conflict with M. Latour, and a sharp passage of arms ensued on the former saying that he had patented, and subsequently abandoned, one of the methods adopted by M. Latour. Returning in his concluding observations to the question of contact surface at the commutator, M. Gratzmuller said that the same surface as with ordinary D.C. motors would be arrived at, nay, we were reaching it—in fact, we had already reached it, for a 420-volt Westinghouse single-phase motor had a contact surface of the same order as a 500-volt D.C. motor. The advantages of A.C. over D.C., he concluded, were regenerative braking, and the possibility of varying the speed without breaking the circuit. He had, he said, proposed and patented a transformer which could be carried on the locomotive to convert single-phase into 3-phase. A very simple method was to employ a squirrel-cage rotating transformer, and to regulate by rotating the brushes, but he did not recommend this.

The fact that M. Gratzmuller had read a Paper in favour of the H.T.D.C. system, and had shown himself an advocate of single-phase in the discussion, provoked considerable amusement.

M. PARODI, who next spoke, said that he was not an opponent of single-phase working, but was sceptical about accepting figures and statements merely given verbally during visits to inspect various lines and systems. The single-phase people, moreover, were now always talking of patents and not accomplishments.

M. GIROUZZE, of the French Post Office, referred to his system for neutralising disturbances in telegraph circuits. It was, however, merely for the purpose of dealing with the fundamental wave, and did not remove the noises due to harmonics which are so disturbing to telephone lines.

Mr. SLINGO (Engineer-in-Chief of the British Post Office) said that it would be a serious thing if he woke up one morning and found that the 750 million pounds worth of telegraph and telephone lines for which he was responsible were useless owing to disturbances from electric railways. The total power used for the latter in Great Britain was still relatively small, and it must not be forgotten that the British telegraph circuits would be particularly liable to disturbance owing to the high speeds at

which they were worked. The risk to railway-signalling circuits, which are worked with earth return, was also great, and he instanced a case between Dublin and Howth in which the signalling wires had had to be doubled on this account. In London the trouble had been got over incidentally and not intentionally by the conversion of the telephone system to common battery working, which had the effect of increasing largely the resistance of the circuits and the voltage applied. Inductive effect due to D.C. traction had thus been effaced. The problem, he said, seemed to be how to divide the earth between the telegraph and traction engineer—a joke which was equally appreciated by the French and English members. In one test he had made, he had cut away the lead sheath of a cable for a few inches, and had bridged it across with an ammeter; several amperes flowed continuously, and the fluctuations in the load were clearly seen. With single-phase working, if the harmonics could be avoided, there would be no difficulty in overcoming the other effects. He had made tests on a telegraph circuit 20 ft. away from a 7,000-volt electric railway line, and running parallel to it, and actually measured a potential of 600 volts. By placing an earthed wire parallel to it and between the railway and the telegraph line, this voltage had been reduced to 50. In another case he had erected a loop of telephone line, 3 miles long and as perfectly revolved as possible, parallel to a single-phase traction circuit, and the telephone connected to it had "absolutely screamed." If this occurred when every precaution had been taken, it seemed impossible to avoid serious effects on ordinary circuits in practice. Another experience he had had was that of a telephone wire having broken off, and the grass upon which the end fell had been set on fire by the sparking occasioned by the induced current.

M. ESBRAN then read a long communication, insisting particularly on the point that D.C. working must frequently be far less efficient than single-phase when the whole system from power-house to train was considered.

M. MAZEN, who is one of the engineers-in-chief of the Ouest-Etat railway, and is responsible for the electrical equipment, speaking again, said he wished to sum up the position from the point of view of the engineer who had to work the line. Single-phase working meant extra weight, and not only this, it meant that the apparatus took up more room on the motor coach, which was far more important. This was one of the reasons why he had continued to use D.C. He was not an opponent of single-phase traction; in fact, he had been one of the first to put in a single-phase equipment. The railway engineer must, however, take things as they are, and not as they would be in five or six years' time. The French railway system, taken as a whole, might be considered as a network of squares, each side of which was from 15 to 50 km. long. It was recognised that the correct policy for the railways was to obtain their current from an electricity works and not to generate it themselves—[M. Parodi concurred]—and the current offered to them was the one which was most useful for general application for the majority of purposes, viz., three-phase, 50-cycle. They had practically no option but to place sub-stations at the junctions of the network of squares, and under these conditions, and also after having carefully considered the London, Brighton & South Coast Railway system (with which company the Ouest-Etat railway was, of course, in close touch), they had come to the conclusion that single-phase working would not be so suitable for the conditions of their own railway as third-rail D.C.

Mr. DUDDELL (who occupied the chair at the Friday meeting) then thanked the speakers for their interesting communications. Speaking in French, he recalled the historical night in the early days of the single-phase 10,000-volt transmission from Deptford to London, when, owing to a cable breakdown, they had run for a night with earth return. The next morning they read in the newspapers of the remarkable "meteorological phenomenon" which had occurred during the night, and had interrupted all the telegraph circuits as far as Rome.

## Two Large Power Stations.

On Wednesday afternoon two of the large Paris power-houses were visited—the enormous station at St. Denis, and the so-called "Triphasé" at Asnières. Between them they supply a great part of the traction and lighting load of Paris, including the electric railways. Space will not permit of a complete description of these stations, but some of the interesting features may be mentioned. Both take their condensing water from the Seine; a feature of both is that some of the chimneys (two at St. Denis and one at Asnières) are of reinforced concrete; and both supply two-phase as well as three-phase current. The Seine water is comparatively clean compared to that of the Thames, and for filtering it a series of screens are used from 30 to 10 mm. mesh, which are simply raised up and cleaned by hand twice daily. The reinforced concrete chimneys are very elegant in appearance, and we were informed were 20 per cent. cheaper than brick chimneys, besides being quicker to erect.

At St. Denis there are 56 B. & W. marine-type boilers, and eleven Brown Boveri turbo-alternators with an aggregate capacity at normal rating of about 73,000 kw., and capable of dealing with heavy overloads. By the courtesy of the Compagnie Electro-mechanique, who supplied the Brown Boveri plant in

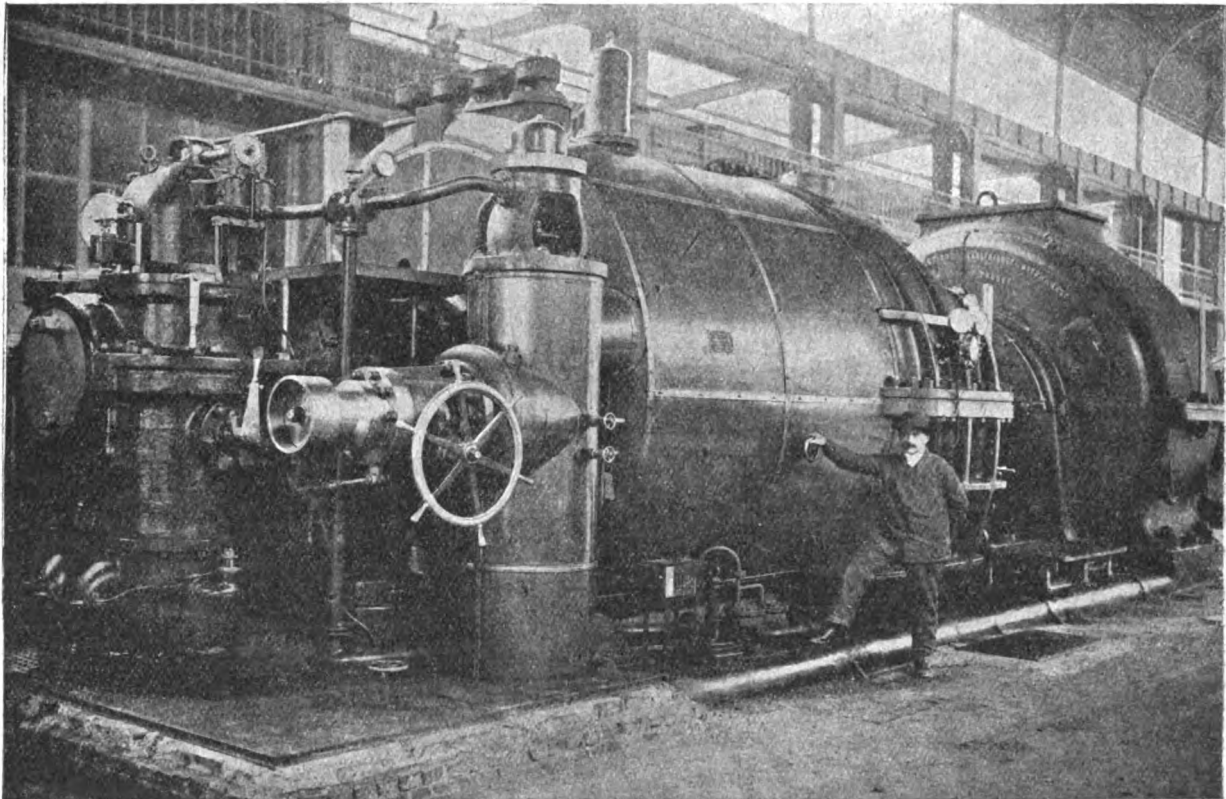
question, we are able to illustrate the largest of the generating sets below; it is a three-phase machine with a normal capacity of 11,000 kw. and an overload capacity of 15,000 kw. for half an hour, runs at 750 r.p.m., and generates at 10,250 volts, 25 cycles per sec. The two-phase pressure at St. Denis is 12,300 at the frequency of 41½ cycles (a legacy from earlier days). At this station an interesting bye-product is manufactured, viz., bricks for building purposes, which are made from the ashes. They have, we are informed, a strength of 140 kg. per sq. cm. The colour is dark grey, and there is said to be no difficulty in selling them at a good price. The brick-making plant includes four presses with a total possible output of 50,000 bricks per day. One thing that impressed the visitors at St. Denis was the exceedingly small number of workmen visible; the station seemed almost to run by itself. The total number of men employed there, we were told, is 85, including the repairing staff. The winter peak load at St. Denis is about 50,000 kw., and at Asnières about 25,000.

At Asnières the generating plant is partly driven by Corliss engines and partly by steam turbines, and is all made by the

station of the Gaumont synchronised cinematograph and gramophone.

#### Power Transmission on the Thury System.

On Thursday a Paper on this subject, by Mr. J. S. Highfield, was discussed. It is the third Paper which Mr. Highfield has written dealing with H.T.D.C. working, and for a description of the plant and system our readers may refer to *ELECTRICAL ENGINEERING* of June 13th, 1912. Mr. Highfield insisted that the H.T.D.C. series system should not be treated as a rival of the A.C. parallel system. When existing methods and standard apparatus offered a satisfactory commercial and technical solution to an engineering problem, there was no reason to depart from existing practice; but in problems where the cost of the transmission line was the most important element the continuous-current series system offered advantages. Among other uses for the constant-current system were those in which variable-speed motors were required, as, for instance, in mining work, as the constant-current series machine was capable of running at variable speeds with high efficiency and without



THE 11,000-KW. BROWN BOVERI TURBO-ALTERNATOR AT ST. DENIS.

Société Alsacienne, of Belfort. The two-phase plant is the more modern, but has, of necessity, the same unusual frequency of 41½ cycles per sec., as that at St. Denis. A 10,000-kw. two-phase turbo-alternator is being erected—probably the only machine of this size with this odd frequency. In this station we were shown two interesting two-phase-three-phase 1,500-kw. motor generators, a feature of which is that the stators can be rotated (by a small motor in the pit controlled from the switchboard) through an angle of about 5 degrees. This is rendered necessary in order that the machines can convert either from two-phase to three-phase, or *vice versa*; both are, of course, synchronous machines, and it is therefore necessary to have a means of adjusting the relative phases independently to synchronise with the other two- and three-phase plant running.

#### The Official Banquet.

Having feasted their guests with six of the best Papers ever read before their Society in the morning, and an inspection of one of the finest Continental power-houses in the afternoon, our hosts completed the day's programme in the evening on Wednesday by another feast, which demonstrated that the French *chef-de-cuisine* can still outdistance his imitators in any other country. M. Berthelot proposed our healths in an excellent after-dinner speech, in the course of which he alluded to the fact that one of the distinguished guests was Prof. Carey Foster, who, as President, had represented the Institution of Electrical Engineers in Paris at their first official visit in 1889, and Mr. Duddell responded with the toast of the Société Internationale des Electriciens. An entertainment followed, which included recitations by Madame Bartel, of the Comédie Française, dancers from the Opéra, and an interesting demon-

strated complicated regulators. Air compressors, for instance, could be driven with constant-current series motors without any regulating gear, for as the pressure rises the motor will slow down, and by giving the brushes the correct lead the motor can be arranged to stop when the pressure exceeds any predetermined limit. The only automatic safety devices used are a short-circuit switch, which closes automatically if the generators reverse their direction of rotation, due to a breakdown of the prime mover, and a slipping coupling, so that if a violent short circuit should pull up the dynamo, the flywheel effect of the moving parts of the steam engine would not get further than the coupling. The current is kept constant by a regulator, which may either vary the speed of the prime mover or the position of the brushes. The latter arrangement is used on Mr. Highfield's system at the Metropolitan Electric Supply Company's station, and was described in the article above alluded to. On the H.T.D.C. area supplied by this station, two single cables are used laid in cast-iron pipes. At a pressure of 100,000 volts they will carry 12,000 kw. In addition to the cables, provision is made for working with an earth return, and for considerable periods the whole of the power has been supplied from a single cable and the earth, so that the author considers that he has practically a duplicate 12,000-kw. line system. Needless to say, this maximum output has not been yet reached by a long way in the area in question.

The Author pointed out that it is easy to meet an increasing load by starting up new stations on the same line, and that this could be done without increasing the maximum line pressure by placing the additional stations at proper points in relation to the sub-stations. This has been done on the Chaux de Fonds system, which was started in 1896 with one

station, and as the load increased two more were erected. On this system the line current is 150 amperes, the total length of circuit 32.3 miles; there are seven machine units with a total output of 1,890 kw., and the total line pressure is 12,600 volts. More recently a similar method has been adopted on the Moutier-Lyons system. The difficulties of running stations in parallel are thus avoided, and the uniform section of cable renders the series system more flexible in this respect than the parallel.

Another advantage put forward by Mr. Highfield is that difficulties due to cable capacity and inductance are eliminated, and he contends that as a higher pressure can be used with continuous current than with A.C., the energy can be transmitted to a greater distance. In the case of overhead lines the author pointed out that the cost of an overhead three-phase line at even the same pressure is greater than that of a series continuous-current line, and for transmitting up to, say, 30,000 kw. not more than four wires will be required working two in parallel, instead of six wires for a similar three-phase line, so that there would be some saving in insulators. The weight of copper would in most cases, he contends, be less, as the regulation need not be so close, and the loss can be calculated purely on a commercial basis without reference to technical difficulties. The Paper included a list of the more important schemes in which the Thury system is employed, and a table showing the cost of overhead lines, bearing out his contention that the H.T.D.C. system is cheaper. In some instances the cost per kw.-mile of overhead line comes out greater than the cost of the underground continuous-current cable system.

In the power station Mr. Highfield considers that the maximum size of a generator on the H.T.D.C. system may be taken as 1,200 to 1,500 kw., so that to make up a large power unit it is necessary to couple two or more generators to a single prime mover. Line losses, the author admitted, would usually be higher than with the constant pressure system, and the A.C. system must also be given the advantage as regards the cost of the sub-stations, except in those cases in which the frequency of the transmission line is different from that required in the distributing circuits. In such a case as that which he had had to consider, in which a load of about 7,000 kilowatts had to be supplied at various points in a scattered district involving a length of approximately 100 miles by underground mains, and in which the cost of energy was comparatively small, the series system was the only one commercially possible.

#### DISCUSSION.

M. THURY said that he would commence by making a sort of confession of faith. He would admit that the applications of the H.T.D.C. system were limited. Constant potential remained the system for distribution, and A.C. transmission suited this in most cases. The series system came in for very long-distance transmission and when underground cables were desirable. An overhead line was dear, and its maintenance expensive when pressures were high. For distribution the series system was limited to cases in which there were only a few consumers of large size. It also enabled problems to be solved which would be impossible with A.C.; for instance, in crossing a small stretch of sea in an American installation, it had been adopted because the cable-makers would only give a guarantee in the case of single cable. Tests at Lyons and also in England showed that D.C. cables absorbed a negligible amount of energy, and this was confirmed by its being possible to test them with a small electrostatic machine. At Lyons it was found that a cable with only three millimetres thickness of insulation would stand 300,000 volts. He placed the limiting size of generator at a higher figure than Mr. Highfield, and referred to a scheme which he had recently got out involving the use of 5,000 kw. divided between two armatures. In conclusion, he thanked Mr. Highfield and stated that several of the accessory apparatus (some of which was described in the paper) and various improvements were largely due to Mr. Highfield.

In answer to a question by M. CLAUDE, M. THURY said that there were no electrolytic troubles in the cables, as by the process of manufacture there was no trace of moisture in them.

M. BOISSONOS described a special case in which several generating stations were wanted, and although it was possible to run them in parallel, yet it was deemed advisable to make use of the H.T.D.C. system. The arrangement decided upon ultimately was to have two lots of stations, three high-tension D.C., and three three-phase interconnected and working on to the same distributing network.

In reply to a question as to whether there had been electrolytic troubles owing to the earth return, Mr. HIGHFIELD said that they had been working in this manner for four months continuously, and there had been no interference with the track signalling on the Great Western Railway.

On the St. Maurice and Lausanne system, M. THURY said that iron earth-plates were used which should theoretically have been destroyed by electrolysis in less than two months, but which worked as well after a year as they did on the first day, owing to a protective film of oxide of iron having been formed. No electrolysis on pipes had been noticed, but he admitted that electrolysis is to be feared, and it was the first thing to be thought about in planning a system. If necessary one had to go one or two kilometres to find a place for an earth.

Mr. J. F. C. SNELL said that while simplifying the distribution system, the method complicated the generating system. The small size of units was one of the difficulties. On the question of cost he referred to a proposal made some time ago for supplying power for London from a station about 100 miles distant, viz., half-way to the coal fields. The cable would have cost £10 per kw. excluding wayleaves, and this represented 15s. per kw. demanded per annum. Assuming that the load-factor was equivalent to 2,628 units per annum per kw. demanded, this was equivalent to a charge of 0.07d. per unit for transmission. If the more favourable site of the generating station enabled the cost of the coal to be halved, so that about 7s. per ton was saved, the saving in annual costs would be 0.099d. per unit, and the extra complication would hardly be justified.

Mr. K. EDGUMBE, who spoke in French, said that on one occasion Mr. Mordey had said that an advantage of the A.C. system was that it was impossible to employ accumulators, and he gathered that Mr. Highfield thought one advantage of the H.T.D.C. system was that it was impossible to employ automatic circuit-breakers. On the other hand, it seemed that one of the objects of coupling two cables, as Mr. Highfield did, might be that one could be cut out automatically in case of a fault.

Mr. F. C. RAPHAEL asked if M. Thury could explain how it would be possible to continue the supply to a single line system if a serious earth occurred on the line, as might happen in the case of an underground cable. So far as he could see, the automatic regulator in the station would continue to maintain the current sent to the line at its regular constant value, no matter how large a proportion of it was leaking at the fault, and the result would be an enormous drop in pressure at the sub-stations and consumers connections.

M. THURY said he found it difficult to answer either Mr. Edgumbe or Mr. Raphael, as he had had practically no experience with faults on a line. He only recalled two cases in which he had had to shut down the generating station in consequence of them. He mentioned one other case in which a fault had been sufficient to set fire to the pole and burn it through, thus re-insulating the line, as the upper pole remained suspended in the air.

Mr. ROGER SMITH said that along either side of a railway there was a strip of land, but there was frequently a difficulty in carrying a three-phase line along it owing to its narrowness. He pointed out that 1,200 kw., the largest size of unit mentioned by Mr. Highfield, was about the power needed for an average-size goods train, and that this would be a suitable unit for sub-station motor-generators on a railway system. Mr. Highfield's earth return current, he said, had been flowing for months under the Great Western Railway, where earth returns were used for the signalling, and where telephones were worked at a pressure of only two volts, and no trouble had been experienced. He was impressed by the simplicity of the sub-station arrangements. Adjoining some of the sub-stations there were allotments, so well kept that he thought the attendants were able to work more in the garden than in the sub-station.

Mr. B. M. JENKIN said that the great advantage in this system was that the cable was all of one section, which facilitated extensions. He was also struck by the great simplicity of the switchboard, for the switching off of large current was becoming a serious difficulty.

M. MAURICE LEBLANC then read a Paper on "Three-Phase Current." This was a long review of present practice and recent developments, and was read from manuscript. The Paper is reserved for publication in the Bulletin of the Société Internationale des Electriciens. There was no discussion.

#### Visit to the Tramway and Railway Depots, &c.

The dépôt of the Compagnie Générale des Omnibus de Paris is far more than an omnibus dépôt and repair shop; the company also runs the tramways in Paris, and manufactures its own cars. The dépôt and works cover an area of about 96,000 sq. metres, and employ 2,000 people. The actual manufacturing part of the works is extremely busy at present, as the existing electric tramway system is being rapidly developed. In passing, we may mention that in some cases trains of three cars are to be used in the rush hours, the middle car a trailer, and the first and last motor-cars. Another interesting point mentioned to us is that large use is being made of aluminium feeders for the tramways. After a visit to these shops, every department of which was shown, the party proceeded to the dépôt and shops of the Métropolitain railway, then to those of the Nord-Sud Railway, and finally to one of the Nord-Sud sub-stations. The Nord-Sud Railway runs in shallow tunnel from north to south of Paris, connecting with the Métropolitain at a few stations. Its equipment differs from the Métropolitain in being on the three-wire system, partly three-rail and partly trolley. The overhead wire is connected to one side of the three-wire network, and the third rail to the other. Two four-motor cars are used, one at the front, and one at the back of each train. The front one takes current from the trolley wire through a special form of collector, and the back one from the third rail, so that the two sides of the network are balanced by each train.

### The Eiffel Tower and its Time Signals.

On Thursday M. Eiffel held a reception on the Eiffel tower; the wireless installation and time-signalling system there was shown to the visitors, and on Saturday a lecture on the latter was given by Commandant FERRIÉ, who was responsible for the installation. In the wireless installation itself a recent innovation is an alteration in the form of spark gap employed. Instead of the spark occurring between two zinc rollers, the discharge is now made between a copper tube and copper plate, and air is forced through the tube by a blower.

The Eiffel tower wireless installation is chiefly used for naval and military purposes, for the time signals, and to send reports as to the force of the wind, which are useful for aeronautical purposes in the northern half of France. Reports are received from Reykiavik (Iceland), Valentia (Ireland), Ouessant (France), Corunna (Spain), Horta (Azores), and St. Pierre et Miquelon (North America), and these are sent out from the tower daily after the time-signals have been sent.

The international wireless time-signal, chiefly of use to enable ships to check their chronometers for observations of longitude, but also available for business purposes and the general public, is sent out twice daily: three signals at 10.45, 10.47, and 10.49 a.m., and three at 11.45, 11.47, and 11.49 p.m. At one minute before these times a series of dashes are sent out by a simple Morse hand key for 50 seconds as a warning signal, and then, after an interval of 10 seconds, there is a single dot, indicating the exact time.

A special clock (which is compared with the master clock in the observatory a short time before the sending out of the signals) is provided with an electric contact which is closed automatically for a quarter of a second to give the final time-signal. This contact is connected by an underground cable to a relay controlling the transmitter in the wireless station at the Eiffel Tower. The lag due to the mechanical and electrical inertia of the various apparatus is carefully measured periodically, and allowance is made for it. From July 1st onwards there will be some alteration in the times for sending out these signals, and also in the character and sequence of the warning signals. The times at which the exact time-signal will be sent will then be 10 a.m. and midnight.

It may be mentioned that considerable use is made of these time-signals by ordinary clock-makers in Paris. In view of the great power of the Eiffel Tower signals, only the simplest form of receiving apparatus and aerial are necessary; in fact, the telephone wire or even gutters, or the iron balustrade of a balcony, are found sufficient.

Before the ordinary night signals, the Eiffel Tower sends out a series of 180 short dots regularly spaced at one second less about 1.50th of a second apart. In each series the 60th and 120th dots are omitted in order to facilitate counting by the observers. This series of dots is received by the wireless installations of the Paris Observatory and by other observatories, where the operator listens simultaneously to the beats of another clock or seconds chronometer. The two sets of beats and dots constitute an "acoustic vernier." By noting the moment of coincidence and the previous number of the "wireless" beats, even greater accuracy of observation is possible than that of the astronomical observations of time themselves.

### The Neon Light.

Another lecture, given on Saturday morning, was on luminescent neon tubes, by M. Georges Claude. An electrical discharge passes easily through neon; the ratio of the voltages required for a discharge across the same distance in air and neon respectively is 100:15. Unfortunately, however, the neon spectrum contains no blue lines at all. Another difficulty is that impurities escaping from the electrodes will prevent the neon from being set into luminous vibration. M. Claude overcomes this latter trouble by using Dewar's method of purifying neon by means of charcoal cooled by liquid air, which he applies in the tube itself to remove the impurities. It is also necessary to give the electrodes a large surface to prevent any volatilisation of them, as otherwise the neon tube has a short life. Taking these precautions, M. Claude has succeeded in obtaining a life beyond that of incandescent lamps. Compared with the Moore tube, the voltage required is only about one-third, and the candle-power is greater. Moreover, the efficiency is better, being 0.6 watt per candle instead of 1.7.

To overcome the red light, neon tubes and mercury vapour tubes are used in conjunction. Here another difficulty occurs, namely, that while neon tubes require high-tension alternating current, Cooper-Hewitt tubes require low-tension continuous current. In place of ordinary mercury vapour, M. Claude uses in his "correcting" tubes neon and some mercury. He did not explain why this should render them suitable for alternating current, but he asserted that they could be used next to the neon tubes, and with the same current, and the combination would then give an illumination of an agreeable colour at 0.8 to 0.9 watt per candle.

### Levelling the Load Curve of Telephone Operators.

Mr. Slingo's Paper on "Application of Mechanical Devices to the Assistance of Manual Operating in Telephone Exchanges" was also taken on Saturday. A system of traffic distributors is being put in at the Paddington exchange in

London for the purpose of levelling the load of the operators at the subscribers' boards. In ordinary circumstances the operator, even during the busy hour, must have a fairly large percentage of unoccupied time, in order that she may be able to cope with the traffic during the short rush periods, and, of course, during the slack hours the load efficiency per position is considerably reduced. The object of the traffic distributor is to place a subscriber automatically into connection with any idle operator directly he lifts his receiver. In the experimental arrangement which is being installed at Paddington, the existing lamps and jacks individual to the subscribers on each position are being replaced by others, say from ten to twenty in number, common to the traffic distributing apparatus. Each position will only be able to receive one call at a time, i.e., whilst an operator is answering one call, one more glow can be received, and any further traffic will be automatically passed to other positions. A difficulty, of course, arises if several types of service are in force at the same exchange, and, to meet this, a separate section of the traffic-distributing apparatus will have to be reserved for each type of service. If the scheme proves satisfactory, it is proposed, in future installations, to arrange that the traffic distributor will pass the call direct to the answering side of the cord circuit, so that no answering jack will be required.

Much difficulty has been experienced during recent years in large cities owing to the poor transmission conditions involved when several underground call-wires are connected to the same "B," or junction, position. It is proposed to instal experimentally a simple automatic call-seeking device which will enable one call-wire at a time to have access to the "B" operator. It will be arranged so that the "B" operator can trip the apparatus in order that only one call can be passed by a particular exchange before the other exchanges working to the same position have each had an opportunity of passing a call. The "B" operator will be made aware of the necessity for using this tripping apparatus by the glowing of a lamp on her position, which will indicate the fact that an outlying exchange wishes to pass a call. By giving improved transmission it is expected that quicker operating will result, with comparative immunity from "wrong numbers."

An automatic call-wire selecting equipment has been installed at the "Central" exchange in London for the purpose of facilitating working on the call wire between the "A" and "B" boards. The object is to avoid confusion during busy periods owing to one operator interrupting another, and also to prevent the delay occasionally experienced by the "A" operator in finding a slack call wire. The selecting device will select and isolate a call wire when one is required by an "A" operator. There are ten call wires in the group affected, and they were, before the introduction of the new conditions, operated from ten call-wire keys, the circuits of which were multiplied over 160 "A" positions. When the selecting equipment was introduced, the ten keys per position were replaced by one key per position. Each operator is given a selector, which rotates when she depresses her call-wire key, and the rotation continues until the wipers of the selector find an idle "B" operator, when the "A" operator is able to pass a call. Thus, when the "A" operator depresses her call-wire key, she is automatically connected to a disengaged "B" operator, and she hears a click in her receiver as soon as the disengaged call wire is obtained. Only one "A" operator can obtain connection with the same "B" operator at the same time. A lamp placed on the chief supervisor's desk glows when all the accessible "B" positions are simultaneously engaged with traffic passing over the call wires. This indicates that there must be delay owing to the "A" operators having to wait to find a free "B" operator, and that therefore additional "B" positions should be staffed to cope with the traffic.

The equipments described above were installed for the British Post Office by Siemens Bros. and Co., Ltd.

Mr. G. H. Nash (Chief Engineer of the Western Electric Co.) alluded to the difficulty of differentiating between the different kinds of service mentioned by Mr. Slingo in the first part of his paper, as, of course, it is an inherent property of the system that the operator does not know who is the calling subscriber. To make provision for this, he proposes that a lamp board should be installed on a wall in the exchange clearly visible, upon which the necessary information would be automatically lighted up. In addition to the advantages indicated by Mr. Slingo, Mr. Nash pointed out that the operator should save about one second per call when the traffic distributor is employed, and that, in consequence, the equipment of the operator's position might be increased by three or four cord circuits. The next step would be, of course, to wipe out the multiple altogether.

This closed the business part of the meeting. On Saturday afternoon an excursion was made to Versailles, the Trianon, and the Buc aerodrome, and the more energetic members of the party were also enabled to inspect the new electrical carriages of the Ouest-Etat Railway—already referred to in M. Mazen's Paper and remarks in the earlier part of our report—on the way back. On Friday afternoon there was also a most enjoyable excursion to Chantilly.



# QUESTIONS AND ANSWERS BY PRACTICAL MEN

## RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

## QUESTION No. 1,340.

Please show how an ordinary incandescent lamp could be connected to a 25-h.p., 220-volt, compound-wound, D.C. motor circuit, to act as a signal at a distant point, in the event of the motor ceasing to run by any cause.—"SIGNAL."  
(Replies must be received not later than first post June 5th.)

## ANSWERS TO No. 1,339.

From an E.H.T. three-phase supply, with static transformers, three phase, six-phase primary delta connected, secondary star connected, it is required to take a large amount of power—single-phase L.T. and H.T.—without unbalancing the three-phase supply. What is the best way to do this, and is it possible without using rotating machinery? Also, could a small amount of single-phase power be taken without using rotating machinery, and, if so, how much? What is the effect of unbalancing a three-phase circuit?—"TRANSFORMER."

The first award (10s.) is made to "ALPH" for the following reply:—

Various schemes have been proposed to give single-phase power from a three-phase supply without unbalancing the latter, but since the total power supplied by a balanced three-phase circuit is steady, while that taken by a single-phase circuit varies from zero to a maximum twice in every cycle, it is evident that the apparatus used to transform from one to the other must be capable of storing energy during that part of the cycle when the single-phase power is less than the mean value, and giving up the stored energy when the single-phase power required is above the mean value. Since a transformer is incapable of storing energy and equalising the demand in this manner, it is impossible to draw single-phase power from a three-phase circuit without unbalancing the latter, by any system of transformer connections. If a large amount of single-phase power is required, it will be necessary to instal a motor-generator set to avoid serious unbalancing, and the best and cheapest arrangement would be a squirrel-cage induction motor wound (if possible) for the full supply voltage, driving a single-phase generator wound for the required H.T. single-phase voltage, and stepping down to the L.T. single-phase voltage by means of static transformers where required. If the bulk of the single-phase demand is L.T., it might be preferable to use a three-unit set, consisting of an induction motor driving two generators, one for each voltage, or even to generate all the single-phase power at the lower tension, and step up to H.T. where required, if the amount of H.T. power required is so small that the extra cost of the cables to carry the heavier current is negligible. If approximately the same amount of power is required, H.T. and L.T., the cheapest plan would be to wind the generator as a two-phase four-wire machine, winding one phase for each voltage. This would have the disadvantage of not permitting independent voltage regulation on the two circuits. Without further particulars of the maximum single-phase demand, the capacity of the power station, &c., it is impossible to say whether a motor-generator set will be required. The effect of unbalancing a three-phase circuit is that the phase voltages are no longer equal and 120° apart as they are in a balanced circuit. The neutral is thus displaced, and, under certain conditions, heavy circulating currents will be induced. The regulation and operation of the generators and other apparatus connected to the line will also be adversely affected, while, since the single-

phase current will not be equally distributed between the different phase windings of the generators, &c., local heating in the coils carrying most current will become excessive before the machines as a whole are carrying their full rated load. A small amount of single-phase power can be taken from the line without causing trouble, but the exact amount can only be determined by careful consideration of the circumstances of the particular case, and it is impossible to give any general figure which would be of practical use. Since both H.T. and L.T. single-phase power are required, in this case it would seem to be possible to subdivide the single-phase supply into two or possibly three groups, connecting each to a different phase of the three-phase supply. In this way the maximum unbalanced demand on any one phase would be only a fraction of the total single-phase load, and this would only occur when one section was running alone. When all the sections were running, the load would be largely balanced. In any case, if it is decided to take off the single-phase supply by means of transformers, the best connection is undoubtedly the simple one of a single-phase transformer connected across two of the supply lines. This has the great advantage that the whole of the transformer capacity is utilised, i.e., if the single-phase current required is  $I$  at a voltage  $E$ , the K.V.A. rating of the transformer is  $E \times I$ . In all the other schemes which have been proposed, the capacity of the transformers required is greater than this (up to twice as much in some cases). The capacity of the leads between generator and transformer is no greater in this scheme than in any other, and is less than in some, while the heating of the generator also is no worse than in any of the other schemes. In fact, no scheme of connections has yet been devised which has advantages to justify its adoption in place of the simple single-phase transformer, with the possible exception of a method recently published in the technical press, (see ELECTRICAL ENGINEERING, Vol. VIII., p. 448, August 8th, 1912), which claims to give single-phase current of triple frequency without unbalancing the three-phase supply. The writer is not aware, however, that this method has been developed on a commercial scale, and in any case it would hardly appear to be suitable for supplying a large amount of power, since it is based upon distorting the wave shape by using transformers with highly saturated cores, and utilising the third harmonic thus produced. It may be mentioned in passing that in a three-phase generator which is required to supply some single-phase current, the active material is used to rather more advantage if the machine is delta-connected than if it is Y-connected. In the former case one phase carries two-thirds of the single-phase current, and the other two phases in series carry one-third. In the latter case two of the phases carry the full single-phase current, and the third phase carries none. The unbalancing and local heating is obviously less in the case of the delta-connected machine.

The second award (5s.) is made to E. B. Pansey, who writes as follows:—

Two methods of connecting up the three-phase to six-phase transformers so as to obtain a single-phase supply without

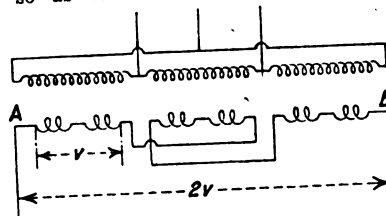


Fig. 1.

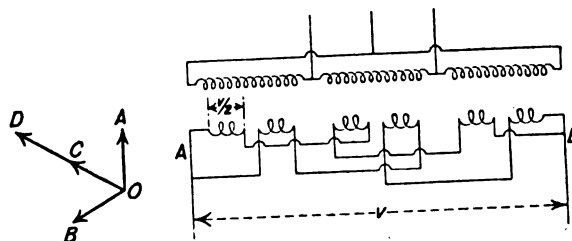


Fig. 2.

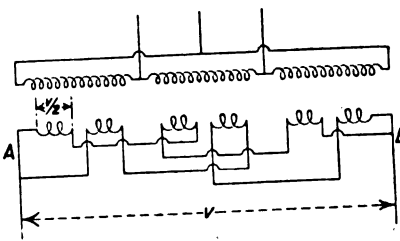


Fig. 3.

unbalancing the three-phase system are shown in the accompanying diagrams. In Fig. 1 the two halves of each phase are connected in series, so as to convert the six-phase secondary into a three-phase one. The three phases are connected up

somewhat similarly to a delta connection, but that one phase is reversed and the delta is left open. From the open ends of the delta, A, B, a single-phase supply may be taken. If the volts per phase of the secondary be called  $v$ , the voltage between A and B will be  $2v$ . This is shown in the vector diagram, Fig. 2. In this diagram OA, OB, and OC represent to scale the volts per phase of the secondary, OC being the voltage of the reversed phase. It will be found that the resultant of OA and OB will coincide with OC; therefore if OC be produced to D, making CD equal to OC, OD will be the resultant of the three vectors, and it will represent to scale the voltage between A and B. Therefore the voltage between A and B will be twice that of each phase. In Fig. 3 a similar arrangement is shown to Fig. 1, but in this case the halves of the secondaries are connected together in parallel instead of in series. The effect of this is that the volts on the single-phase mains are half what they were in the former case. Otherwise the action is the same as in the first case. Should neither of these arrangements give the desired voltage, a phase-changer must be used, say, a three-phase motor driving a single-phase generator. Another way would be to rewind the present transformers so as to get the required ratio. A third way would be to use a second transformer, the primary of which would be connected to the secondary of the existing one. Single-phase could be taken from one phase of the three-phase system. The capacity of each phase is fixed, independently of the balance of the system; and one phase could be loaded right up, even if the others carried no load whatever. The effect of doing this would be to cause an extra drop of volts in the heavily loaded phase; and also in the others, if the load is inductive, due to the demagnetising effect of a lagging current on the generators. The efficiency and capacity of the system would also be reduced in proportion to the amount of out-of-balance load.

### A NEW METHOD OF OBSCURING LAMPS

A NEW lamp obscurer has recently been placed on the market by Siemens Bros. Dynamo Works, Ltd., incandescent lamp and fittings department, Tyssen Street, Dalston, N.E. Hitherto the only method of obscuring lamps apart from the use of varnishes was by means of sand blasting, a process which is somewhat expensive, and in which breakages are likely to occur. The Siemens obscurer is a fluid which etches the glass leaving an even matt surface. Its application is extremely simple, the acid being simply poured into a container sufficiently large to take the lamp or any glass article it is desired to obscure. The surface of the glass should, in the first place, be dusted to ensure that it is free from dirt and grease, and then immersed in the acid for a period of from four to ten seconds. It has then only to drain for about a minute, and afterwards thoroughly washed to remove all traces of milky film from the glass. It can then be dried off with a clean cloth and the operation is complete. Heating is not at all necessary, either in the case of the article to be obscured or of the obscurer. Neither is it necessary to place the lamps on circuit during the operation. From a sample piece of glass obscured by the process we can bear witness as to the fineness and evenness of the effect. The fluid is supplied in sealed kegs or earthenware jars at 28s. per gallon or 7s. 6d. per quart.

### CATALOGUES, PAMPHLETS, &c., RECEIVED

**FANS.**—The small energy consumption combined with the low prices at which electric fans are now obtainable should enable everyone to provide a cooling breeze when nature is at fault, as has been the case recently. A special supplementary list of table, oscillating, ceiling, and porthole fans for D.C. or A.C. is now being circulated by Scholey & Co., Ltd. (151 Queen Victoria Street, E.C.). To increase further the air displacement, we note that Pitters' Patent Multiblades can be fitted to several of the designs at a slight extra cost.

*Readers desiring copies of catalogues or pamphlets should apply to the firms in question, referring to the notice in "Electrical Engineering."*

**TELEPHONES.**—A neat folding card from the Sterling Telephone & Electric Co., Ltd. (200 Upper Thames Street, E.C.) describes their "Ferro-case" battery ringing telephones.

**INSULATION TESTERS.**—The Electrical Engineering & Equipment Co., Ltd. (109-111 New Oxford Street), send us some particulars of the latest form of their "Mego-meter" insulation testing set with self-contained generator. This apparatus embodies various electrical and mechanical improvements, but is

in its essentials the same instrument which was described in *ELECTRICAL ENGINEERING*, Feb. 22nd, 1912, page 83.

**GEARING.**—An illustrated pamphlet from the Power Plant Co., Ltd. (West Drayton, Middlesex), gives particulars of a combined driving, starting, and roll-turning gear for cold rolls. The main gear is of the double helical type, and a helical back gear is provided which is used when starting or for roll turning, but disengages automatically when the through drive from the motor is put into action.

### WATER-TIGHT GLANDS FOR BULKHEADS

THE numerous cables, telephone, signalling, and other wires which have to pass through bulkheads on warships and other vessels demand glands which, while preventing the passage of water, will not injure the insulation of the cables, &c. A new method has been designed by Mr. T. Harden, and has been approved and adopted by the Admiralty, and which, by the courtesy of The Metal Jointing Co., Ltd., of Adelphi House, W.C., we are able to describe. By this system it becomes possible to dispense entirely with packing, and to relieve all pressure from the lead sheathing, which is ill-adapted to stand it. A gland consisting of a cup and back nuts is used, which bear upon a hemisphere of lead cast on to the lead covering of the cable. In the case of the larger cables, this cup and nut form the actual mould, and the lead is cast on in place. The fitting is shown in Fig. 1. This casting on is rendered possible without any special precautions by covering the cable first with the Company's special alloy used in all their metal jointing processes, and called "Amalgaline." The cable having been fixed in position—rove through the glands and bulkheads—a strip of "Amalgaline" is wrapped round the lead covering of the cable on the part which enters the gland, the back nut is

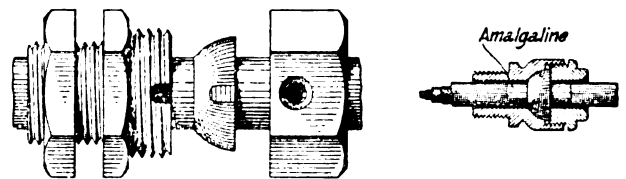


FIG. 1.—BULKHEAD FITTING WITH CABLE DRAWN OUT TO SHOW PIECE CAST ON. FIG. 2.—SMALLER GLAND FOR SWITCH-BOXES, &c.

screwed up until the pouring holes are vertical, molten lead is poured in, and a half-sphere or ball is cast upon the lead covering of the cable, as is shown in Fig. 1; one turn of the back nut cuts off the runner, and the gland is completed. No matter how much strain is brought to bear upon the nut in tightening, the effect upon the lead covering is nil; the pressure is solely upon the casting, which can only compress tighter and tighter to the cup. We are informed that these glands have been subjected to enormous stresses by hydraulic pressure, and the cables, after casting numerous spheres upon the lead covering, have likewise been subjected to both pressure and insulation tests without a single fault developing. With small cables or wires for such purposes as telephone or lamp wires, a separate mould is used. These, of course, are more flexible and readily got at, but in the case of cables passing through bulkheads, &c., these are practically immovable. A gland for this purpose is shown in section in Fig. 2. The introduction of these glands would appear to have overcome a great difficulty that continually confronted both mechanical and electrical engineers dealing with marine work and has created a demand for glands on the same principle for numerous requirements both ashore and afloat. The Company have in hand double glands for tightening from either side of the bulkhead, oval glands, and numerous other arrangements.

**Osram Lamp Patents.**—An order in the usual form was granted to the Osram Lamp Works, Ltd., on Friday last, in the High Court of Justice, Chancery Division, by Mr. Justice Neville, against Louis Schloss & Co., for the delivery up of all metal filament lamps infringing the Osram patents and for an inquiry into damages.

On page 156 of our issue of March 13th we referred to an interim injunction restraining L. Apple, 13 Brewer Street, Regent Street, W. (Brewer Lamps), from selling lamps infringing Osram Patents Nos. 23,899 of 1904, and 18,622 of 1906. On Tuesday, before Mr. Justice Warrington, the Osram Lamp Works, Ltd., were granted a perpetual injunction, with costs, and an inquiry as to damages, &c., the defendants not having entered any defence to the action.

# ADAMS IGRANIC

MOTOR CONTROL GEAR FOR MACHINE TOOLS.

ADAMS  
M<sup>FC</sup> L<sup>P</sup>  
BEDFORD  
AND  
LONDON

## REVISION OF THE BOARD OF TRADE REGULATIONS FOR OVERHEAD WIRES

A REVISED set of model regulations for high-pressure overhead wires is being issued by the Board of Trade, which embodies some alteration in the previous codes. A revised memorandum for the guidance of applicants for consent to overhead schemes has also been issued. The general idea is that the applicant must set out certain statements relating to the particular scheme, including the working voltage; the kind of wire, whether copper or aluminium, solid or stranded, its sectional area, tensile strength and elongation; the average and maximum length of span; the minimum height of the wires from the ground; and the name or description of any automatic protective device that is used, and must submit maps (on the six-inch Ordnance scale) and drawings of construction. Regulations are then "made" for each case separately, after consideration of the circumstances, following the model codes, unless special alterations are sanctioned.

Among the changes in the regulations we notice the reduction of the wind-pressure from 30 to 25 lb. per sq. ft. It may be remarked that this is more favourable than the German regulations, for no allowance is made for accumulation of snow or ice, and it is the maximum allowance, while in Germany 125 kg. per sq. mile. (256 lb. per sq. ft.) is the usual allowance, and this may be increased near the sea or in other places specially exposed to the wind.

A new regulation appears in the high-pressure code requiring precautions to be taken against accident due to contact between a wire and a tree. In other countries it is usual to clear away trees on each side of a transmission line, but rights of way are so difficult to obtain here that this is often impracticable. Another new regulation prohibits the carrying of high-pressure wires across the premises of a consumer except under special conditions. This regulation avoids the difficulty that such wires might be regarded by the Home Office as service wires, and therefore excluded from the Factory Regulations. As the code is really intended only for cross-country work, responsibility for accident might fall on the supply company.

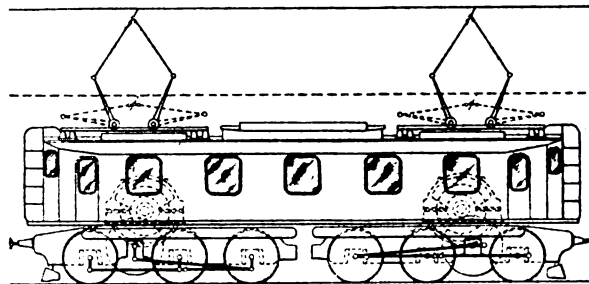
With regard to the important question of earth wires, the alternatives are offered of a continuous earth wire carried from pole to pole, or the ironwork on each pole being connected to a substantial earth-plate. We are glad to see that the method of crossing roads is not prescribed, and that it is left to the applicant to propose details for approval. Wire cradles have been abandoned for some years, and one of the recent codes suggested the strengthening of the weakest points by the duplication of the insulators and the use of a supplementary conductor wire reaching three or four feet in both directions and securely whipped or clamped to the main wire. Sometimes the supplementary wire is carried across the road if the span is short. Several improvements and some new departures in guarding against the fall of wires have been devised lately. Opportunity is given for the adoption and development of these by the details being left open.

## ELECTRIC TRACTION NOTES

A report of an interesting discussion on electric traction at the Paris Meeting of the Institution of Electrical Engineers will be found on pages 299 to 303.

The Loetschberg Tunnel is to be opened for traffic on June 1st. Apart from its interest as a 9-mile tunnel driven in quick time under difficult conditions, and its importance from a traffic and possibly even from a strategic point of view, it marks a step in the history of electric traction as practically the first application of the 15-cycle 15,000-volt single-phase system for really heavy work. The traffic will be worked by electric locomotives, and extensive trials have been made on the Spiez Frutigen approach line to the tunnel of locomotives made by the Siemens-Schuckert, Oerlikon, and A.E.G. Cos.,

the result of which was that ten of the Oerlikon type were ordered, half of which will actually be built by Brown, Boveri and Co. This pattern of locomotive was fully described in *ELECTRICAL ENGINEERING*, Vol. VII., p. 18 (Jan 12th, 1911), and its general arrangement is shown in the accompanying figure. The two motors, one on each truck, each develop from 1,000 to 1,250 h.p. and drive through helical gearing and connecting rods. The locomotive complete weighs 108 tons, and



is designed for a maximum speed of forty-six miles per hour and a maximum draw bar pull of 28,400 lb. Power is obtained from two power stations on opposite sides of the tunnel belonging to different companies.

In the House of Commons on Tuesday a discussion took place on a motion by Mr. H. Lawson (Mile End), that the introduction of trolley-buses in London by the L.C.C. shall be subject to the veto of the borough councils, in the same way as tramways are. The Board of Trade opposed the motion, but it was eventually passed by a majority of 79.

## TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

Our report of the Proceedings of the Joint Meeting of the British and French Institutions of Electrical Engineers in Paris last week contains, on p. 306, descriptions of the wireless time-signalling arrangements on the Eiffel Tower, and also a Paper by Mr. W. Slingo on some new automatic traffic distributing devices which are being installed in London telephone exchanges.

The much-talked-of criminal libel action by Mr. Godfrey Isaacs, Managing Director of Marconi's Wireless Telegraph Co., against Mr. Cecil Chesterton, Editor of the *New Witness*, commenced at the Old Bailey on Tuesday. The statements complained of were in connection with the Imperial wireless telegraph scheme, Mr. Godfrey Isaacs alleging that these amount to a charge of conspiracy with his brother, the Attorney-General, to secure the contract by undue influence.

Another matter of considerable interest in connection with the Marconi Co. is the announcement of the issue of a writ on behalf of some of the shareholders against the directors of the English Co. to recover a sum of about £1,000,000, said to be the difference between the sale price and par value of 500,000 shares with the American Marconi Co., presumably held by the English Co.

The United States Government has placed an order for a Poulsen wireless telegraph station at Colon, and according to a statement in *The Times* the day and night range is to be 3,000 miles. We understand that a patent infringement action has been pending between the Marconi Co. and the American Poulsen Co. for some time, and that in consequence of this contract having been awarded the hearing of the action will be expedited.

The Canadian Government has concluded a contract with the Marconi Co. for the erection of wireless telegraph stations at La Pas (Manitoba) and Port Nelson (Hudson Bay).

Communications with Quillengues and Caconda were restored on the 23rd inst., as well as the Fao route.—Until further notice telegrams to Derna and Tobruk are sent by post from Bengasi.—Telegraphic correspondence to Morocco is now no longer subject to delay.

## "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

### Specifications Published May 22, 1913

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

Names in italics indicate communicators of inventions from abroad.

7,903/12. **Pupin Loaded Lines.** F. A. BECKER. To regulate the attenuation in telephone and telegraph lines according to the different frequencies, inductances are inserted at equal distances. They are specially arranged compound shunts, which may be tuned to different frequencies. Four figures.

9,941/12. **Metal Filaments.** F. HANSEN and W. F. MOHR. To increase the specific resistance, tungsten oxide is converted into trioxide, to which is added boric acid-anhydride to saturation. This is then dried and heated in a neutral atmosphere, and reduced by heating with zinc powder. The zinc is removed, and is made into a paste and squirted.

10,655/12. **Induction Motors.** SUBMERSIBLE & J.-L. MOTORS and H. B. POYNTER. Insulation is eliminated from the stator, or else thin refractory layers only are used. Also the number of conductors is reduced as much as possible, and these are fed at low pressure through a transformer which may be incorporated in the base of the motor. To minimise leakage the laminations are enamelled, cut radially, and assembled so that the cuts are not continuous. The motors may be used under water if the pressure is kept below that at which electrolysis takes place. Four figures.

10,765/12. **Heating Element.** E. & O.A. Co., J. D. MORRISON, and L. H. DAVIES. The resistor is wound on a single triangular refractory insulator, so that the area of the front is the greater. Concave heat-reflecting surfaces are provided, and terminals are fixed to the flat ends. Seven figures.

10,863/12. **Wireless Telegraphy.** R. C. GALLETT. The transmitting aerial is slowly charged and impulsively discharged by quenched sparks in one sense only. Free oscillations in the receiving aerial are prevented, and only uni-directional currents flow. Two figures.

14,015/12. **Wireless Telegraphy.** W. DUBILIER. To produce small alternating currents of suitable frequency, e.g., 200 watts at 400 cycles, a primary oscillating circuit with a natural frequency equal to or an harmonic of the frequency of the oscillator itself, feeds another circuit through a transformer and including a spark gap, the aerial, and earth connection. Three figures.

16,153/12. **Cable Sheathing.** W.E. Co. (W.E. Co., U.S.A.). To decrease the cost of cable sheaths, an alloy of approximately 99 per cent. lead and 1 per cent. antimony is used. The alloy is preferably formed by combining the metals after they have been reduced to their natural state.

23,734/12. **Wireless Telegraphy.** R. GOLDSCHMIDT. High-frequency undamped waves are at the receiving station transformed to waves of constant low frequency by asynchronously rotating commutators. Six figures.

### Specifications Published To-day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, E.C., at the price of 8d. each, post free.

Summaries of some of the more important of these patents will appear in our next issue.

**Arc Lamps:** MASCHINEN UND METALL INDUSTRIE [Economisers for multiple arcs] 11,842/12; ROGERS and ROWE [Non-shunt arcs] 28,627/12.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** SIEMENS-SCHUCKERT [Regulation of frequency produced by polyphase induction generators] 8,070/12; DALEN [Railway carriage lighting] 10,993/12; W.E. Co. (W.E. Co., U.S.A.) [Lead alloys for tapes] 25,090/12; LAWTON [Apparatus for forming joint ends on conduits] 27,510/12.

**Dynamos and Motors:** GEORGE POLKEY, LTD. [Dynamos] 22,500/12; SIEMENS-SCHUCKERT [Field magnets] 3,627/13.

**Electrometallurgy and Electrochemistry:** STROHMENGER [Arc welding] 11,079/12; DEKKER [Electrolytes] 17,836/12; JÖSSINGFORD MFG. Co. [Arc furnaces] 26,165/12; [Tilting mechanism] 26,166/12; HARKER and SCOTT [Furnaces for fixing nitrogen from the air] 866/13.

**Heating and Cooking:** GUALTIEROTTI [Moulding silicon and its alloys for resistances and heaters] 10,657/12; COLLINS [Self-contained utensils] 18,911/12.

**Incandescent Lamps:** J. STONE & Co. and MYERS [Also lamp-holders] 10,959/12; JOLY, 20,361/12; SIDON, 27,813/12.

**Instruments and Meters:** ARTHORPE and CAMBRIDGE INST. Co. [Moving coil instruments] 11,279/12.

**Storage Batteries:** PORSCHE and ACHENBACH [Negative electrodes for alkaline cells] 29,848/12.

**Switchgear, Fuses, and Fittings:** HALE [Lamp-holders] 7,552/12; PERL [Switches] 11,051/12; THOMPSON (*Ateliers de Constr. Elec. de Charleroi*) [Remote control] 11,537/12; WANK-MULLER [Lamp-holders] 14,750/12; B.T.-H. Co. (*G.E. Co., U.S.A.*) [Sealing leading-in cables] 15,342/12; BOUTARD [Liquid resistances] 3,855/13.

**Telephony and Telegraphy:** POSSOLO [Ship and shore communication] 10,701/12; BARON (*Heimann*) [Graded service automatic telephone system] 11,261/12; ZAHARIA and ROTHLANDER [Wireless receiving stations] 12,444/12; SEFTON-JONES (*Drahtlose Telegraphie*) [Production of high frequency currents] 14,390/12; TELEPHON APPARAT FABRIK E. ZWIETUSCH & Co. Ges. [Selector switches] 16,151/12; PRANCE [Loud-speaking attachment] 17,357/12; SCHAEFER [Sourdines or dampers for conductors] 25,449/12; SIEMENS BROS. and PERRY [Insulating sectional iron masts] 1,899/13; SABULKA [Wireless transmitters] 6,479/13.

**Traction:** STUART [Railways] 2,957/12; HAYWARD [Railways and tramways] 10,417/12; ROTTENBURG and NEW TRANSPORT Co. [Setting selective control on moving automatic goods conveyor from a fixed station] 11,681/12; STUART [Signalling] 3,588/13.

**Miscellaneous:** HOLMES and KEMP-WELCH [Two separate and opposite drives from a single motor] 14,560/12; SIEMENS DYNAMO WORKS and CALLOW [Photometers] 15,660/12; KIRK and BAKER [Fire-alarms] 15,676/12; BRUCKMANN [Electricity charging calculator] 21,446/12; KILBURN [Vehicular tail light frontal indicators] 27,707/12; MOLLER and KONIG [Cooling incandescent wire] 27,950/12.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Distributing Systems, &c.:** CREIGHTON [Circuit protective gear] 5,662/13.

**Dynamos and Transformers:** A.E.G. [Windings] 10,608/13.

**Electrometallurgy:** HELFENSTEIN ELEKTRO-OFEN-GES. [Enclosed furnaces with upper charging chutes] 9,590/13.

**Heating:** ARPIN [Radiators] 10,289/13; [Bath water heaters] 10,403/13.

**Meters:** SCHÖLLER, 24,954/12.

**Switchgear:** A.E.G. [Immersed break] 10,077/13.

**Telephony and Telegraphy:** CEREROTANI [Printing telegraphs] 9,833/13; UDE [Telephone fixtures] 10,556/13.

The following Amended Specifications may now be obtained.

20,107/11. **Telegraph Receivers.** W. S. STELJES.

26,184/11. **Combined Oil and Electric Furnaces.** V. STOBIE.

### Application for Amendment

1,950/08. **Telephone Switch Hooks.** J. E. KINGSBURY. Removable arms are arranged so that the stem engages with the parts within the case without it being opened, and cannot be again withdrawn without the case being opened. The W.E. Co. are now seeking leave to amend by striking out claim 1, which broadly covers switch hooks which may be inserted or removed from the case without tools. The subject-matter is said to have been old when the application was filed.

### Petition for Extension of Term of Patent

24,048/99. **Telautographs.** F. RITCHIE. Constructional details and arrangement of apparatus. The National Telewriter Co. intend to apply on July 1st to Mr. Justice Warrington for a date to be fixed for the petition to be heard. Notices of objection before July 1st, with J. H. and J. Y. Johnson (47 Lincoln's Inn Fields, W.C.).

### Expired Patents

The following are the more important Patents that have become void through non-payment of renewal fees.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** E. D. PAGE [Metal trough casing with plain or transversely corrugated flexible metal lids] 2,461/01; T. MARRIOTT [Bitumen substitute] 3,063/07.

**Dynamos:** G. SAUTTER, E. HARLÉ and J. REY [Compounding alternators with a reaction exciter] 1,430/05.

**Ignition:** A. F. WHITE [Window to observe sparking] 2,853/06.

**Incandescent Lamps:** J. HOWARD [Multiple filament] 2,707/08.


**Storage Batteries:** VAN RADEN & Co. and M. METZ [Construction] 2,727/08; [Fixing electrodes] 25,264/08.

**Switchgear, Fuses and Fittings:** A. H. ADAMS and J. T. MOULD [Motor controllers with interlocked main and rheostat switches] 2,984/02.

**Traction:** SIEMENS BROS. and L. M. G. FERREIRA [Electromagnetic semaphores] 2,961/03; [Detectors for railway points] 3,082/07; J. A. LYCETT and G. J. CONARY [Bogie tramcar truck construction] 3,096/06; G. LOWTHIAN [Locomotive cab signalling] 2,975/07.

**Miscellaneous:** J. FIDDES and J. F. WATT [Fire alarms with sprinklers] 2,772A/04; F. W. HURD [Radial drill] 2,740/08.





# Everybody's doing it

## Trying to keep cool,

and a difficult job, too, in the hot and dusty cities and towns of Great Britain, unless aided by artificial means.

NOW is the time to push

## "FREEZOR" FANS

Now—when the Butcher, the Dairyman, the Fishmonger, &c., cannot keep the flies away—when Restaurants are empty because patrons cannot stand the heat and stuffiness—when the tired and jaded worker lacks energy owing to the heat—when the hotel keeper is expected to provide cool corners for his guests.

*A timely appeal to the right classes at this season will be productive of lucrative results.*

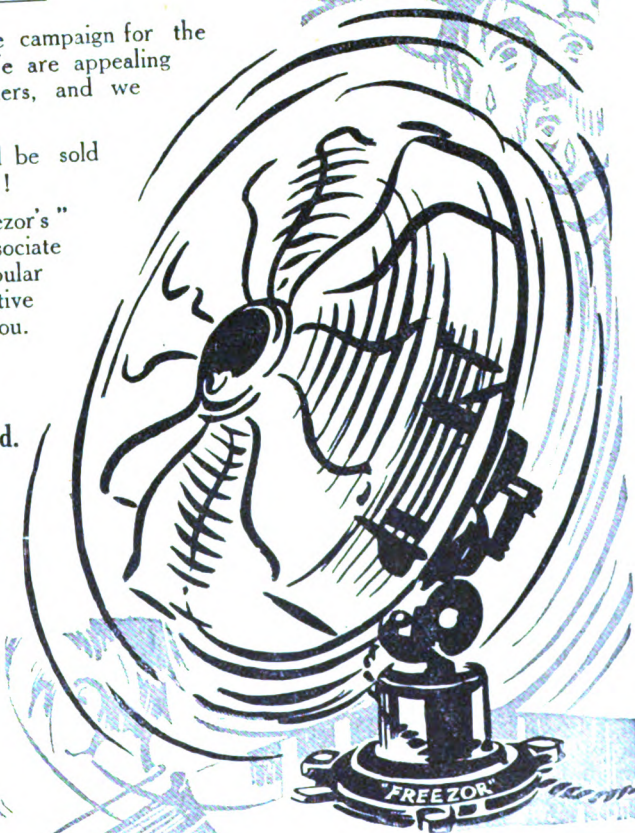
We are engaged upon an extensive campaign for the sale of "FREEZOR" Fans. We are appealing to all classes of electricity consumers, and we know that results will accrue.

Thousands of "Freezor" Fans will be sold this summer—how many by you!!

Let us help you to advertise "Freezor's" in your own district. Let us associate your establishment with this most popular fan. Let us send a representative to discuss this proposition with you.

The GENERAL ELECTRIC CO., Ltd.

Head Office:  
67, Queen Victoria St., London, E.C.  
Branches: Manchester, Birmingham, Glasgow,  
Newcastle, Cardiff, Dublin, Belfast, Bristol,  
Swansea, Liverpool, Leeds, Sheffield, Nottingham,  
Hull, Southampton, &c.



*When corresponding with Advertisers, please mention "Electrical Engineering."*



# THE LONDON ELECTRIC WIRE COMPANY

Telegrams: "ELECTRIC LONDON." **AND SMITHS LTD.** Telephone No. 3105 London Wall.

Offices and Warehouse:  
PLAYHOUSE YARD, GOLDEN LANE, LONDON, E.C.

Works: { CHURCH ROAD WORKS, LEYTON, E.  
ANACONDA WORKS, SALFORD.

MANUFACTURERS OF EVERY DESCRIPTION OF CABLES AND WIRES FOR ELECTRICAL PURPOSES.

**DYNAMO WIRES** Strips and Compressed Strands. **INSTRUMENT WIRES**, Silk and Cotton Covered.

**EUREKA, PLATINOID** and other High Resistance Wires. **ENAMEL** Insulated Wires.

**FLEXIBLES.** **INSULATING VARNISH.** **BRUSHES.** **FUSE WIRES.** **JOINTING MATERIAL.**

**HIGH CONDUCTIVITY COPPER WIRE.**  
**SPECIAL TROLLEY WIRE.**

**SILICIUM BRONZE & PHOSPHOR BRONZE WIRE.**  
**ALUMINIUM WIRE.**

**MICA** **BRITISH MICA CO., LD.**  
Contractors to  
H.M. Government,  
Lebanon Road Works,  
Wandsworth, S.W.  
Tel.—406 P.O. Putney.  
Telegr.—"Micamint," London.

Plate Tubes,  
Rings, &c., in  
**MICANITE**

The Micanite & Insulators Co., Ltd.  
WALTHAMSTOW,  
London, E.

FOR **FIBRE**  
SHEETS, RODS  
AND  
TUBES.

**CRYSELCO**  
**ELECTRIC**  
**LAMPS.**  
KEMPSTON WORKS, BEDFORD.  
Telegrams: "Cryselco," Kempston.  
Telephone: 1577 Bedford.

**GLASS TUBES**  
**AND RODS**  
FOR ELECTRICAL PURPOSES  
GUILBERT-MARTIN  
9, Edmund Place, LONDON, E.C.

**ELECTRICAL PORCELAIN**  
OF  
HIGHEST QUALITY  
APPLY TO  
JAMES MACINTYRE & CO., LTD.,  
BURSLEM.

**F. WIGGINS & SONS,**  
FOR **MICA** **INSULATION**  
102, 103 & 104, MINORIES, LONDON.



**IRONCASED  
SWITCHES.**

**M TYPE. FOR LIGHTING.**  
For Workshops, Collieries,  
and exposed situations.

**STRONG & COMPACT.**

(LIST ON APPLICATION.)



**DORMAN  
AND  
SMITH,**

Ordsal  
Electrical  
Works,  
SALFORD,

**MANCHESTER.**

## BABCOCK & WILCOX, Ltd.

### ELECTRIC CRANE DEPARTMENT:

GOLIATH CRANES, TRANSPORTERS, PORTAL CRANES, JIB TRAVELLING CRANES,  
WINCHES & CAPSTANS, COAL HANDLING CRANES, FOUNDRY CRANES, LADLE  
CRANES, SCRAP MAGNET CRANES, PIG BED CRANES, SECTION HANDLING  
CRANES, BOX HANDLING CRANES, OPEN HEARTH CHARGERS, VERTICAL INGOT  
CHARGERS, HORIZONTAL INGOT CHARGERS, &c.

**Head Office: ORIEL HOUSE, FARRINGDON STREET, LONDON, E.C.**

Telegrams—"Babcock, London."

Works: RENFREW, SCOTLAND.

Telephone No. 5540 Holborn (8 lines).

*When corresponding with Advertisers, please mention "Electrical Engineering."*

## LOCAL NOTES

**Blackpool: Street Lighting.**—A saving of £550 per annum in the cost of the street lighting is foreshadowed in the Borough Electrical Engineer's estimates to the Street Lighting Committee. This will be brought about by a reduction in the charges for current for street lighting purposes from 3d. for the first 250,000 units with a sliding scale to a flat rate of 2½d. per unit.

**Burton-on-Trent: Electricity Accounts.**—After meeting interest on capital charges there is a surplus of £1,189 on the electricity undertaking of last year, of which £1,000 is to be applied to relief of rates and the balance carried to renewals fund. This surplus is £1,530 less than in the previous year, due to the increased price of coal.

A new turbo-generator was started up at the electricity works last week.

**Canada: Sale of Electric Lighting Co.**—With reference to the recent notes in our columns concerning a proposal of the Toronto Government to purchase the Toronto Tramway and Lighting Cos., it is now stated that the Toronto Electric Lighting Co. has offered its undertaking at £5,000,000. The valuation of the Company's plant on behalf of the Government is to be put in hand.

**Cromer: Transfer of Electricity Undertaking.**—The agreement for the transfer of the Council's electricity undertaking to Edmundson's Electricity Corporation is now before the Board of Trade.

**Egypt: Water-Power Development.**—The Board of Trade Journal states that the Egyptian Government is considering the development on a large scale of the power at present running to waste through the Assuan Dam. It is believed that the Government will probably set up a small installation in the first instance for the manufacture of calcium cyanamide, which is said to be rapidly coming into favour with farmers as a chemical manure.

**Felixstowe: Tent Lighting.**—An interesting departure has been made by the Suffolk Electricity Supply Co. for the wiring of the tents on the beach and fitting them with a lamp, a kettle, and a radiator for 5s. plus a charge of 10s. for all current used during the period from May 14th to Oct. 14th.

**Galashiels: Electric Supply.**—The Council has decided not to proceed with an electric lighting scheme themselves, but to give facilities for a proposed local company to be formed to take the work in hand. Mr. T. C. Parsons, late Burgh Electrical Engineer at Govan, reported to the Council on the matter.

**Hornsey: Tampering with Fuse Boxes.**—The Electricity Department has had quite a number of cases recently of consumers tampering with their meters and main fuse boxes, and at the last meeting of the Council a warning was given that in all future cases proceedings will be taken.

**Kettering: Electric Supply Accounts.**—The accounts of the electricity undertaking for the year to March 31st show a gross profit of £6,556, and after meeting capital charges and transferring £800 to reserve fund, the net revenue account, including the balance from last year, shows a surplus of £2,069. This result has been achieved notwithstanding coal having cost 40 per cent. more than in the previous year, but this extra cost is being counteracted by the working of the mixed-pressure turbine which is now in operation.

**Oldham: Electricity Accounts.**—There was a net profit of £1,044 on the electricity undertaking last year, which sum is carried forward. There have been large increases in the number of units sold for all purposes, and the generating plant at the Greenhill power station has been increased to 8,600 kw. by the addition of a further turbo-generator set.

**Pembroke (Ireland): Electric Supply.**—An agreement is being entered into for giving the Blackrock Council a supply of electricity in bulk.

**Portsmouth: Power Charges.**—In order to arrive at a general reduction with a view to developing the use of power by small users, a sub-committee has been appointed to obtain information from other supply authorities in this connection.

**Libel Action by Electrical Engineer.**—Mr. George Balfour, who is connected with a large number of important electrical undertakings in different parts of the country, and managing director of Balfour, Beatty & Co., has instituted an action for libel against Ben Tillett, the labour leader. Mr. Balfour was a Unionist candidate at the Govan bye-election, and the statements complained of were in connection with the strike of the employees of the Llanelli Light & Tramways Co.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

## Generating Stations, Sub-Stations, Mains, &amp;c.

**Bootle.**—A Local Government Board inquiry has been held concerning a loan of £3,750 for electrical extensions.

**Canada.**—The Board of Trade Intelligence Department has the name of a coal, railway and power company which contemplates extensions to its power plant, and the electrification of its colliery plant.

**Darwen.**—A Local Government Board inquiry has been held concerning a loan of £6,400 for new plant at the electricity works.

**Leicester.**—A 5,000-kw. generating set with rotary converters, switchgear and boiler plant are to be installed at an estimated cost of £32,350, together with new cables at an estimated cost of £20,000.

**Limerick.**—A loan of £6,100 for the provision of Diesel engine plant is to be applied for.

**London: Hammersmith.**—Estimates have been presented on contemplated mains extensions at a cost of £3,055, in addition to an estimated expenditure of £2,500 on new services, and £2,590 on transformers, sub-stations, &c.

**Norwich.**—The Electricity Committee contemplate an expenditure of £25,000 upon the electricity undertaking during the next five years. A 3,000-kw. turbo-alternator and condensing plant, rotaries, switchboard, &c., are to be installed immediately.

**Oldham.**—E.H.T. switchboard. Borough Electrical Engineer, May 31st.

**Rawtenstall.**—One 1,500-kw. turbo-alternator and condenser. Borough Electrical Engineer, June 10th.

**York.**—An inquiry was held on Monday concerning a loan of £24,440 for extensions at the electricity works. This amount is made up as follows:—Generating plant, £10,100; two water-tube boilers, £4,300; cables, £5,250; battery, £3,900; buildings, £890.

## Wiring

The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.

**Aberdare.**—Cinematograph theatre. C. L. Stewart, Milbourne Chambers, Merthyr Tydfil.

**Bognor.**—New school.

**Cromer.**—Cinematograph theatre.

**Dublin.**—Alterations and additions to the Royal Hospital. Donnybrook. Architects, Beckett & Medcalf, 6 Clare Street.

**Exeter.**—Swimming baths.

**Gillingham.**—New secondary school.

**Haslingden.**—New school.

**London: Bermondsey.**—New baths.

Telephone and bell system at the Western Fever Hospital. Metropolitan Asylums Board, June 4th.

Additions to North-Western Fever Hospital, Hampstead. Metropolitan Asylums Board.

**Maidstone.**—New offices for Prudential Insurance Co.

**Manchester.**—Grange Street Municipal School. Education Offices, Deansgate.

**Margate.**—Public baths and workmen's dwellings.

**Shipley.**—Additions to Otley Road Council School.

**Stirling.**—New municipal buildings.

**Swansea.**—Electric lighting and bells at new training college. Clerk, Education Offices, 9 Grove Place.

**Wakefield.**—Cinematograph theatre. A Winstanley, 5 Blackfriars Street, Manchester.

**West Ham.**—Extensions at Technical Institute, Romford Road.

## Miscellaneous

**Azores.**—The St. Michael's Government has decided to construct an electric tramway system to afford communication with the points of popular interest in the island. The first

## THE RECORD ELECTRICAL Co., Ltd.

LONDON OFFICE:  
CAXTON HOUSE,  
WESTMINSTER, S.W.  
Telephone:  
3097 Victoria.

MEASURING  
INSTRUMENTS.

RECORD'S PATENT.

Telegrams & Cablegrams:  
"Infusion,  
London."

Write for Prices & Particulars.

WORKS:  
BROADHEATH,  
MANCHESTER.  
Telephone:  
104 Altrincham.  
Telegrams & Cablegrams:  
"Infusion,  
Altrincham."

line will be to the Valley of Furnas, which is estimated to cost £250,000.

**Belfast.**—The Harbour Commissioners have decided to erect four electrically-driven gantry cranes at an estimated cost of £17,000.

**Bristol.**—The Corporation has decided to convert a further 1,157 street gas lamps to electricity.

**Devonport.**—Twelve months' supply of cables, wires, meters, &c. Borough Electrical Engineer, June 2nd.

**London: Hammersmith.**—A number of 100-kw. and 50-kw. transformers are required by the Council.

**Servia.**—The Servian Telephone Co. requires large quantities of telephone apparatus and material. Direction des Téléphones Serbe, Belgrade. Local representation is necessary, and the name of an agent in Belgrade who is willing to act for British manufacturers may be obtained at 73 Basinghall Street, E.C.

## TENDERS RECEIVED AND ACCEPTED

**Argentina.**—A contract for the supply of 12,000 "Wotan" lamps has been placed with Siemens Bros. Dynamo Works, Ltd., by the Buenos Aires Great Southern Railway.

**Carlisle.**—The following tenders have been accepted:—Generating set, Browett, Lindley & Co., for £2,708; water-tube boiler, superheater, mechanical stokers, &c., Stirling Boiler Co., £1,610; ejector condenser, Korting Bros., £85.

**Harrogate.**—The tender of Messrs. Ferranti, Ltd., at £195 10s. has been accepted for a switchboard extension.

**South Africa.**—A contract for the supply of 3,500 "Wotan" drawn tungsten wire lamps has been placed with Siemens Bros. Dynamo Works, Ltd., by the Union of South Africa.

**Walsall.**—The tender of Callender's Cable & Construction Co. for a main in Darlaston Street has been accepted at £601; that of the British Westinghouse Co. for sub-station equipment at £167 10s.; and that of E. Green & Son for a new economiser at £623.

**Wolverhampton.**—The following tenders have been accepted: British Westinghouse Co., four converters, £2,950; Electric Construction Co., two sub-station switchboards, £408 10s. and £209 10s. respectively; Reyrolle and Co., E.H.T. switchgear for Commercial Road station, £2,000 10s.

## APPOINTMENTS AND PERSONAL NOTES

Mr. Cyril Clarke has been appointed Manager of the Birkenhead Tramways in succession to Mr. W. Wyld, recently appointed Electrical Engineer to the Hampstead Borough Council. Mr. Clarke has been Chief Assistant Manager at Birkenhead for 12½ years.

Mr. A. J. Ryan, Assistant Resident Engineer at the Gillingham electricity works, has received a presentation from the staff on his leaving to take up the post of Chief Assistant Electrical Engineer at Hastings.

The salary of Mr. A. R. Tudman, Borough Electrical Engineer to the Colwyn Bay Council, has been increased from £230 to £255 per annum.

The Coventry Electric Lighting Committee recommend that the salary of Mr. G. Tough, the Borough Electrical Engineer, be increased from £550 to £650 per annum.

The salary of Mr. H. M. Taylor, Borough Electrical Engineer at Middlesbrough, has been increased by £25, making it £450 per annum. Mr. R. H. Scotson, the outside distributing engineer, has had his salary increased from £180 to £200.

The Bristol Corporation Electricity Department requires a sub-station shift engineer with experience of E.H.T. sub-station work. (See advertisement on another page.)

The Birmingham Corporation Electric Supply Department requires a commercial assistant. June 6th. (See advertisement on another page.)

Assistant engineers are required in the Engineer-in-Chief's Department of the G.P.O. (See advertisement on another page.)

**The Strike of Leicester Wiremen.**—As a result of a conference between the electrical contractors of Leicester and their employees, the strike which recently took place has been ended by an agreement to pay 9d. per hour to all wiremen who have worked at the trade not less than six years, with 8½d. to other qualified men of less experience. The new arrangement comes into force as from August 31st.

## MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. G. Smith and Son, of 5 Philpot Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night, was £72 5s. to £72 15s. (Last week, £72 10s. to £73.)

**Bankruptcies.**—J. G. Hilton, Electrical Engineer, 103 Exchange Buildings, Birmingham, has been adjudicated bankrupt. The first meeting of creditors will be held on June 4th at 10.30 a.m. at 191 Corporation Street, and the public examination is on June 25th at 2.30 p.m. at the Court House, Corporation Street.

**Liquidations.**—A receiver and manager of the X.L. Electric Co. has been appointed, with power to act until October 20th.

The Gem Dynamo Brush Co., Ltd., is to be wound up voluntarily. The liquidator is Mr. J. W. Massey, and a meeting of creditors will be held at his offices, 45 Cherry Street, Birmingham, on June 2nd, at 2 p.m.

**Theft of Electric Fittings.**—A labourer in the employ of the Southwark Borough Council has been sent to prison for six weeks for stealing a quantity of electric fittings, the property of the Electricity Department.

**Curious Accident to a 'Bus.**—Whilst an electric lamp standard was being hauled into position by a tripod derrick in Ludgate Circus on Tuesday, the derrick collapsed and fell on to a passing motor-bus. Fortunately there were no passengers on top of the vehicle at the time.

**The "Point-Fives."**—The June meeting will be held on Tuesday, June 17th, at 7 p.m., at the Delico Restaurant, Barrett Street, Oxford Street, W. The tickets for the dinner are 3s. 6d. each, and may be obtained from the hon. secretary, Mr. A. H. Seabrook. The chairman will address the meeting at about 8.30, and this will be followed by a general discussion dealing with the extension of the use of electricity for domestic purposes, tariffs, apparatus, selling methods, &c. Mr. H. F. Friederichs, Borough Electrical Engineer, West Hartlepool, and Mr. F. W. Purse, late of Watford, and now at Carlisle, have been appointed members of the "Point-Fives."

**The Strength of Metal Filament Lamps.**—The British Thomson-Houston Co. tell us of several examples of the many severe tests to which the strength of Mazda drawn-wire lamps has been subjected. Amongst the accidental tests was, it will be remembered, a shipwreck, in which several cases of Mazda lamps had only suffered damage to the extent of about 1 per cent.—and things are not handled gently during salvage operations. In another instance a stage-lighting batten, containing 100 Mazda lamps, fell five feet, and not one of the lamps was damaged. These lamps had all been burning for some time. The latest, and perhaps most crucial test of all, has just been reported. A 60-watt, 230-volt Mazda lamp, installed at the Palace Theatre, West Hartlepool, fell from a height of twelve feet on to a stone pavement. Although a gallery and heavy bead shade were attached to, and fell with, the lamp, it was found to be in perfect condition when placed in the holder again.

**The Secret of the Permanent Magnet.**—An interesting discourse with this title was given last Friday evening by Professor Silvanus P. Thompson. After demonstrating experimentally the different retentive power of soft iron, soft steel, and hard steel, and illustrating the theory that magnetisation is essentially a change of orientation of the components of material by experimental evidences of the sound, and change of length produced, and the comparative transparency of magnetic "mud," he proceeded to explain the significance of the intercepts of the Ewing cyclic magnetisation curve as measures of the amount of remanent magnetism and its fixidity, comparing the properties of many qualities of steel in these respects. He explained the construction of Ascoli for taking into account the self-demagnetising coefficient by shearing the co-ordinates through a certain angle, and showed how different qualities of steel gave best results for different dimension ratios. A modification of the diagram was also used to explain the sub-permanent nature of a portion of the magnetism. For a treatment of this subject reference may be made to Professor Thompson's lecture last year at Glasgow. The lecturer dealt briefly with the recalcence points of steel, and showed a few micro-photographs of its internal structure. Finally, he summed up the requirements of a good permanent magnet as:—suitable alloy-steel, a shape giving a low coefficient of self-demagnetisation, forging at a moderate temperature, hardening by quenching from a temperature well above the recalcence points, maturing by prolonged subsequent gentle heating to get rid of the subpermanent magnetism. The lecture concluded with a demonstration of the Poulsen Telegraphone.



# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 336 [Vol. IX., No. 23]

*All rights reserved.*

THURSDAY, JUNE 5, 1913.

[PRICE ONE PENNY.]

*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT and WANTED, ARTICLES FOR SALE and WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES and TECHNICAL COLLEGE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

*Other Advertisement Rates on Application.*

#### *Latest Time for Receiving*

Letters for Insertion, Tuesday first post

Small Advertisements and Official Announcements, Wednesday first post.

Displayed Advertisements, Tuesday first post.

Corrections in Standing Advertisements, Monday first post.

All letters to be addressed to "Electrical Engineering," at the EDITORIAL and PUBLISHING OFFICES: 308-306, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Cireling, Fleet, London."

Telephone No.: 5509 Holborn

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

ARRANGEMENTS for interconnecting the mains of the Bury Corporation with those of the Lancashire Electric Power Co., in the event of an emergency, are under consideration. (Page 314.)

At the Mining Exhibition now being held at the Agricultural Hall, all kinds of electric coal-cutters are represented. Miner's electric safety lamps are also in evidence, while the aid of electricity is sought on almost every stand. (Page 315.)

A NEW form of electrically driven two-high rolling mill was described in a Paper by Mr. A. Lamberton at the May meeting of the Iron and Steel Institute. In this, instead of reversing the motor, the return pass is obtained by mechanically interchanging the positions of the rolls. (Page 316.)

THE Gray-Sussmann, Oldham, and Ceag electric safety lamps have been approved by the Home Office for use in mines. (Page 317.)

AN electric mine hoist in Canada is described on page 318.

SPECIFICATIONS published by the Patent Office during May of interest to electrical mining and metallurgical engineers include three dealing with electric furnaces, two for tilting and one for an arc furnace with metal electrodes and a special hearth for the production of alloys. Other patents embrace miner's safety lamps and blasting cartridges. (Page 318.)

A TRIAL run from Dumfries to London is about to be made by an electric car equipped with the Edison battery. (Page 320.)

A CEILING fan, in which special precautions are taken in the design of the bearings and lubrication system, is illustrated on page 320.

At the annual meeting of the Institution of Electrical Engineers last Thursday, Mr. R. A. Chattock, who was proposed independently of the Council nominations, was elected to a seat on the Council. (Page 321.)

SOME details are published from the reports of the Consulting Engineer, Borough Electrical Engineer, and Electricity Committee on the condition of the Walsall electricity undertaking. (Page 321.)

A NEW large asylum has just been finished at Colchester. Electricity is used for power purposes in the laundry, bakery, &c., as well as for lighting. The generating station can take a load of over 200 kw. (Page 321.)

A COOKING outfit in a private house and a new design of enclosed fuse are described in short articles on page 322.

THE inspection and routine testing of electric mining plant is dealt with in our Questions and Answers columns. (Page 323.)

A NEW design of oil switch is illustrated, and a recent installation of condensing plant is described in short articles. (Page 324.)

WE describe the Siemens' standard Telefunken 0.3-kw. ship wireless set, with which a large number of vessels are now equipped.—Considerable difference of opinion exists among the members of the Marconi Committee regarding the terms of their report. (Page 325.)

THE L.C.C. has abandoned its trolley omnibus schemes in consequence of the decision of the House of Commons last week regarding the Borough Councils veto.—An extension of trailer cars in London is to be applied for.—Opposition of several London Borough Councils is threatened to the Post Office tube railway.—"Self-propelled" tramcars are recommended in Edinburgh.—A tube railway between the Isle of Wight and Hampshire is again projected. (Page 325.)

THE specifications published by the Patent Office on Thursday last included several dealing with wireless telegraphy, one for a remote controlled switch with an oscillating armature, by A. H. F. Perl; one covering a method for the speed control of induction motors with short circuited rotors by the employment of adjustable frequency and pressure, by Siemens Schuckertwerke; and one for a self-regulating dynamo, by Geo. Polkey, Ltd. (Page 326.)

THE West Ham Electricity Department has in use two Edison electric battery vans.—There are now 1,500 looms with individual motors supplied from the Blackburn electricity works.—The Dundee Electricity Department has built up a £21,000 reserve fund in three years.—A sum of £24,500 is to be paid to relief of rates from the Manchester electricity profits for last year. (Page 327.)

ELECTRICAL extensions are contemplated as follows:—Wallasey, £65,000; Worthing, £6,750; Southwark, £29,464; Bispaham, £8,155; York, £6,800; Hebden Bridge, £3,250; Halifax, £23,180.—Air-cooled static transformers are required at Hammersmith; double-deck trolley omnibuses at Brighton; cable at Southampton; and a twelve months' supply of electrical stores by the Penrikyber Navigation Colliery Co.—Electric lighting schemes are under consideration at Dolgelly and Tullamore. (Page 327.)

THE American Westinghouse Co. made a profit of about £600,000 on its past year's trading, and an 8 per cent. dividend is to be paid.—A scheme for the consolidation of the Edison & Swan United Electric Light Co.'s debentures has been formulated. (Page 328.)

**Single-phase Commutator Motors.**—At the Annual General Meeting of the I.E.E. Students' Section, a Paper was read by Mr. E. A. Richards and Mr. D. Dunham, in which they described a series of tests on a 140 volt, 57 ampere, 1,430 r.p.m. Fynn single-phase motor when connected as an Atkinson, Latour-Winter-Eichberg and synchronous machine. It was found that for the Fynn, L.W.E., and synchronous connections, at 6 b.h.p., the efficiencies were nearly the same, although the losses were made up in rather different ways. Friction and windage accounted for approximately 40 per cent. of the losses, and about one-third of this consisted of brush friction. The copper losses in each case were under 30 per cent., whereas the iron losses and circulating currents came to 6 per cent. of the total with the synchronous motor connection, 8 per cent. with the Fynn, and 14 per cent. with the L.W.E. connection. With the Atkinson connection the maximum output was 3 b.h.p., and the efficiency 50 per cent. In this case the friction and windage also accounted for about 40 per cent. of the total, the iron losses and circulating currents 21 per cent., and the copper losses 36 per cent. of the total. A new type of motor, due to Mr. F. Creedy, in which the stator has salient poles and the rotor an ordinary D.C. armature with three brush sets on the commutator, was also described. Compensation is produced by an external transformer with the primary in parallel with the stator. The power factor of the whole motor reaches about 91 per cent. at full load, with an efficiency of about 74 per cent. The motor tested was designed for lift work, and gives a very high starting torque. Starting is effected by switching the motor straight on the mains.

## ARRANGEMENTS FOR THE WEEK

(TO-DAY) THURSDAY, JUNE 5TH.

*Institution of Mining Engineers.*

- 11 a.m. At Burlington House, Piccadilly. Among the papers to be read (at 2.30) will be "Insulated and Bare Copper and Aluminium Cables for the Transmission of Electrical Energy, with Special Reference to Mining Work," by B. Welbourn.

SATURDAY, JUNE 7TH.

*Association of Mining Electrical Engineers.*

- 5.30 p.m. Warwickshire and S. Staffs. Branch. At Imperial Hotel, Temple Street, Birmingham. "Notes on Colliery Generating Plant," by W. Bolton Shaw.

THURSDAY, JUNE 12TH.

*Tramways and Light Railways Association.*

- 10.30 a.m. Annual Congress at Blackpool. At Imperial Hotel.

FRIDAY, JUNE 13TH.

*Tramways and Light Railways Association.*

- 10 a.m. Annual Congress (continued).

*Physical Society.*

- 8 p.m. At Imperial College of Science. "Some Experiments on Tinfoil Contact with Dielectrics," by G. E. Bairsto.

## The London Electrical Engineers.

(TO-DAY) THURSDAY, JUNE 5TH.—C. Company. FRIDAY, JUNE 6TH.—D. Company. MONDAY, JUNE 9TH.—A. Company. TUESDAY, JUNE 10TH.—B. Company. THURSDAY, JUNE 12TH.—C. Company. FRIDAY, JUNE 13TH.—D. Company. Infantry Drill, 7 to 9 p.m. Technical instruction for all Members on the Sixth Rate and for all Candidates for Higher Rating, 7 to 9 p.m. Musketry Instruction, 9 to 10 p.m.

SATURDAY, JUNE 14TH.—Headquarters open from 10 a.m. till noon.

**"Electrical Combine: Civic Scheme to Meet any Emergency."**—Under this heading a Lancashire paper last week published a statement that an important scheme would be given practical consideration in the very near future for the interconnection of electric mains belonging to local authorities and companies round about Manchester, so as to maintain a supply of current in case of a breakdown. This very much overstates what is really occurring. The true facts of the matter are that the Bury Corporation are considering the question of interconnecting their mains with those of the Lancashire Electric Power Co. The interconnection of other electricity works in the Manchester district in a similar manner of course would be very desirable, but we understand that no definite scheme in this direction has been formulated, at any rate at present.



WAS THE CHIEF PLEASED?

**MAINS FOREMAN**, at telephone (time 4.30 a.m.). That you, sir? We didn't like to bother you before, but I thought you'd like to know that the lights have been out in feeder districts 1 and 2 since half-past ten, and that we have just got current on again.

## ELECTRICAL ENGINEERING IN THE MINING AND METAL INDUSTRIES

### THE MINING EXHIBITION

THE uses of electricity in mining are fairly well represented at the Mining Exhibition, which was opened at the Agricultural Hall on Thursday last, and continues until Saturday next. The larger proportion of the coal-cutters exhibited are electrically driven, electric safety lamps also make a good show, and other miscellaneous uses of electricity are everywhere in evidence. Electrically-driven coal-cutters are best represented on the large stand of Mavor & Coulson, Ltd. (Glasgow), where the compact machines for D.C. and A.C. working, which have for a great many years been made by this firm, are on view. To demonstrate the smoothness with which the speed-reducing gears work, one of the machines is arranged with a small handle on the motor end. The motors are cooled by an air current in a novel way. The motors are gas tight, with gauze-protected openings at each end, while on the shaft in a separate chamber from the rotor is a fan, which draws air in through one of the gauze openings and forces it through a number of small tubes, passing close to the outside of the stator stampings to the opposite end, where it is discharged into the air through the other gauze openings. The heat produced by the motor is thus carried away, first by convection to the tubes and thence by conduction to the air stream, whereby no dangerous gas or dust can be brought in contact with the interior of the motor. As is known, this company does not build many "chain" machines, but has introduced and developed the "bar-pick-quick" type, which is now made with a fast-cutting double worm. "Disc" machines are also largely made, but, owing to the liability of the cutting wheel to get jammed if certain obstructions are met with, the rotors of induction motors for driving these machines must be of the wound type, while for the bar-pick-quick machines a squirrel-cage motor is used, on which the end rings are cast solid. A new feature is a design of aluminium, micanite insulated, pommel for use with the coal-cutters and other machines. It is made in two halves, and is very convenient to wire, and is fibre-protected where necessary. This company have also a display of gate-end switch-boxes, dust-extractors, and other machinery. Other firms exhibiting coal-cutters include the Diamond Coal-Cutter Co., Ltd. (Wakefield), who make a good show of junction-boxes, gate-end cable winches, and disc and chain coal-cutters, as well as their recently introduced bar machines. The Sullivan Machinery Co. (Salisbury House, E.C.) show chain machines developed at their works in the United States. These they claim are suitable for any kind of service, and machines are now being worked for extremely hard holing, such as in anthracite, in clay pavement, and in bituminous coal containing many hard impurities. Some of the features of these machines are that the feed may be reversed without stopping the motor, resetting the jacks, or moving the feed chain; while interposed between the armature pinion and the sprocket which drives the feed chain is a friction clutch, which is adjusted so as to slip before any excessive stress can come on any part of the machine. Besides ordinary "long-wall" machines, the company also has a continuous cutter on the long wall principle for undermining coal in headings and stalls, to which a pioneering claim is made. Anderson, Boyes & Co., Ltd. (Motherwell) are exhibiting on their stand both disc and chain machines, as well as an electric header and some switchgear, including gate-end and trifurcating boxes of substantial design. "Crescent" disc coal-cutters are shown on the stand of A. Hirst & Son, Ltd. (Dewsbury). These may be obtained specially low if necessary.

Besides the exhibitions of switchgear already mentioned, the Electrical Apparatus Co., Ltd. (Vauxhall) have on view both direct- and alternating-current gear. The former is represented by a panel comprising several units, all totally enclosed. A motor-starter is fitted with a slow-motion device which allows a rapid motion from step to step, but ensures a definite stop on the centre of each. A solenoid-operated starter for the automatic or remote control of machinery is also shown. A feature of this is that the main switch and resistance-controlling levers are operated by separate iron cores, moving one at each end of a single solenoid coil. Among the alternating-current gear may be mentioned a

triple-pole oil-switch with oil level interlock, by which the switch cannot be closed unless there is sufficient oil to cover the contacts. Various samples of parts and materials are also exhibited. Electrically-driven pumps are represented on the stand of Gwynnes, Ltd. (Hammersmith), where there are one or two centrifugal pumps constructed to the order of the New South Wales P.W.D.: 75,000 gallons of water can be delivered per hour against a head of 517 ft. A special pump is also shown, in which any solids which enter the suction pipe can pass through the pump. Submersible motors, made by Submersible & J.L. Motors, Ltd. (Southall), are used for all the pumps. These motors can be used in fiery mines, as they can be totally immersed in a tank of water. Another branch of heavy electrical equipment is supplied by the Union Cable Co., Ltd. (Dagenham Dock), who have a range of samples showing all classes of insulated cables for power, light, traction, and telephony, as well as a display of bitumen-insulated mining cables and joint-boxes.

Among the electric safety lamps shown are those on the imposing stand of the "Ceag" Electric Safety Lamp Co., Ltd. (London), where a multitude of "Ceag" lamps are displayed. These and the other lamps awarded prizes in the Home Office competition have been already fully described in ELECTRICAL ENGINEERING, and are now well known. Charging sets, lamp racks, magneto-openers, &c., are also on view at this stand, as well as at the stand of the Cremer Lamp & Engineering Co., Ltd. (Leeds), who also make a cylindrical miner's lamp of very robust construction, as evidenced by the rough usage to which the lamps are put for demonstration purposes. Inspection lamps in aluminium cases and one in a sheet metal case, with a number of lamps on a movable steel tube, so arranged that the light can be regulated in strength and direction, are also included. Acroyd & Best, Ltd. (Morley) also show some lamps made under Hailwood's Patents, as well as their well-known relighting machine for oil lamps, while John Davis & Son (Derby), Ltd. (Derby), have an exhibition of Gray-Sussman lamps, which are made in several sizes. Special attention has been given to the battery, which does not show any tendency to leak when held upside down, and to the magnetic lock. This is of substantial construction, and can only be opened by the special magnetic opener provided. It would be most difficult to open it any other way. This firm also have on view a large variety of accessories for different purposes, including Berry interlocked switchgear with illuminated indicators, compact shot-firers, and the Davis-Fryar mechano-electric signals for haulage planes, &c., in gassy mines. These are designed to comply with Rule 15 in the Home Office Special Rules for Electricity in Mines. Instead of fixing a series of gas-proof press buttons at frequent intervals so as to avoid open sparking, a contact maker of special design is erected about every 200 yards, and in either direction from this flexible pull wires are run over guide pulleys at 5-yard intervals along the sides of the road. The patent covering this system was abstracted in ELECTRICAL ENGINEERING, December 5th, 1912. This firm, as well as Siebe, Gorman & Co., Ltd. (Westminster) show Professor J. S. Haldane's new design of catalytic detector, while Manley & Sandey, Ltd. (King's Cross), are showing their catalytic detector, which is made of an alloy with no temperature coefficient, as well as neat lamp cabin equipment.

A very imposing stand is that of Bleichert's Aerial Transporters, Ltd. (Egypt House, 36 New Broad Street, E.C.). Here there is a working model of an aerial wire ropeway and relief models, in gypsum, of the large ropeway built for the Famatina Mines in the Argentine, and of the remarkable wire ropeway built for Wilkins & Wiese in East Africa. This line is about 5½ miles long and has a rise of 5,000 ft., equivalent to a gradient of 41 degrees or 86 per cent. Besides a full size 4-wheel carriage there is a full size working model of an automatic telfer. These lines are fitted with remote control, as are, of course, those driven electrically. A natural size telfer car, as used in mines and iron works, is also working. The motive power is supplied by enclosed electric motors, and a patent block system is provided, so that collision on the track, at crossings or switches, are impossible. The cars can be provided with winches for lowering and hoisting, or with automatic grabs for handling ores, coal rubbish, &c. These

automatic cars have been constructed for effective loads up to 2½ tons.

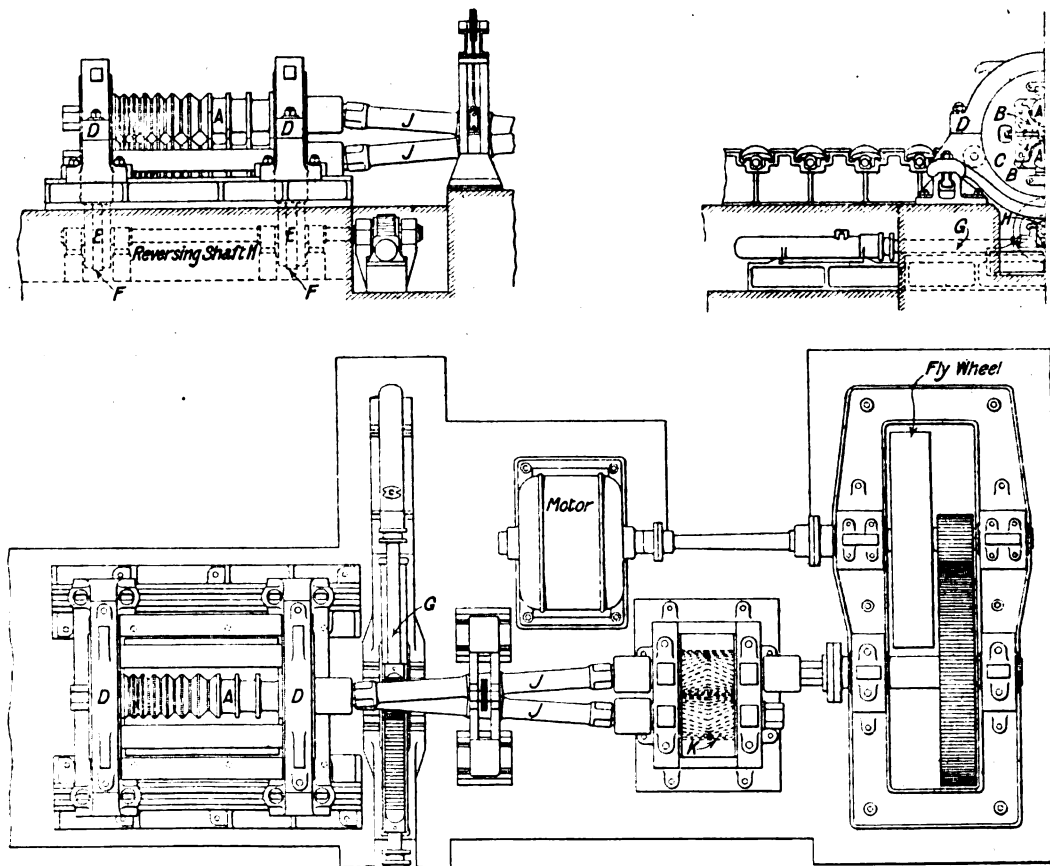
Electricity is also the agent for transmitting power to the fans, blowers, portable forge, &c., exhibited by Jas. Keith & Blackman, Ltd. (Farringdon Avenue), and for the many "Sirroco" centrifugal fans shown by Davidson & Co., Ltd. (Belfast), on their interesting stand, where there is a model arrangement for reversing the air current without touching the motor; while the Mining Appliances Co. (Sheffield) have a working exhibit of a through conveyor and other appliances. Neither can one leave the subject of the exhibition without a word about the Kennicott Water-Softener Co. (Wolverhampton), who show one of their latest type "K" small plants for 1,250 gallons capacity—plants up to 30,000 gallons per hour have been made. The apparatus depends on the action of lime and soda, and is so arranged that it is continuous and wholly automatic in its action. If the water to be treated has "temporary" hardness only, no lime is required, and the revolving sludge pipes prevent accumulation of sludge, so that the tank never requires opening for cleaning. On this stand there is also a tray-type boiler feed-water heater for the utilisation of exhaust steam. Directly associated with the use of electricity is the epicyclic speed-reducing gear shown by Joseph Baker & Sons, Ltd. (Willesden Junction). These gear wheels have a large number of accurately cut teeth, so that the driving force is equally distributed. Several speeds forward and a reverse may also be easily provided for. A self-adjusting earthing and continuity clip which fits any size cable, conduit, or pipe, is shown by Hann & Ingle (Manchester), and an interesting exhibit of the pulmotor automatic oxygen-reviving apparatus is shown by Richard Jacobson (Shoe Lane, E.C.).

### A NEW FORM OF ELECTRICALLY DRIVEN ROLLING MILL

ONE of the Papers read at the May meeting of the Iron and Steel Institute in London was on "A New Form of Electrically-driven Two-high Continuous-running Reversing

the cost of current was low enough. For light sections the three-high continuous-running mill was practically universal, and in such cases the electric motor left nothing to be desired. For larger sections, however, there was the objection that complicated live roller tables were required to rise and fall at each pass, and there were difficulties in the exact setting of the rolls. These considerations had caused many steel-makers in the country to prefer the two-high reversing mill, even though its driving was less economical.

This being so, it occurred to the author that if two-high section rolling mills could be designed so as to be capable of being driven by a continuous-running electric motor, and at the same time give the necessary reversals to the bar at each pass, this would go a long way to meet the difficulties. The root idea of his new system by which this is accomplished is that, if in a mill with two rolls arrangements can be made to make the bottom roll the top roll, and vice versa, then at each reversal of the position of these rolls there will be a pass in the opposite direction. Referring to the figure, the two rolls, A, are mounted in the usual form of chocks, B, contained in the circular gables, C, which gables are free to rotate in the fixed frames or housings, D. In order to make the turning of the gables easy, these are carried on broad revolving anti-friction rollers, E, placed immediately under the gables, and carrying their weight. These anti-friction rollers have part of their breadth formed into a spur pinion, F, which gears with corresponding teeth in the rotating gables. By means of a hydraulically-operated rack, G, gearing into a pinion on the bottom roller shaft, H, the rotation of the gables is quickly effected, the time taken being only three to five seconds, and the stroke of the hydraulic rams is just sufficient to bring the rolls to their exact position at each reversal. To provide for the alternative change in the position of the top and bottom roll, the driving spindles, J, conveying the power from the mill pinions, K, to the rolls, A, are disposed in the manner shown on the drawing, and the weight of these spindles is borne up in their centre by a balanced carrying gear, the weight of the descending spindle balancing that of the ascending spindle



PLAN AND ELEVATIONS SHOWING GENERAL ARRANGEMENT.

Mill," by Mr. A. Lamberton. The author was not fully convinced of the advantage of electrical driving over other methods for large reversing mills, but said that all engineers were in agreement that where rolling mills could be driven by a constant-running motor associated with a heavy fly-wheel, electrical driving was to be preferred, provided that

at each reversal. The mill pinions are placed side by side, and not superposed as is usual, as this reduces the angle on the spindles during reversals. The first mill of this new type is now in course of construction, and will be put to work in a large steelworks in England in the early summer.

During the discussion, the opinion was expressed that from



3 to 5 seconds was rather a long time for reversal of a mill. Some points in the mechanical design of the proposed mill were also criticised. Another speaker was distrustful of a flywheel in conjunction with a continuously-running motor, but Mr. Lamberton, in his reply, pointed out that there was no danger because there was the braking spindle between the flywheel and the mill. He had always thought that a continuous running motor, coupled to a flywheel, was the finest drive for a rolling mill.

### ELECTRIC MINERS' LAMPS

THE Gray-Sussmann (Nos. 3 and 4), the Oldham, and the "Ceag" miners' electric safety lamps have been approved by the Home Office for use in mines.

According to the official description, the Gray-Sussmann lamp, which is illustrated in Fig. 1, possesses the following essential parts:—(1) A sheet-steel case with securely soldered joints, tinned or galvanised, and enamelled on the inside. (2) An electrical accumulator, so constructed as to prevent escape of the liquid whatever the position of the lamp, whilst allowing the escape of gas generated by chemical action in

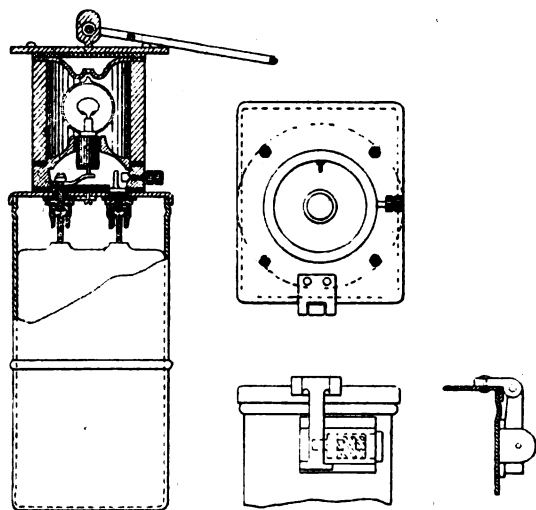


FIG. 1.—GRAY-SUSSMANN LAMP.

the accumulator. (3) A hinged stamped-steel cover, tinned or galvanised, forming a flame-tight connection with the case, and secured thereto by (4) an efficient locking device of one or other of the following types:—(a) A lead rivet lock; (b) a magnetic lock, so constructed that the bolt can only be withdrawn by applying the pole of an electro-magnet to the face of the lock. (5) An insulated domed base plate of aluminium or brass, secured to the cover of the case by means of a screw, and carrying the bulb, switch, and two spring contacts making connection with the terminal lugs of the accumulator. (6) A flame-tight screw-switch in the base plate. (7) A top-plate of aluminium or brass, carried by four brass pillars screwed to the top plate, and secured to the cover of the case by nuts on the inside and outside of the cover. (8) A stout protecting glass held in position by the top-plate and pillars, and forming flame-tight connections between the top- and base-plates by washers of indiarubber or asbestos.

The lamp is approved for use under the following conditions:—Provided—(1) That the lamp may be made in two sizes, one of which shall be named the Gray-Sussmann Electric Safety Lamp No. 3, and the other the Gray-Sussmann Electric Safety Lamp No. 4. (2) That the total weight of the lamp is not more than  $5\frac{1}{2}$  lbs. in the case of No. 3, and 6 lbs. in the case of No. 4. (3) That the strength of material and attachments throughout the lamp is not less than in the sample submitted to tests on the 4th March, 1913. (4) That the lamp shall be capable of maintaining a light of not less than 1 candle-power all round in a horizontal plane throughout a period of not less than 9 hours, and also of giving a light of not less than 1.5 candle-power over an arc of 45 degrees in a horizontal plane. (5) That the lamp has been made at the works of Mr. W. E. Gray at 19 Archer Street, Camden Town, London. (6) That the lamp shall have marked upon it its name and the name of the maker.

The Oldham lamp is illustrated in Fig. 2, and according to the official description, possesses the following essential parts:—(1) A solid drawn steel case (tinned). (2) An electrical accumulator, the terminals of which are fitted with spiral springs carrying rubbing contacts: the construction of the

accumulator being such as to prevent escape of the liquid, whatever the position of the lamp, whilst allowing the escape of gas generated by chemical action. (3) A top screw plug carrying the bulb, protecting glass, pillars and crown, and forming a flame-tight connection with the case: the protecting glass, pillars and crown, being of any of the types shown in the plate. (4) A bottom screw plug carrying the accumulator

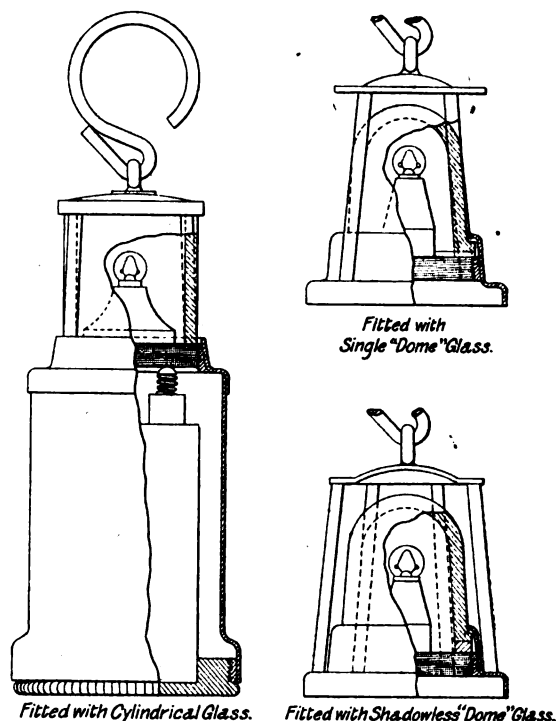


FIG. 2.—OLDHAM LAMP.

and forming a flame-tight connection with the case. (5) An efficient locking device of one or other of the following types, to prevent unauthorised persons from unscrewing the bottom plug, viz.—(a) A brass locking bolt, held in position by a lead rivet; (b) a magnetic lock, so constructed that the locking bolt can only be withdrawn by applying the pole of an electro-magnet against the cover of the lock.

It is approved for use:—Provided—(1) That the total weight of the lamp is not more than 5 lbs. 4 ozs. (2) That the strength of material and attachments throughout the lamp is not less than in the sample submitted to test on the 7th and 8th January, 1913. (3) That the lamp shall be capable of maintaining a light of not less than 1 candle-power all round in a horizontal plane throughout a period of not less than 9 hours, and also of giving a light of not less than 1.5 candle-power over an arc of 45 degrees in a horizontal plane. (4) That the lamp has been made at the works of Messrs. Oldham and Son, at Denton, near Manchester. (5) That the lamp shall have marked upon it its name and the name of the maker.

The "Ceag" lamp, which obtained the first prize in recent Home Office competition, is illustrated in Fig. 3. According to the official description it possesses the following essential features:—(1) A solid drawn-steel case (tinned), strengthened by pressed corrugations; fitted with securely attached steel lugs, or brass screw ring, for the attachment of the cover. (2) An electrical accumulator, the terminals of which are fitted with spiral springs carrying rubbing electrical contacts; the construction of the accumulator being such as to prevent escape of the liquid, whatever the position of the lamp, whilst allowing the escape of gas generated by chemical action. (3) A cover, carrying the pillars and crown, either (i) of stamped steel (tinned), fitted on the inside with a securely attached stamped steel ring provided with feathers to engage lugs on the case; or (ii) of brass, screw threaded internally to engage the screw ring on the case. Provided that the cover, whether attached by bayonet joint or screw, shall form a flame-tight connection with the case. (4) A metal plug, with insulated connections screwed to the inside of the cover, and carrying the bulb and a spiral spring, which is kept in compression when the bulb is in position. (5) A stout protecting glass secured to the cover by the metal plug described in paragraph (4) and forming a flame-tight connection with the cover by means of asbestos or india-rubber washers. A steel spiral

spring, kept in compression between the protecting glass and the bulb, holds the latter in position. (6) An efficient magnetic lock, securing the cover to the case, and so con-

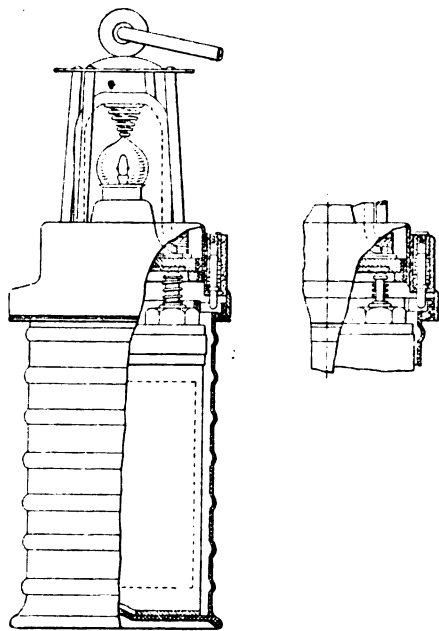


FIG. 3.—"CRAG" LAMP.

structed that the bolt can only be withdrawn by applying the pole of an electro-magnet to the outside of the lock.

The following are the conditions under which it is approved for use:—Provided (1) that the total weight of the lamp is not more than  $5\frac{1}{2}$  lb. (2) That the strength of material and attachments throughout the lamp is not less than in the sample submitted to test on the 16th March, 1913. (3) That the lamp shall be capable of maintaining a light not less than 1 candle-power all round in a horizontal plane throughout a period of not less than nine hours, and also of giving a light of not less than 1.5 candle-power over an arc of  $45^\circ$  in a horizontal plane. (4) That the lamp has been made at the Corcordia Works of the "Ceag" Electric Safety Lamp Co., in Dortmund, Germany. (5) That the lamp shall have marked upon it its name and the name of the maker.

### AN ELECTRICAL MINE HOIST IN CANADA

THE conditions in Northern Ontario have always been very favourable to the introduction of electrical driving for all mining purposes on account of the scarcity of fuel and the abundant water supplies available. The mine of the Mond Nickel Company, from which a rich nickel ore is produced from approximately 1,000 ft. depth, has been working for over ten years with electric drive. The Company has its own power-station, whence three-phase power is transmitted over a distance of four miles at high pressure to a sub-station, where the pressure is reduced 550 volts. All the motors for pumping, hauling, ventilating, winding, &c., work at this pressure. The mine hoist is driven by a 300 h.p. slip-ring motor controlled by a series relay type, reversible controller, which is in turn controlled by a master drum. The controller consists of two double pole contactor switches with blow-outs for the control and reversal of the primary circuit, and a number of similar D.P. switches for the control of resistance in the rotor. These switches are in turn controlled by 3-phase series relays connected in the rotor circuit so that they prevent the closing of the accelerating switches until the motor has come up to a certain speed and the

accelerating current has dropped to a predetermined value. The master drum is of the multi-step type, by means of which the operator is enabled to start and reverse the motor and run it at any speed desired. Should he throw the master drum quickly to the full-speed position, the motor resistance would not be cut out suddenly, but the acceleration is controlled by the series relays. The hoist is stopped by means of hand brakes, and is equipped with an emergency brake, which is set by a falling weight, this weight being held suspended by a latch. On failure of the line current, this latch is tripped by an A.C. solenoid, and after the current is re-established the brake is re-set by hand.

### ELECTRIC MINING AND METALLURGICAL PATENTS OF MAY

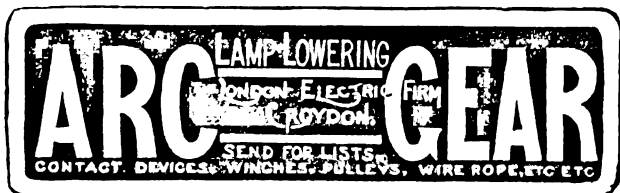
#### Mining.

The Specifications which were published by the Patent Office during May, having particular interest for mining electrical engineers, include No. 5,073/13 by H. F. Joel (Forest Gate). This covers a simplified mechanical construction of the casing and switch in the type of miners' safety lamp developed by the inventor. The lantern and battery casing are connected by inclined slots and set screws, so arranged that when the screws abut against the ends of the slots, the switch rod and lamp and battery terminals are in their working position where they are locked. The switch rod, which passes through a hole in the battery cover, ensures that the enclosure cannot be opened until it is withdrawn to the off position. Specification No. 20,445/12 by J. Lamour (Germany) deals with blasting in fiery mines, and embraces transmitting the force of the explosion through water in a vessel in the borehole. There is no substantial ejection of water until the rock or coal has been shattered, so that time is given for the products of the explosion to be cooled. Another Specification dealing with blasting is No. 16,536/12 by N. Field (Newcastle-on-Tyne). The detonator tube is located on one side of the glass cartridge case, to which it is inclined. The two are made in one piece. The object is to protect the explosive from moisture, and to prevent perforation of the cartridge case.

#### Metallurgical.

The Specifications of interest to electro-metallurgical engineers, published during the month of May, had amongst them No. 26,165/12 by The Jössingford Mfg. Co., A/S. It is sought to combine the advantages of furnace electrodes, mounted on galleys and suspended by chains, by using a travelling electrode-carrier mounted on a trolley, which is locked to the furnace, and may be tilted with it. In No. 26,166/12, the same inventors describe an arrangement whereby, in a tilting furnace, the tilting force acts approximately in a vertical direction during the whole of the tilting operation. The tilting force acts through linkwork, so that tilting is effected along a straight track without the use of toothed gearing. Specification No. 8,791/12, granted to E. C. R. Marks (communicated by the Patents Purchasing Co., U.S.A.), covers the use in arc furnaces for the production of alloys of vanadium and aluminium and other metals, of an adjustable non-metallic hearth forming one electrode, and metallic electrodes of iron or of the metal to be reduced. The material to be treated is passed continuously, in a finely-divided state, through the arc. The hearth, which is supported on a truck, forms a temporary support, and a channel is arranged to carry off the molten material. The other electrodes are supported on trucks running on inclined guideways, and are electro-magnetically controlled.

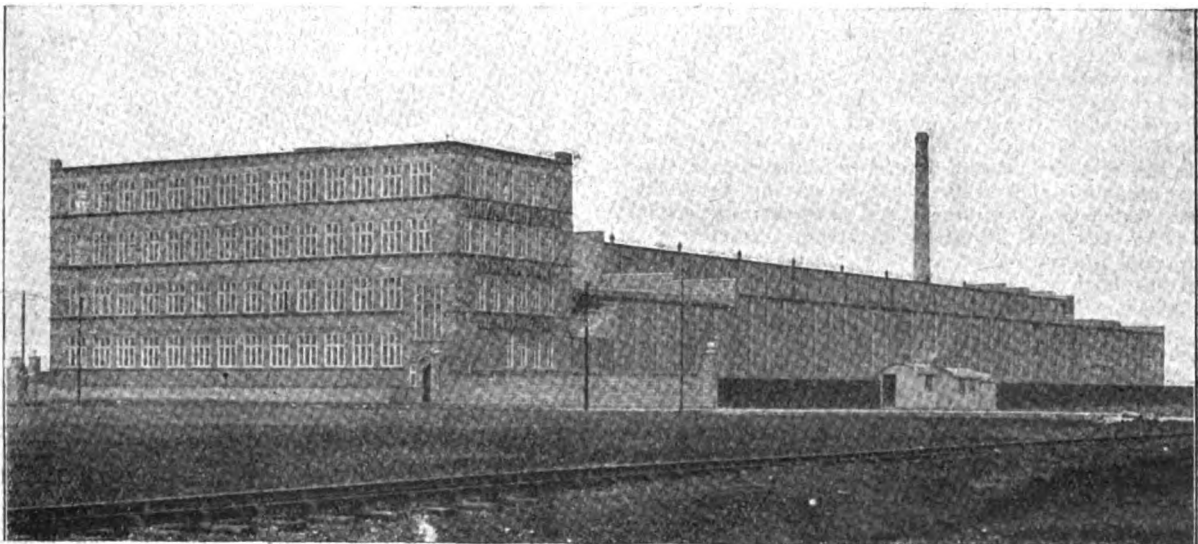
**Electrical Drive for Underground Conveyors.**—In the course of a Paper read recently before the South Wales Institute of Engineers, Mr. Sam Mavor described the construction and use of a number of types of underground face conveyor, and remarked that where electricity is the motive power the total power cost was moderate. At an energy cost of 1d., he continued, per unit, the cost for eight hours for a conveyor 100 yards long is about 3s. Where compressed air is used the efficiency is much lower, and this is emphasised by the fluctuating character of the load on the air motor, because the amount of compressed air used is more nearly proportional to the time of working than to the load upon the motor. At a cost of 0.65d. per b.h.p. delivered to the compressor (equivalent to 1d. per unit for electricity) the cost of power for eight hours' running is about 10s., without allowing anything for losses in transmission or leakage; providing for these losses the cost is about 12s. for eight hours' running.



# UNION

**ALL UNION CABLE CO LTD**  
**PAPER INSULATED**  
**LEAD COVERED CABLES**

**ARE MANUFACTURED AT THESE WORKS**



**DAGENHAM DOCK, ESSEX**

# CABLES

*When corresponding with Advertisers, please mention "Electrical Engineering."*

## EDISON BATTERY CARS

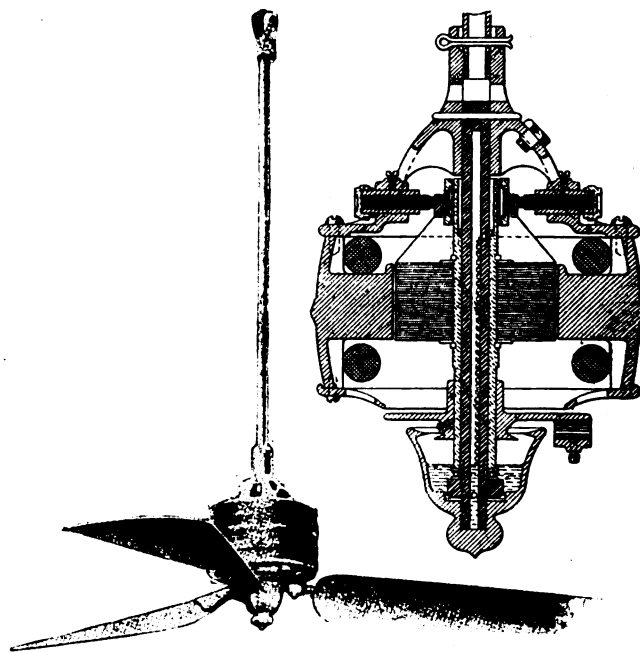
A GOOD deal of activity is now being shown in the application of the Edison battery to motor-car work in this country, not only in the direction of commercial vehicles, several of which are now to be seen about London both as demonstration vehicles undergoing trials under service conditions, and as in the case of the West Ham electricity department in permanent use, but also in the construction of private passenger cars. We announced recently that Arrol Johnson, Ltd., were putting down a large batch of electric cars propelled by the Edison battery at their works at Paisley, and we are now able to state that one of these cars, in a fully finished condition, with a handsome coupé body, driven from inside, is about to start on a trial run from Dumfries to London, which, if successful, will form an epoch-making achievement. We are not yet in possession of full technical details of the car, but we understand that it has an underhung frame, and is driven by a single motor placed about the centre of the chassis through an undertype worm gear on to the live back axle. The cells are, we believe, stowed partly in the forward bonnet, which is the well-known form adopted in the Arrol-Johnson petrol cars, and partly in the rear of the vehicle, so that the lines of the body are in no way spoilt by the unsightly battery-box, which has been a feature of some previous electric cars. The motor is rated at  $3\frac{1}{2}$  h.p., with overload capacities of 300 per cent. for  $\frac{1}{4}$ -hour and 100 per cent. for one hour. The control is as simple as possible; plain series resistances are used on the first few steps. As there is only one motor with a single commutator, series parallel control cannot be made use of in any way, nor is there any alteration in the grouping of the cells, which are kept permanently in series. The characteristic of the motor, however, enables quite steep hills to be taken on the top controller notch without undue current being taken from the battery. Thus the resistances are only in circuit at starting. The motor has an efficiency not falling below 80 per cent. from full up to its maximum overload, and thus, when developing its rated load of  $3\frac{1}{2}$  h.p., must take about 50 amperes from the 65-volt battery. We regret that at the time of writing we have not full details of the battery capacity, nor the weights of the battery and car before us, but we are told that with extreme care in driving, as much as ninety miles can be run on one charge with a battery of the size in question, or from thirty-five to sixty in ordinary work, according to circumstances. It is not intended in the forthcoming run to attempt records in this direction; attention will rather be concentrated on proving reliability and ability to run to a given time-table.

The car, which, we understand, will carry an independent observer is to start from Dumfries on Monday morning next at 5 a.m., and is expected to arrive at Carlisle at 8, where a stop of one hour will be made for charging and breakfast. Penrith, where a half-hour's charge will be taken, should be reached by 10.30, and the next stop of one hour for charging and lunch is to be made at Kendal, which is timed to be reached at 1.30, and a further short charge will be taken during a half-hour stop from 4 o'clock at Lancaster, where the Mayor and other notabilities have promised to inspect the vehicle. Continuing, Preston will be reached at 6, where an hour is allowed for dinner for the battery and passengers. The first day's run is to conclude at 9.30 at Manchester, a total distance of 159 miles in  $12\frac{1}{2}$  hours' running time. Evidently no attempt will be made to approach the legal limit. The next day's run will be arranged on similar lines, with stops probably at Rugby, Northampton, Bedford, Luton, Hitchin, and Barnet; this rather roundabout route is necessarily chosen to take advantage of charging stations. London is expected to be reached finally at 11 o'clock on Tuesday evening. The trip will be a remarkable one, and should do much to draw attention to the possibilities of the Edison battery, but of course it is not intended to imitate real touring conditions such as can be met with a petrol car of higher power. The true field of the electric car is for urban work, where a low speed and limited radius of action is all that is necessary, and for such its cleanliness, simplicity, ease of control, and, in these days of rising petrol prices and falling electricity tariffs, probably also its cheapness of running give it an excellent chance of popularity now that the Edison battery, with its appreciably lighter weight and greater robustness than the lead battery, is available. Already, as we have indicated above, a good start has been made in commercial work, where the good qualities of the Edison battery show perhaps to the best advantage, and we must congratulate Mr. W. H. L. Watson, of "Edison Accumulators" (41 Great Portland Street), on the progress he has made in the short time during which he has had the matter in hand in this country. Those

unfamiliar with the construction and working of the Edison alkaline nickel-iron battery may be referred to detailed articles which appeared in *ELECTRICAL ENGINEERING*, October 12th, 1911, Exhibition Supplement, page 67, and May 19th, 1910, page 319.

## THE SWAN CEILING FAN

AN ailment common to many ceiling fans is the leakage of lubricant from the upper bearing, not only on to the commutator and armature, but on to the fan blades, where it is reinforced by a further leakage from the lower bearings, and is disseminated about the room. Attempts to overcome this difficulty have taken the form of a lower thrust bearing designed to sustain the whole weight of the fan, and to relieve the upper bearing of the necessity for lubrication. In such an arrangement the slightest error in the centring of the armature in the field magnets sets up such severe strains in the overhung bearing, owing to want of balance in the magnetic pull on the armature, that the bearing is quite unable



SWAN PATENT CEILING FAN, SHOWING DETAILS OF MOTOR.

to withstand them. In the Swan ceiling fan, which is manufactured by the General Electric Co., Ltd. (67 Queen Victoria Street, E.C.), the problem has been met by combining the advantages of an end thrust bearing with those of a lubricated upper bearing. First, a simple bearing has been designed to which no exception can be taken for rigidity and freedom from stresses arising from a de-centring of the armature, and, secondly, the upper bearing is adequately lubricated for the work it is called upon to perform. An idea of its general construction is to be gained from the illustrations. The design frees the fan from all the troubles arising from leaking lubricant, and at the same time gives the fan considerable constructional strength.

**Institution of Electrical Engineers.**—The following is the result of the ballot for new members, and transfers from one class to another, at the annual meeting on Friday:—**Members:** H. Leitner, A. N. Moore. **Associate Members:** G. W. Carpenter, F. J. Culligan, E. I. David, W. da F. Davids, A. Davis, P. A. Fildes, E. W. Fulcher, E. C. Gage, G. F. Gregory, A. R. Hemsted, S. Hill, N. V. Lloyd, N. McLachlan, E. P. Neate, R. O. Neil, S. C. Newton, J. I. Robertson, E. Sidgwick, T. Smith, T. W. Smith, G. E. Swift, A. H. Trench, C. R. Ward. **Associates:** I. Hemmings, G. Phillips, O. Thomson. **Graduates:** A. J. Arthur, J. H. Borland, P. H. Brewer, E. F. Hollands, G. N. Hurst, C. H. Jeffcoat, W. H. King, A. McPherson, M. R. Soi. **Students:** A. E. Beach, R. Dods, L. D. Hill, P. V. Hoare, J. W. Kilby, F. H. Lawrence, P. J. Wood. **CANDIDATES TRANSFERRED:**—**Associate Member to Member:** R. L. Alkin, J. D. Dallas. **Associate to Associate Member:** F. E. Davies, A. B. Newman, C. Turner. **Graduate to Associate Member:** H. G. Furlong. **Student to Associate Member:** R. D. Fairclough, G. Ingram, P. E. Peronne, L. F. Summers, T. H. West, J. M. Whellens. **Student to Graduate:** H. Bond, D. N. Jenkins, F. P. Lacey, H. J. Loughlin, S. K. Srivastava.



## ANNUAL MEETING OF INSTITUTION OF ELECTRICAL ENGINEERS

THE annual meeting of the Institution of Electrical Engineers was held on Friday, May 31st. The first business was the announcement of the result of the ballot for new members of Council, the nominations for which were given in our issues of April 8rd, p. 183, and April 24th, p. 224. Mr. R. A. Chattock, City Electrical Engineer, Birmingham, was elected to the vacancy as an ordinary member of Council; to fill the three vacancies as associate members of Council, Mr. F. E. Berry, Capt. E. O. Henrici, R.E., and Mr. A. W. Martin were elected; and as associates, Mr. E. Russell Clarke and Mr. A. M. J. Ogilvie were elected. The honorary officers were also re-elected.

The annual report of the Council, abstracted on p. 284 of our issue for May 22nd, was then adopted without discussion.

Mr. Robert Hammond, the Hon. Treasurer, in presenting his annual report, said that the revenue from amount received for life compositions had not been treated as revenue for the year, but had been invested. He also drew attention to the fact that the enlarged funds of the Institution had permitted the purchase of some very much needed experimental apparatus. The assets of the Institution, he added, amount to £110,368, against liabilities of £45,150. The accounts were then adopted. Votes of thanks to the honorary officers concluded the proceedings.

## THE WALSALL ELECTRICITY UNDERTAKING

THE full text of the report of Mr. E. M. Lacey on the condition of the Walsall electricity undertaking, together with the comments thereon by Mr. A. S. Barnard (Borough Electrical Engineer), and the report of the Electricity Committee, are now available.

Mr. Lacey attributes the recent troubles to the inability of the boiler-house plant to raise sufficient steam to deal with the load without undue forcing, which led to inefficient working and deterioration of the plant without opportunity for laying off for repair. In view of the urgency of the matter he sent in an interim report in February urging immediate boiler extension. He gives a full description of the plant, and condemns very strongly the condition of the mechanical stokers, forced draught plant, flues, economisers, &c., and comments on the unsuitable quality of coal used. With regard to the allocation of responsibility, Mr. Lacey considers that had it not been for difficulties with the Local Government Board which prevented Mr. Barnard's advice being adopted, the undertaking would not have sustained the heavy financial losses of the past 12 months. The most serious of the difficulties were due, he considers, to causes beyond the control of the committee or of the Electrical Engineer. Repairs were recommended to the auxiliary, as well as the provision of a new boiler at a total cost of about £5,200. In general, however, Mr. Lacey reports that the site of the station is unsuitable, the design of the station is bad, and the only proper way to provide for the future is to erect forthwith a new 3,000 kw. station, capable of ultimate extension to 12,000 kw. In the meantime increases in the tariff are recommended.

Mr. Barnard in his remarks points out the very heavy strain put on the station, and discusses the condition of the plant in some detail to show that Mr. Lacey's remarks that "there were causes for the apparent negligence," which were beyond the control of the station staff. At the same time, he complains that his staff was inadequate, that he was never allowed to have a fully qualified chief assistant, and that his recommendations as to the control of the station during his six months' illness were not followed.

The Electricity Committee, in considering these reports, are unwilling to free the engineer entirely from blame regarding the unsatisfactory condition of the plant, but approve of the retention of his services, pending the result of the present year's working being known. A Works Sub-committee is appointed to keep a watch on the matter. Some of the immediate recommendations of Mr. Lacey have been carried into effect, and a

reorganisation of the staff has been made. Having regard to this provision of additional boiler plant, the question of a new station is shelved for the present, and other matters in Mr. Lacey's report are still under consideration.

## ELECTRICAL EQUIPMENT AT AN ASYLUM

THE self-contained electrical equipment of the new Severalls Asylum at Colchester is interesting on account of its completeness. Electricity is used for lighting and power throughout the premises. The engine-room is 51 ft. long, 36 ft. wide, and 15 ft. high. The interior walls are lined with white glazed brick relieved with a dado of green. There are three Paxman engines, supplied with steam at 120 lb. per sq. in. from dry-back boilers. Two drive 100 kw. compound dynamos giving 470 volts at 450 r.p.m., and the other drives two 50-kw. machines forming a steam balancer. There is also a motor balancer consisting of two 235-volt 15-kw. machines. No battery is at present installed, but provision is made for one to be added at a future date. The main switchboard is placed at the end of the engine-room. It consists of marble slabs mounted on an iron frame let into the end wall, and is raised about 6 in. from the floor, and is protected by a hand-rail. Plant, switchgear, and travelling crane were supplied by the British Thomson-Houston Co., Ltd. (Rugby). The heating and hot-water supply is furnished by the exhaust steam from the engines at about 5 lb. per sq. in. to calorifiers which are also fed with live steam through reducing valves. The steam-pipes, valves, &c., were supplied by Aiton and Co. (Derby). The Asylum buildings are constructed in the form of a large rectangle with several spur wings, and the wiring is carried out through a subway about 8 ft. wide by 6 ft. 6 in. high, which runs under the whole of the rectangular portion, with creepways under the wings. From the switchboard feeders are carried to a triple concentric ring main running the whole length of the subway and supported in wooden cleats bolted to the walls. Some of the larger services are connected as three-wire and the remainder as two-wire. The supply pressure is 460 and 280 volts. Special mains supply the covered ways, connecting the various blocks with two distinct services, and others supply power to the laundry, bakery, &c. Twin lead-covered wires are used for the lighting of the covered ways, and the general wiring is carried out in wood casing with covers in the form of a circular arc, so that the lodgment of dust may be a minimum. Plain pendant fittings are used as much as possible, with a specially designed bulkhead fitting for the single rooms and batten-holders in the covered ways and subways. Two-way switching is employed, so that the night watchman can switch on a section as he approaches, and off as he passes through. All the water required is pumped by electric motors, and two 20-h.p. fire-pump motors are also installed. A 8-h.p. motor in the bakery is used for the kneading and mixing machines, while over 50 h.p. is supplied by four motors for the washing and drying machines in the laundry. Others will be added as required. The motors were supplied by Mawdsleys, Ltd. (Dursley).

In addition, a central battery telephone system, a fire alarm, and a central time recording system is installed. The complete wiring was carried out by H. J. Cash and Co. (Westminster), while the consulting engineer for the whole scheme was Mr. W. C. C. Hawtayne (9 Queen Street Place, E.C.), to whom we are indebted for these particulars.

**The Ghent Exhibition.**—A preliminary list of the British exhibitors has been issued by the Board of Trade Exhibitions Department. Among electrical and engineering firms that are represented may be mentioned the British Westinghouse Co., Ferranti, Ltd., the Harper Electric Piano Co., R. O. Lister and Co. (Dursley), Reavell and Co., Sanders, Rehders and Co., and Vickers, Ltd.

**The "Point Fives."**—The discussion at the meeting on June 17th at the Delico Restaurant will be opened by Dr. Ferranti. Several general points were unanimously agreed after the debate on the standardisation of electric cookers at the special meeting on May 23rd. These were: (a) that cooking ranges (consisting of oven, with at least two circuits, grill, and hot-plates) should have each subcircuit separately fused, and each protected by a switch; (b) switches and fuses should be easily accessible, and so positioned that they cannot be unduly heated or damaged by liquids; (c) provision should be made for efficient earthing; (d) at least one separately-fused indicating device to show whether any circuit is closed should be fitted; and (e) manufacturers and designers should endeavour to develop a hot-plate which will work satisfactorily at a red heat. It was not found practicable in the time available to come to any decision on the subject of tariffs. Further consideration of this subject was therefore deferred to a future meeting.

## British Association Reports on Electrical Standards

Reprinted by permission of the Council and collected in one volume. A record of the history of Absolute Units and of Lord Kelvin's work in connexion with these.

With ten plates.

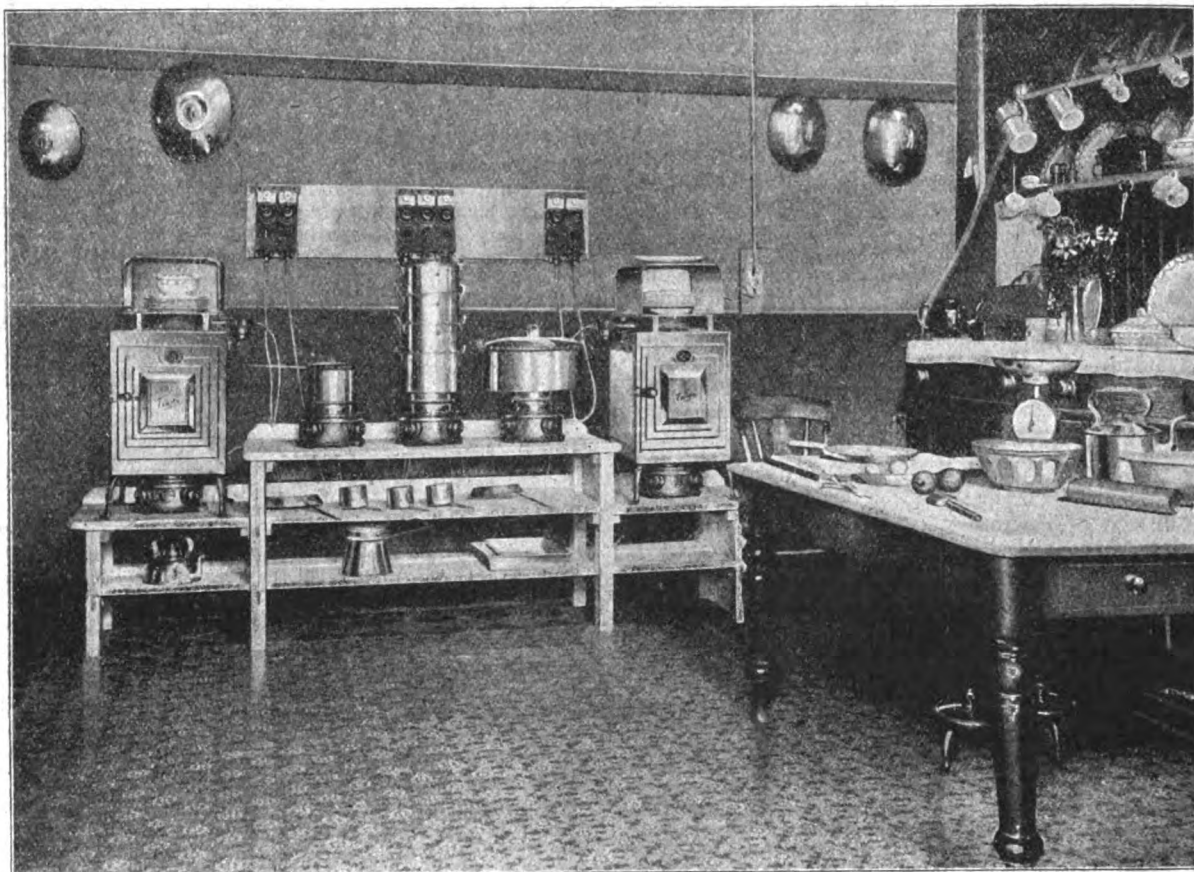
Demy 8vo. pp. xxiv + 784. 12s 6d net

**Cambridge University Press**

Fetter Lane, London

## A "TRICITY" COOKING OUTFIT

BY the courtesy of the British Electric Transformer Co., Ltd., we are able to illustrate here a "Tricity" cooking equipment which is in use at the house of Alderman J. P. Smith (Chairman of the Electricity Committee, Barrow-in-Furness). In addition to the apparatus shown in the illustration, there are two more single cookers which can be used on



'TRICITY' COOKING EQUIPMENT IN A PRIVATE HOUSE.

a table placed in front of the kitchen range, controlled by two panels similar to those shown in the illustration. These are for either heating an urn or for grilling operations. The hot-water supply of the house is taken care of by an independent coke stove which has been fixed near the kitchen range. The installation has only recently been completed, but we understand the average consumption for cooking for a household of five adults is 8 units per day. During the second week in May, Mr. F. S. Grogan, of the British Electric Transformer Co., Ltd., gave a series of lectures and demonstrations, and the Corporation of Barrow-in-Furness have decided upon a scheme for hiring out "Tricity" cooking outfits to their consumers.

**Shipping Exhibition.**—A Shipping, Engineering, and Machinery Exhibition is to be held at Olympia in the autumn of next year. Arrangements are being made whereby the exhibition will be run on co-operative lines by the industries concerned, and several large shipping and engineering firms have already promised support. The organising managers are Mr. C. H. Luke and Mr. F. W. Bridges.

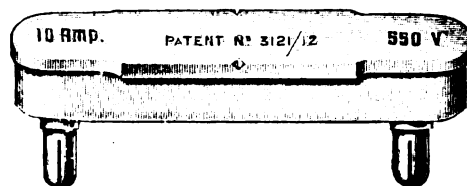
**The British Electrical and Allied Manufacturers' Association.**—The Wilson-Wolf Engineering Co., Ltd., and Tilghman's Patent Sand Blast Co., Ltd., have been elected Members of the Association, while Maschinenfabrik Augsburg-Nürnberg A.G. has been elected an Associate.

**"The Central."**—The May issue of the magazine of the old students of the City and Guilds (Engineering) College, South Kensington, contains an interesting article entitled "Some Notes on the Present Position of Electric Traction," by Mr. L. Calisch. This is an illustrated second instalment—the first appeared in *The Central* for August, 1912. Among other articles may be mentioned one on "Precise Surveys for Tunnel Alignment," by Mr. J. L. Busfield, and one on "The Development of the Æsthetic Sense in Engineers," by H. E. A. This deals largely with lead paints, and is written in humorous vein. A large number of personal and general notes are also included.

## NEW ENCLOSED FUSES

A NUMBER of important improvements in the design of enclosed cartridge fuses have been embodied in the "Rex" totally enclosed fuses, which are made and supplied by the General Electric Co., Ltd. (67 Queen Victoria Street, E.C.). These fuses may be obtained for 2, 4, 6, or 10 amperes capacity at 250 or 550 volts at a very moderate price. The

neatness of the design is seen from the illustration, which shows a 10-ampere 550-volt size. All the metal parts are shielded, and fuses of one capacity are not interchangeable with those of another capacity. An efficient indicating device is provided, and, owing to the sealing arrangements, no



explosion or arc ensues, even on a dead short. They may be obtained made up on distribution boards in wooden or iron cases, and a design suitable for use in existing spring clip fuse boards, with  $2\frac{1}{2}$  in. break, is also available. An allowance for blown fuses is made by the company. Descriptive leaflets dealing with these fuses are now obtainable on application.

**Factory Lighting.**—The Home Secretary has appointed Professor C. S. Sherrington, F.R.S., D.Sc., of Liverpool University, to be an additional member of the Departmental Committee on the lighting of factories and workshops.

## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,341.

A system of discriminating fault protection has been recently developed in which the difference under fault conditions of the currents flowing in two concentric conductors in parallel, and normally equal, is utilised to trip the switch. It is desired to apply this system to three single concentric cables in parallel originally laid for A.C. single-phase distribution, but now required to be converted to three-phase as feeders. What are the objections to this arrangement, and what is the formula for mutual induction of the cores (1) when currents are equal and in the same direction; (2) when one current is larger than the other, but both in the same direction; (3) when one current is in the opposite direction to the other? What would be the effect of a stray field on each core; for instance, how would the voltage induced in the cores compare if a length were suddenly drawn sharply through a magnetic field?—"KINK."

(Replies must be received not later than first post, June 12th.)

### ANSWERS TO No. 1,337.

**Coal Mines Act Electrical Rules:**—Rule 14, C (1), requires "the thorough examination of all apparatus (including the testing of earth conductors and metallic coverings for continuity) as often as may be necessary to prevent danger; and (2) the examination and testing of all new apparatus, and of all apparatus re-erected in a new position in the mine before it is put into service in the new position." Under ordinary circumstances how often will it be advisable to test earth conductors and metallic coverings, and what other "examination and testing" is necessary on the following plant? How may we prove that we have continuity and suitable carrying capacity of all armour and earth conductors? We have two 2,000-kw. generators, 3,000 volts, 40 cycles, three phase; current is transmitted at this pressure to three seams at different depths. In these seams we have haulages working direct at 3,000 volts; also in each seam we have transformers stepping down to 440 volts for pump motors and small haulage, and small lighting transformers 440 to 110 volts. The cable from the H.T. switch-board in the power-house to each seam is three-core, paper-insulated, lead-sheathed, and double-wire-armoured; it is fixed to sides of shafts by wooden cleats, and the shaft is comparatively wet. We use the lead sheath and armour as our main earth connection to surface earth plate. The shaft cable is led to a distribution board in each seam, from which all cables in use are also double-wire armoured, and the armour in every case is used as main earth wire between each motor, &c., and main cable armour to surface. I may mention here that in some places the cables are buried in the ground. We have two C.I. earth plates at the surface, and one in the sump at each seam. We transmit about 600 kw. into each seam. The depths of the seams below surface are 400 yards, 500 yards, and 680 yards. At each motor we connect up the switch, controller, motor frame, &c., to a common copper earth wire, and this to armouring of cable by means of W.I. clamps, as, of course, we cannot solder terminals on here underground.

"ASSISTANT ELECTRICIAN."

The first award (10s.) is made to "C. L.," and the second award (5s.) to "Colliery Electrician." We publish these in slightly abridged form. Reference should also be made to

ELECTRICAL ENGINEERING of August 15th, 1912, p. 457, in which a set of 12 rules, to be issued by the mine manager to the working electrician-in-charge, is suggested.

### QUESTION No. 1,337. ANSWER.

"C. L." writes:—The electrician ought to examine all plant at least once in every week, as follows:—

Follow the main cable in-by, and see that all suspenders or other fastenings are intact; examine each joint-box carefully, and, by taking hold of the earth wire that connects the armouring at each end of joint box with the fingers, satisfy yourself that this is secure, and if necessary tighten screws with screwdriver. All earth wires of motors and apparatus should also be tried as above, as they are liable to work loose.

Oil switches should have their baths removed at least once in every month, the period between each inspection depending upon the purpose for which the switch is being used. The oil should be tried by dipping the hand in and scraping fingers along bottom of bath; if the oil is thick or of very dark colour, and if any residue is at the bottom, the bath must be cleaned and the oil filtered or renewed. Liquid controllers should have part of the liquid renewed every fortnight.

Metallic controllers should be inspected every fortnight at least (in the case of large units every week), and burnt contacts renewed or dressed up with a file.

To prove metallic continuity of earth wires to bank, unfasten the main connection of earth wire and armouring that forms the earth to bank at both ends of main intake cable. With the current "off," short-circuit one conductor and armouring, and test as in Fig. 1 from the other end with an accumulator battery. The resistance of the armouring will be  $\frac{V}{A}$  less the resistance of one core of the cable. [A better way is to

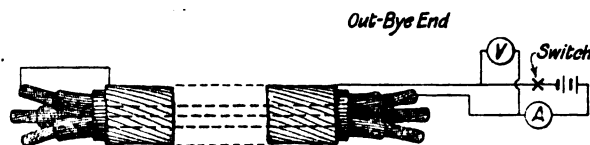


Fig. 1.

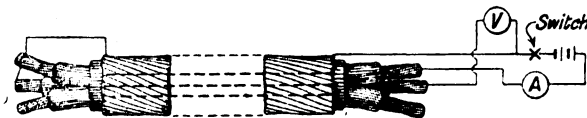


Fig. 2.

connect as Fig. 2, when the resistance of the armouring is simply  $\frac{V}{A}$ —Ed. E.E.]

Assuming a competent electrician in charge, a test for continuity of earthing system to bank need only be made about every three months. The Rules demand that conductivity of the earth wire shall be not less than 50 per cent. that of the largest conductor used solely to supply apparatus a part of which it is desired to earth. Therefore, in the event of H.T. current transformed down to L.T., it may be found necessary to run an extra earth wire if the conductivity of earthing system to bank is to be kept within legal limits. Although the lead sheath may be connected to armouring, the lead cannot be reckoned in when estimating the conductivity of armouring.

In addition to an insulation test of motors, a feeler gauge test of the air-gap should be made at least once in every week. An "Inspection Book" ought to be kept, and the results of the systematic inspections entered up in it, e.g., gap, top 30, bottom 25, say. When a belt drive is used, the feelers ought to be inserted into that part of the gap which the belt pull tends to reduce. Brushes of D.C. machines should be carefully examined, and renewed in the case of tips being broken off. Switches ought to be tried for tension, as insufficient "tension" will cause heating of contact surface. Large transformers of the oil type should be "sludged" occasionally, and the oil tried for moisture. This can be done by taking a sample of oil in a glass jar and inserting a red-hot piece of, say,  $\frac{1}{4}$ -in. iron; if moisture is present there will be a crackling noise. Lightning arrestors should be examined and kept clean.

All new apparatus ought to be efficiently earthed and tested for insulation resistance by a "Megger," and a final inspection



of oil baths made to be doubly sure that these are at the correct level.

"COLLIERY ELECTRICIAN," who is electrician of a modern three-phase colliery plant, describes the methods adopted there in endeavouring to comply with Rule 14, Section C 1 and 2, as follows:—

We examine all oil-immersed gear, such as motor control switches, controllers, and resistances, weekly. A record is kept of condition of same, and also of the state of the oil; the oil is changed at intervals. This examination is made on night duty, a few motors being examined each night. The condition of the slip-rings and brush-gear is also paid attention to, and rotor clearances are taken monthly.

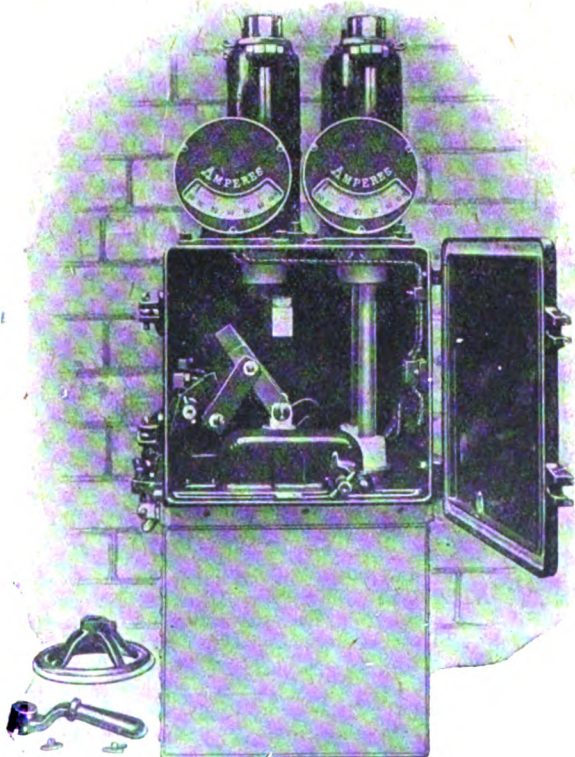
An insulation test is taken of the whole system monthly. Each section taken by itself from the low-tension board in the transformer house. The procedure is as follows:—The supply is cut off from the section, and then the switches at the various motors are put in, and the controllers put on *first step*, which, of course, allows us to test through whole of resistance and motor.

For testing continuity of cores and armouring we obtain the information by "looping," at the farthest-away motor in the section, the core of cable to the *earth wire*, which is clamped on to the armouring.

New apparatus undergoes an examination in the shop before coming down the pit, and the motors are given a twenty-four hours' running test on a testing bed. All this material is tested for soundness of insulation and continuity.

### OIL SWITCHES WITH ISOLATING DEVICES

THE illustration shows a new form of oil-switch suitable for wall mounting and containing an isolating device, which has been designed by A. Reyrolle and Co. (Hebburn-on-Tyne). The isolating switch handle mechanism is interlocked with the oil-switch to ensure that, when the circuit is broken, it must be broken on the oil-switch, avoiding any risk of arcing on the isolating contacts. Suitable provisions are made for receiving cables to accommodate the equipment on which the panels are used. The cables may be arranged to lead



in and out respectively in a vertical position, as shown on the illustrations, or, in other cases, suitable provision is made for leading the cables out horizontally.

Like all of Messrs. Reyrolle's manufactures, the workmanship is of good quality, and the new combination serves very well in place of an individual switch panel for controlling a motor in a situation remote from the power plant, where the more expensive draw-out type pillar, for economic reasons, cannot be installed.

### AN UP-TO-DATE CONDENSING PLANT

THE surface-condensing plant supplied by the Mirreles-Watson Co., Ltd. (Scotland Street, Glasgow) for the 3,000-kw. turbo-alternator which forms the latest addition to the plant at the Pinxton power station of the Glasgow Corporation Tramways, contains several interesting features. It is designed to deal with 72,000 lbs. of steam per hour, at which duty it is capable of giving a 28-in. vacuum when supplied with cooling water at 70° F. The condenser is of the wedge-shape type, without baffle plates, and has 10,200 sq. ft. of cooling surface, which allows considerable margin for loss of heat transmission, due to scaling or dirty tubes. The circulating water passes three times through the full length of the tubes. The Mirreles-Leblanc rotary air and condensate or water-extracting pumps and the centrifugal circulating pump, are directly coupled to a 120-B.H.P. "Curtis" steam turbine, running at 2,000 revs. per minute. The water-extracting pump is capable of withdrawing the water from the condenser under the highest possible vacuum, and delivering it to a "Lea" recorder tank. The circulating water pump is capable of delivering 6,000 galls. per minute against a total head of 20 ft. On account of the high speed of the turbine drive, the impellers are of small diameter, and to pass the quantity of water required, six of these are mounted on a common spindle, where they work in parallel. The efficiency of this pump is 62 per cent. These rotary pumps, with their turbine, form a very compact group and the running is practically noiseless. There are only the revolving parts of the turbine, the pump spindle and impellers, as no gearing whatever is required.

### CATALOGUES, PAMPHLETS, &c., RECEIVED

**SWITCHGEAR.**—A series of leaflets conveniently bound in one cover describe some of the latest products of A. Reyrolle & Co., Ltd. (Hebburn-on-Tyne). The apparatus dealt with much of which has already been illustrated in our columns, includes "split conductor" protective gear under the Merz-Price patents, sheet-steel enclosed generator panels, cable glands and fittings for armoured cables, armoured wall operated switch-gear, plugs and sockets, cast-iron distribution boxes, &c.

**ROLLER BEARINGS.**—A neat booklet dealing with "Timken" adjustable roller bearings is now being distributed by The Electric & Ordnance Accessories Co., Ltd. (Cheston Road, Aston, Birmingham), who will be pleased to supply a copy to any of our readers who are interested. The booklet sets forth in clear and concise manner the weak points of ordinary ball bearings, and explains how the design of the "Timken" bearing gives it advantages over some other roller bearings on the market by the arrangements for always securing parallel-line contact, and the care taken in the accuracy of manufacture of the constituent parts combined with careful choice of materials which are subjected to special hardening treatment.

*Readers desiring copies of catalogues or pamphlets should apply to the firms in question, referring to the notice in "Electrical Engineering."*

**SWITCHGEAR.**—We have received from the Midland Electric Manufacturing Co., Ltd. (Rea Street, South Birmingham), a comprehensive catalogue of ironclad switches and fuses, motor control panels, distribution wards, fuses carriers, knife and other quick break switches, switchboards, &c. A very ample range is presented, and the prices throughout appear very moderate.

**CLUTCHES AND GEARING.**—A new catalogue from David Bridge & Co., Ltd. (Castleton Ironworks, Manchester), describes Heywood & Bridges' patent friction clutches, and illustrates a considerable range of pulleys, gearing, shafting, flexible couplings, and millwright work generally. Some useful tables are also included.

**METERS.**—A full description of the "Fortiter" continuous-current watt-hour meter is given in an illustrated booklet from the Union Electric Co., Ltd. (Park Street, Southwark, S.E.). This contains some interesting special features, notably as regards the design of the brush gear, the patent locking device, and the ease of access to all vital parts without removing the cover.

**The Electrical Trades Benevolent Institution.**—Sir William Preece has promised to add his name to the list of donors for £100 each. The number has therefore now reached five, leaving five more donors yet to be found for the conditions of the original donation to be fulfilled.



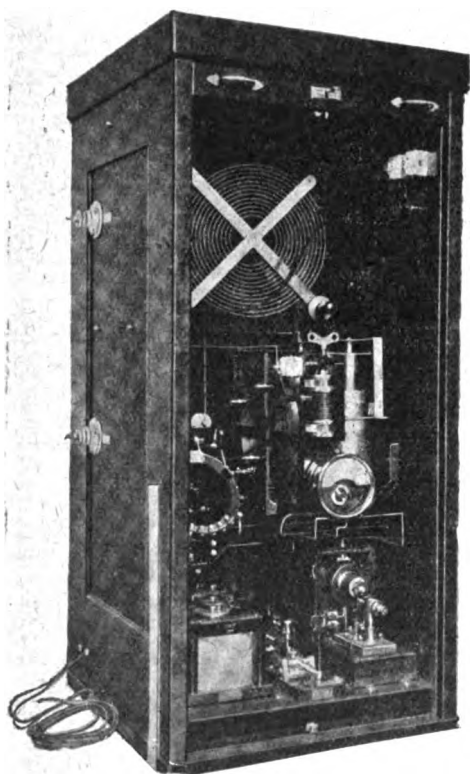
# ADAMS IGRANIC

CONTROL GEAR FOR HYDRAULIC PUMP CONTROLLERS.

ADAMS  
MFG CO LTD  
BEDFORD  
AND  
LONDON

## TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

INTERESTING details of the *Telefunken* quenched spark system as supplied to ships are contained in a new illustrated pamphlet from Siemens Brothers and Co., Ltd. (Woolwich). The manufacture of this apparatus was commenced at Woolwich in 1910, and a large number of British and foreign vessels have been equipped. Recent contracts include eleven ships of Messrs. A. Holt and Co., seventeen ships of the Tank Storage and Carriage Co.'s fleet, as well as some long range foreign naval installations and land stations, including those of the British North Borneo Co. and the African Direct Telegraph Co. From statistics which are given, it appears that of the total number of wireless stations throughout the world more than fifty per cent. are equipped on the "quenched spark" system, in which an efficiency of 50-75 per cent. is stated to be obtained in transforming the primary electrical energy into useful radiated energy. This has led to the classification of the types of station according to the energy in the antenna, and not according to the



SIEMENS STANDARD TELEFUNKEN 0.3 kW. SHIP SET.

primary energy. Thus a 15-kw. installation of the usual open-spark type with an efficiency of about 30-35 per cent. has only the same radiative power as a quenched spark 5-kw. installation. Other advantages of this system are also pointed out, such as the harmonic nature and high pitch of the propagated waves, which enables atmospheric disturbances to be largely eliminated; the absence of noise which, with the ordinary spark gap, necessitates a specially constructed sound-proof cabin occupying a considerable amount of valuable space on board ship. The standard ship equipments range in six sizes, from the extremely compact 0.1 kw. launch equipment, with a range of forty miles by day, to the large 5-kw. ship or shore plant, with a 500-mile day range. One station which has been specially designed to meet the requirements of the recent American Shipping Acts, and has a

guaranteed range of 100 miles by day, is totally enclosed in a roll-front case, of which the dimensions are only 4 ft. 8 in. by 2 ft., 2 ft. by 2 ft. 4 in. This is illustrated in the figure. Where there is an electric installation, the requisite direct-current (about 400 watts) can be taken from the ship's mains. If no electric installation is available, the necessary energy is provided by a D.C. generator of about  $\frac{1}{2}$ -kw. output, driven by a petrol or other engine. The transmitter includes a special high-tension induction coil feeding the excitation circuit. This consists of a battery of Leyden jars, an inductance of copper strip, and a quenched spark gap. An aerial lengthening inductance of two fixed coils and one movable coil is provided. Fine adjustment of the wave-length emitted is obtained by adjusting the position of this movable coil. An aural receiver with contact detector is employed. This receiver, which has a wave-range of from 200-2,000 metres, provides a wide range of variation of coupling, enabling very exact tuning to be obtained.

There seems to be considerable difference of opinion among the members of the House of Commons Committee which has been inquiring into the Imperial wireless telegraph scheme as to the nature of their report. Not only is it stated in *The Times* that a separate report has been prepared by the Unionist members of the Committee, but also certain Liberal members of the Committee favour a report in which no reference is made to the dealings of Ministers in American Marconi shares: on the other hand, it is believed that the Chairman of the Committee, who is also a Liberal, is not in favour of this course being taken.

The Compagnie Française des Câbles Télégraphiques is in trouble again, as the Paramaribo-Cayenne cable failed on 28th May. This misfortune was followed by another on the 30th May, when the Martinique-Paramaribo cable also gave out.—The Meshed line gave out on the 3rd inst. near Teheran.

## ELECTRIC TRACTION NOTES

The London Suburban Traction Co., which, as we recently announced, has been formed to amalgamate the Metropolitan Electric Tramways, Ltd., and the London United Tramways, Ltd., has now acquired a controlling interest in the South Metropolitan Electric Tramways and Lighting Co. Thus, with the exception of the London County Council Tramways, the whole of the tramway and motor-bus services in the Metropolitan area are now under one control.

The British Electric Traction Co.'s finances are beginning to show signs of considerable improvement. For the year ended March 31st, 1913, after paying the full 6 per cent. dividend on the first preference stock, a 8 per cent. dividend is also to be paid on the non-cumulative 7 per cent. preference stock. The receipts for the year were £50,000 better than in the previous twelve months, whilst for the current year to date the receipts are £6,800 better than for the corresponding period last year.

The Sunderland District Electric Tramways Co. is now out of the hands of the receiver, and the financial position is much stronger. It is proposed to reduce the share capital and to write off the debit balance, and a proposal to this effect will be placed before the shareholders later on.

Several London Borough Councils are threatening opposition to the Bill of the Postmaster-General for constructing a tube railway through London, on the ground that sufficient protection is not given in regard to the electric mains.

The Sunderland Corporation has agreed to arrange mutual running powers with the Sunderland District Tramways Co.

A deputation of the Edinburgh Corporation has been visiting various places in England where "self-propelled" tram-cars are in use. Included in their tour was London, where the Stevens petrol-electric cars of the London County Council were examined. As the result of its inquiries the deputation has reported that the introduction of some form of self-propelled car for Edinburgh experimentally is justifiable.

As the result of the decision of the House of Commons last

# "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

## Specifications Published May 29, 1913

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

Names in italics indicate communicators of inventions from abroad.

8,040/12. **Induction Motor Control.** SIEMENS-SCHUCKERT. To adjust the speed by varying the frequency and pressure of the power current a self-excited series connected commutator generator is connected to a transformer through a choking coil, saturated so that as the frequency of the generator is reduced by altering the ratio of the stator and rotor pressures, the effective magnetic characteristic simultaneously drops, so that stable pressures are produced approximately proportional to the frequency. A transformer with adjustable secondary in parallel with the stator may also be added to the mains. Four figures.

11,051/12. **Remote Controlled Switches.** A. H. F. PERL. On the control circuit being closed a magnet is energised, and this attracts an oscillating armature which is arranged to break the circuit just before the mid point of the swing is reached, so that it is carried by its own momentum, aided by a spring, to its position for the next operation. The switch is worked by a pin on the armature connected by a crank to a rod engaging the shorter arm of a switch contact lever. Two figures.

12,444/12. **Wireless Receiving Stations.** D. ZAHARIA and G. ROTHLÄNDER. The telephone is arranged directly in a detector circuit which has a unipolar connection with the primary circuit. Increased pressure is thereby obtained in the detector circuit similarly as in a radiation coil. The primary winding is bridged over by a regulating resistance. Four figures.

**Wireless Telegraphy.** H. SEFTON-JONES (*Ges. für Drahtlose Telegraphie*). High frequency currents are obtained by supplying current to static frequency transformers with a frequency of at least 5,000, obtained from a high-frequency alternator. The frequency may be further increased by sending the secondary high frequency current through the primary coils of the same transformer. Tuning means may be inserted in the secondary circuits, and a pressure adjusting transformer may also be inserted. In order to allow of higher saturation than usual the windings of the frequency transformers are smaller than usual, and the transformer is placed in a cooling and insulating liquid. Four figures.

15,342/12. **Sealing Wires in Glass.** B. T.-H. Co. (*G. E. Co., U.S.A.*). Iron chromium alloys containing from 20 to 30 per cent. of chromium have been found to have the same temperature coefficient as lead glass, and to adhere to the glass so as to make a perfectly vacuum tight seal.

17,357/12. **Loud Speaking Attachment for Telephones.** H. W. PRANCE. A trumpet is placed in front of a platform provided with guides, so that when the telephone receiver is placed on the guides it slides into position with the diaphragm coincident with the small end of the trumpet.

22,500/12. **Self-Regulating Dynamos.** J. POLKEY and GEO. POLKEY, LTD. A single intermediate brush approximately midway between the main brushes bears on the commutator. The field winding is in two parts, one part, half on each of two diametrically opposite poles, is connected between one main brush and the intermediate brush. The other part is placed on one pole only, and is connected between the other main brush and the intermediate brush. Two figures.

25,090/12. **Lead Alloys for Tapes.** W. E. Co. (*W. E. Co., U.S.A.*). The tapes are primarily intended for telephone switch-board cables. It is stated that by using an alloy composed of 93.25 to 96.75 parts lead, 3 to 6 antimony, and 0.25 to 0.75 of one part tin, the tape need only be about half as thick as usual, with pure lead tapes to obtain equal strength.

27,813/12. **Incandescent Lamps.** M. SIDON. The filament carrying frame is removably mounted on a conducting rod supported in the base of the bulb. The rod is adapted to hold the parts in place and to connect the filament to the leading-in wires in such a manner that the frame may be removed without breaking them. Five figures.

28,627/12. **Series Arc Lamps.** W. ROGERS and G. ROWE. A pivoted and adjustable stop-piece and an auxiliary pendent armature which will fall away from the lamp spool on cessation of the current, are so arranged that the fall of the lamp armature is prevented until the arc of any of the series lamps becomes too long. All the top carbons fall at the same instant and strike fresh arcs. Three figures.

29,848/12. **Negative Electrodes for Alkaline Storage Cells.** H. P. R. L. PORSCHKE and J. A. E. ACHENBACH. To increase their capacity, negative electrodes for alkaline accumulators are made by boiling finely powdered iron and cadmium in an excess of ammonia water until a dry mixture of metal powder and metal compounds is obtained. This is subjected to a reducing electrolysis in an alkaline solution.

6,479/12. **Transmitters for Wireless.** J. SAHULKA. By means of a rotating commutator the pressure across the condenser in the oscillation circuit is kept equal to twice the pressure of the supply, so that the energy absorbed by the condenser is increased fourfold. Seven figures.

## Specifications Published To-day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, E.C., at the price of 8d. each, post free.

Summaries of some of the more important of these patents will appear in our next issue.

**Dynamos, Motors, and Transformers:** DARMOIS and LEBLANC [Vapour rectifiers] 11,870/12; SCHNEIDER [Bi-polar form-wound rotor windings] 12,766/12; PLOHL [Magnetic and electric fields for frequency changing] 15,774/12.

**Electrometallurgy and Electrochemistry:** RUSS and EHRLICH [Oxidation of mixed nitrogen and oxygen] 10,992/12; DUBILIER [Ozone] 11,090/12; PEACOCK [Compounds of aluminium, carbon, and nitrogen] 11,393/12 and 11,395/12; PROSTLER and GES. FÜR ELEK. INDUSTRIE [Sheet brass and aluminium welding] 25,987/12.

**Heating:** STOTT and SCHOFIELD [Water] 10,955/12; PURLE, 15,429/12.

**Ignition:** SCOTT [Engine starter combined with car-lighting set] 11,388/12; BOSCH [Distributor] 5,532/13.

**Incandescent Lamps:** TRIQUET [Mercury vapour] 12,270/12.

**Meters:** H. ARON ELEKTRICITÄTSAHLERFABRIK [Motor] 792/13.

**Switchgear, Fuses and Fittings:** COOPER [Manufacture of resistance bodies] 11,380/12; PILLINGER and SUNDERLAND [Switch] 11,486/12; HUNTER and SHAND [Switches] 11,586/12; NICHOLSON [Relays] 30,059/12.

**Telephony and Telegraphy:** MELLINGER [Telephony] 11,964/12; GOTT [Telegraph cable working] 22,364/12; ROOSE and FINLAY [Selective signalling] 28,486/12.

**Traction:** STITT [Railway signalling] 12,649/12.

**Miscellaneous:** PRICE [Automatic electric thermal control] 15,178/12; GIBBS [Protective layer on iron electrodes] 15,852/12; JABS [Clocks] 24,313/12; GRAEMIGER [Electromagnetic suspension devices] 24,499/12.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Distributing Systems, &c.:** SIEMENS SCHUCKERT [Flywheel storage for hauling or winding engines] 11,007/13.

**Electrochemistry:** SOC. GEN. DES NITRURES [Aluminium nitride manufacture] 10,975/13.

**Switchgear, Fuses and Fittings:** HOVLAND [Relays] 10,472/13; A.E.G. [Automatically maintaining phase equality in parallel machines] 10,609/13.

**Telephony:** SIEMENS & HALSKE, 10,685/13.

**Traction:** MOUYEN [Railway signalling] 10,803/13.

**Miscellaneous:** HARTMANN & BRAUN [Measuring small resistance variation or differences] 8,602/13.

## Expired Patents

The following are the more important Patents that have become void through non-payment of renewal fees.

**Arc Lamps:** JOHNSON & PHILLIPS and S. PATERSON [Non-shunt lamps for series working] 3,266/08.

**Dynamos, Motors, and Transformers:** B.T.-H. Co. (*G.E. Co., U.S.A.*) [Single-phase commutator motor speed control using transformer] 3,588/04; B.T.-H. (*A.E.G.*) [Single-phase commutator motors for machine-tool driving, and having a shunt characteristic for the working period and a series characteristic for the idle period] 3,096/08.

**Incandescent Lamps:** H. HOGE and "Z" LAMP Co. [Metal filament lamp] 3,248/08.

**Instruments and Meters:** H. BEVIS and J. W. PENICUD [Recording galvanometer recording simultaneously currents in three circuits] 20,633/08.

**Storage Batteries:** P. MARCHAL [Charging apparatus] 3,494/08.

**Switchgear, Fuses, and Fittings:** B.T.-H. Co. (*G.E. Co., U.S.A.*) [Remote control switchgear] 3,666/04.

**Telephony and Telegraphy:** SIEMENS & HALSKE [Selectors for single-line working] 2,308/08.

**Traction:** F. E. CASE [Multiple unit control: contactors worked by currents of different strengths obtained by resistance regulation through the master controller] 18,331/01; B.T.-H. Co. (*G.E. Co., U.S.A.*) [Series parallel control: contactors are operated against control by a cam shaft] 3,886/04.

**Miscellaneous:** G. H. DAVIS [Automatic piano players and music recorder] 3,617/02; W. REUTER [Electromagnet for loading conveyers, cradles, &c., piece by piece] 3,737/04; B. F. HUTCHES [Electro-mechanical typewriter] 3,355/07; SIEMENS BROS. (*Siemens & Halske*) [Motor-car horns] 3,778/07.

week, giving the London Borough Councils the same veto for trolley-bus schemes that they have over tramways schemes, the L.C.C. has withdrawn from its Tramway Bill this session four trolley-bus schemes in Hackney and Sydenham.

In consequence of the success of working trailer cars in the Woolwich district the L.C.C. has asked the Board of Trade to sanction their use upon the Merton circular route.

The scheme for the construction of an electric tube railway between Stokes Bay, in Hampshire, and Ryde (I.O.W.), is being revived. Some years ago a similar scheme was actually sanctioned in an Act of Parliament, but the capital for its construction was never raised.

A holder of £11,000 ordinary stock in the Metropolitan Railway Co. has deposited a petition in Parliament against the Bill of the Company, which seeks to purchase the Great Northern & City Tube Railway.

Referring to last week's note on the locomotives for the Loetschberg tunnel, on page 309, we have received a letter from Mr. W. Gratwicke pointing out that the ten new locomotives are not quite of the same design as the Oerlikon locomotive illustrated, with which the trials were made. They will be, he says, of the ten-coupled (2-10-2) type, with a total weight of 108 tons, of which 85 will be available for adhesion. Each of the two motors, which are geared to jack-shafts driving through cranks, will develop 2,500 h.p. at 50 km. per hour for 1½ hours, and will exert a pull of 180,000 kg. at starting.

## LOCAL NOTES

**Abercarn: Electric Lighting.**—The Board of Trade has refused to grant the Council an electric lighting order.

**Blackburn: Electricity Accounts.**—The net profit of £3,521 upon the electricity undertaking last year is nearly double that of the previous twelve months. About 1,500 looms having individual motors are now driven from the Corporation supply mains, and there are now 5,000 h.p. of motors connected.

**Cleckheaton: Bulk Supply.**—The Council, which has an electric power station of its own, is negotiating with the Yorkshire Electric Power Co. for a supply of electricity in bulk.

**Coventry: Electricity Profits.**—The net profit on the electricity undertaking for the year to March 31st was £16,245. A sum of £4,500 is to be paid in relief of rates and £11,600 to plant reserve. The flat rate for lighting purposes is to be reduced from 4½d. to 3½d. per unit.

**Dundee: Electricity Accounts.**—The accounts of the Corporation Electricity Department for the year ended April 30th, 1913, show a net profit of £7,082. The increase in the sale of units is between 1½ and 2 million, representing an additional revenue of £4,000. The bulk of the progress during the year has been in the direction of power supply, although there has been the gratifying increase of 250,000 units for lighting purposes. The whole of the profit has been allocated to the reserve fund, bringing this to £21,000, and as this fund has been built up in three years, this result must be considered exceedingly satisfactory.

**Exeter: Electricity Accounts.**—There was a net surplus of £1,378 on the Electricity Department last year, in spite of the fact that the tramway supply was less by 21,000 units than in the previous twelve months. Although the charges for power and heating have been twice reduced recently, the loss of revenue from this cause has been already counterbalanced by the increased demand. The Electric Light Committee recommends placing the surplus to reserve and renewals account.

**Grimsby: Electric Lighting Accounts.**—In spite of the loss of the Railway Co.'s custom, which amounted to £2,100 per annum, the net profit for the past year was £3,147. This result is due to the very large development in private supply. The sum available after meeting various charges, apart from capital charges, is £1,417, and Mr. W. A. Vignoles, the Borough Electrical Engineer, in his report, urges the Committee to take the whole financial position of the undertaking into account before deciding what shall be done with this sum. The desirability of a strong reserve fund is pointed out, but nevertheless Mr. Vignoles suggests that part of the surplus might be utilised to pay off the amount still owing to the rates in respect of contributions received in the first three years' working of the undertaking. The Electric Light Sub-committee recommends that £1,330 10s. be transferred to the relief of rates, and expresses the hope that within the

next few years they will be able to repay compound interest on the money received from the rates.

**Manchester: Electricity Accounts.**—The accounts just published show a revenue of £467,194, compared with £427,701 in the previous twelve months. A sum of £24,500 is to be transferred to relief of rates out of the net profit. The cost of coal during the year was 12s. 4d. per ton, compared with 10s. 10d. in the previous year, but the average working costs were 1'033d. per unit sold compared with 1'045 in 1911-12.

**West Ham: Electric Battery Vehicles.**—Following the example of Glasgow and one or two other places, the Electricity Department has invested in two Edison battery vans for departmental work.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

### Generating Stations, Sub-Stations, Mains, &c.

**Atherton.**—A loan of £6,800 for electric lighting extensions is to be taken up.

**Bispham.**—Sanction of the Local Government Board has been given to the borrowing of £8,155 for additional plant.

**Dolgelly.**—A committee has been appointed to arrange for a site for an electricity generating station.

**Halifax.**—A loan of £23,180 has been sanctioned for electrical extensions.

**Hebden Bridge.**—An inquiry has been held concerning a loan of £3,250 for electrical extensions.

**London: Hammersmith.**—Air-cooled static transformers. (See advertisement on another page.)

**Marylebone.**—A loan of £42,500 is to be taken up for electric lighting purposes.

**Southwark.**—A loan of £29,464 for new plant is to be applied for.

**Manchester.**—An inquiry was held last week concerning a loan of £75,000 for electricity purposes. There was some opposition from the Ratepayers' Association, which has decided to oppose all such applications on the part of the Corporation until there is, what they term, a more ample return on capital outlay, and proper provision made for depreciation. At the inquiry the representative of the Association stated that it was understood that the present extensions were sub-stations for large power consumers, and it was contended that power users have an unfair advantage over the larger body of consumers.

**Pembroke.**—Condensing plant for electricity works. Town Clerk. June 14th.

**Southampton.**—New cable is to be laid at an estimated cost of £950.

**Tullamore.**—The Council has received a report on an electric lighting scheme by Mr. L. J. Lawless, Consulting Engineer of Rathmines.

**Wallasey.**—Sanction to a loan of £65,000 for electrical extensions is to be applied for.

**West Hartlepool.**—Two 300 kw., 6,000 v., 40 cycle rotary converters, with transformers, switchgear, and connections; traction feeder, and Board of Trade panels, &c. Borough Electrical Engineer, June 14th.

**Worthing.**—Sanction to a loan of £6,750 for electrical extensions is to be applied for.

**York.**—Loans of £5,000 for mains, £1,000 for services, and £800 for motors, are to be applied for.

### Wiring

The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.

**Aberdare.**—Cinematograph theatre. Architect, C. H. Elford, 31 Canon Street.

**Barrow.**—New library.

**Beckenham.**—New school.

**Bradford.**—Residential school for blind.

**Blackburn.**—New fire station.

FOR  
STEAM JOINTS  
USE



JOHN HUDSON & CO.'S SUCCESSORS, Mansell St., London, E.

**Chelmsford.**—New school.  
**Crumpton.**—New technical school.  
**Edinburgh.**—New music hall adjoining Caledonian goods station, Lothian Road.—New Sailors' and Soldiers' Home.  
**London.**—Offices for Public Trustee and Lunacy Commissioners. H.M. Office of Works, Storey's Gate.  
**L.C.C.**—Electrical installation at Randall Place elementary school, Greenwich. (See advertisement on another page.)  
**Manchester.**—St. Mary's Church, Droylsden.  
**Redruth.**—Workhouse infirmary.  
**Rochdale.**—New building for Equitable Pioneers Society.  
**Southampton.**—Electric lighting of old pavilions at infirmary, Shirley Warren. Clerk, St. Mary's Street. June 19th.

#### Miscellaneous

**Aberdeen.**—The Tramway Manager recommends considerable extensions of the tramway system, estimated to cost £50,000.  
**Brighton.**—The Tramways Committee has presented a report recommending the use of double-deck trolley omnibuses on the Preston Road—New Road route. The capital cost of the scheme is put at £5,600.  
**London: L.C.C.**—50-ton electric overhead travelling crane for the Greenwich Power Station. (See advertisement on another page.)  
**South Wales.**—The Penrikyber Navigation Colliery Co. requires tenders for a twelve months' supply of electrical fittings. Secretary, Penrhiwceiber, R.S.O. Glam.

### TENDERS RECEIVED AND ACCEPTED

**Bolton.**—The tender of British Insulated & Helsby Cables, Ltd., has been accepted for cables.  
**Newport (Mon.).**—The tender of the A.E.G. Electric Co. for a 3,000 kw. turbo-generating set at £7,120, and that of the Lancashire Dynamo & Motor Co. for a 600 kw. direct-current generator at £935, have been accepted. There was considerable discussion with regard to the first tender, which, it was stated, was £1,326 cheaper than the lowest British tender. In addition, no English firm would carry out the whole of the contract, and the Council objected to dividing up the responsibility between three firms, which would have been necessary.  
**South America.**—Messrs. Siemens Bros. Dynamo Works, Ltd., have received a contract for the supply of "Wotan" pure drawn Tungsten wire lamps for a large town in South America. The lamps, which are mainly intended for street lighting, number 36,100, and the total candle power amounts to 2,117,000. The highest candle power lamp employed will be 400, and the lowest 16. The contract was decided upon after exhaustive tests.

### APPOINTMENTS AND PERSONAL NOTES

We have been asked to state that, owing to the operation of the Glasgow Boundaries Act 1912, Mr. T. C. Parsons and Mr. W. Sillery have now definitely retired from the management of the Govan and Partick Electricity Undertakings respectively.

Mr. C. G. Hamilton, who was elected Member of Parliament for Altrincham last week, is one of the Managing Directors of Drake & Gorham, Ltd.

Mr. Mervyn O'Gorman, at one time well known in electrical circles and now superintendent of the Royal Aircraft Factory, has been made a C.B.

Another of the Birthday Honours is a Knighthood conferred on Mr. Francis W. T. Brain, who was President of the Mining Association of Great Britain, 1911-12, and presided at the Conference in London during the coal strike last year. Those who are interested in the early days of the application of electricity in mines may possibly remember that Frank Brain was the first engineer to introduce electricity in a coal mine. He introduced electric signalling in a mine as early as 1866, and, at the Trafalgar Colliery in 1882, he installed the first electric pump.

Mr. A. A. Day, Borough Electrical Engineer to the Bolton Corporation, has resigned.

The Redditch U.D.C. has received 191 applications for the post of Borough Electrical Engineer.

The Aylesbury U.D.C. requires a Resident Electrical Engineer at a salary of £200 per annum.

The salary of Mr. R. M. Carr, Borough Electrical Engineer at Leek, has been increased by £25, making it £300 per annum.

Gas engine driver required. (See an advertisement on another page.)

### MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. G. Smith and Son, of 5 Philpot Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night, was £71 to £71 15s. (Last week, £72 5s. to £72 15s.)

**Change of Address.**—Matthew Wylie & Co., of 57 Robertson Street, Glasgow, have removed to 81-83 Portman Street, Kinning Park, Glasgow.

**Exhibition Awards.**—The British Thomson-Houston Co. (Mazda House, Upper Thames Street, E.C.) has been awarded a diploma for their display of up-to-date systems of illumination at the recent Cinematograph Exhibition.

A Diploma of Honour has also been awarded to the Electrical Engineering and Equipment Co., Ltd., for their exhibit at this Exhibition.

The Westminster Engineering Co., Ltd. (Victoria Road, Willesden Junction, N.W.), has received a diploma for their projection and photographic arc lamps shown at the Exhibition.

**Agency.**—Andrews and Co., 198A St. Vincent Street, Glasgow, have been appointed representatives of the Midland Electric Manufacturing Co. (Birmingham), whose interests have ceased to be represented by G. C. Fisher and Co.

**Dissolution of Partnership.**—R. Dobson and H. Dobson, Electrical Engineers, 39 Dean Road, Salford, have dissolved partnership.

**Liquidations.**—Engineering Instruments, Ltd., Skerne Works, Darlington, is to be wound up voluntarily, and the business transferred to a new company called the Skerne Works, Ltd. The liquidator is J. W. Watson, Tubwell Row, Darlington.

A meeting of the Beck Flame Lamp, Ltd., will be held at 21 Ironmonger Lane, E.C., on June 30th, at noon, to hear the liquidator's account of the winding up.

Electric Lamp Regenerators, Ltd., is to be wound up voluntarily for the purpose of reconstruction. The liquidator is Mr. F. W. Beard, 480 Salisbury House, London Wall, E.C.

### COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &c.

**Urban Electric Supply Co.**—After meeting interest and debenture stock redemption, the accounts for 1912 show a net profit of £18,496, from which is deducted £10,000 for depreciation, and after paying 3 per cent. on the preference shares, a balance of £996 is carried forward.

**Cleveland and Durham County Electric Power Co.**—A dividend of 3½ per cent. for 1912, carrying forward £148.

**Westinghouse Electric & Manufacturing Co. (U.S.A.).**—The net income of this company for the year to March 31st, 1913, was about £600,000, which is the largest in the company's history. A dividend of 8 per cent. is to be paid on the ordinary stock compared with 6 per cent. in the previous year.

**Edison & Swan United Electric Lighting Co.**—A scheme has been circulated among the 4 per cent. first debenture stock holders and the 5 per cent. second debenture stock holders for the purpose of providing additional working capital, through the absence of which, it is stated, the progress of the company is being retarded. It is proposed to consolidate these stocks into one 4½ per cent. stock, and to call up the outstanding stock as and when required, to an extent not exceeding £1 per share.



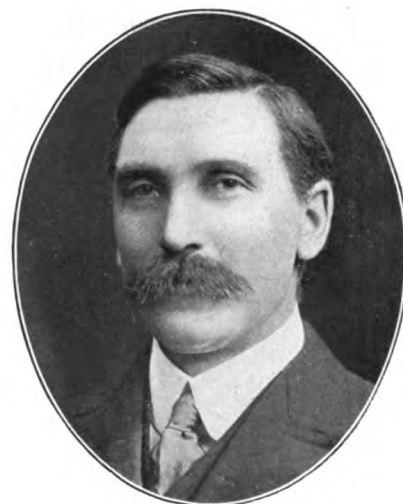
## ANNUAL CONVENTION OF THE INCORPORATED MUNICIPAL ELECTRICAL ASSOCIATION

**T**HE Incorporated Municipal Electrical Association will hold its Eighteenth Annual Convention from Tuesday to Friday next week, in London and Kingston. The headquarters will be at the Hotel Cecil, and a time-table of the meetings and visits to works will be found in our "Arrangements for the Week" column on

page 330. In accordance with our usual custom we give below portraits and brief biographical notices of the President and the readers of papers, and we also publish descriptions of the features of interest in the works to be visited, which include the Deptford, West Ham, and Lot's Road stations.



MR. C. E. C. SHAWFIELD.

THE PRESIDENT,  
MR. J. E. EDGCOME.

DR. S. Z. DE FERRANTI.



MR. J. CHRISTIE.



MR. W. H. L. WATSON.



MR. R. J. MITCHELL.



MR. A. H. SEABROOK.

### OUR PORTRAITS.

Mr. J. E. EDGCOME was elected President by the Council early this year. He replaces Mr. C. E. C. Shawfield, who was elected President at last year's Harrogate Convention, but has since resigned his post as Chief Electrical Engineer to the Wolverhampton Corporation, and had in consequence to relinquish the Presidentship. Mr. Shawfield will, however, deliver a Presidential address, but a short and possibly less formal address may be expected from Mr. Edgcome. In addition to having been Honorary Treasurer of the Association for many years, Mr. Edgcome has also filled the Presidential chair on a previous occasion, viz., 1905-6. He has been in charge of the Kingston-on-Thames electricity undertaking since 1893, and the latest addition to the works has been two 400-h.p. horizontal Diesel engine sets.

Mr. C. E. C. SHAWFIELD was appointed Chief Assistant

Engineer at Wolverhampton in 1896, and Chief Electrical Engineer in 1898. Very considerable extensions have been carried out recently under Mr. Shawfield's superintendence, in consequence of the increase in the power and tramway loads. Mr. Shawfield resigned his position with the Wolverhampton Corporation last January to take the appointment of Chief Engineer and Joint Manager of the Knowles Oxygen Co., Ltd.

Dr. S. Z. DE FERRANTI'S Paper on "Prime Mover for Electric Power," and the discussion upon it, is looked forward to with the greatest possible interest, following, as it does, so soon after his James Watt lecture, in which, for the first time, he gave a brief description of the turbine on which he has been working for several years. As is known, he considers that it is in the development of the steam turbine rather than in the gas or oil engine that ultimate great improvements in fuel economy are to be sought, and it may be anticipated that the

o

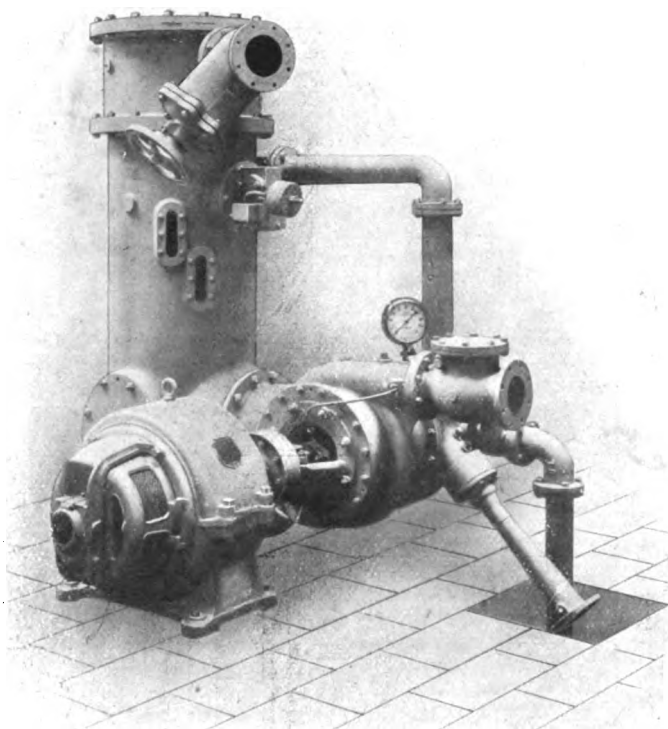
# MIRRLEES-LEBLANC

## MULTI-JET CONDENSER

WITH "MIRRLEES-LEBLANC" ROTARY PUMPS FOR AIR AND WATER DISCHARGE.

SIMPLICITY

RELIABILITY  
IN ACTION



SMALL  
SPACE  
OCCUPIED

### MANUFACTURERS

THE MIRRLEES WATSON CO., LTD,  
SCOTLAND STREET, GLASGOW.

WE HAVE CONSTRUCTED—OR HAVE IN PROCESS—  
"MIRRLEES-LEBLANC" CONDENSING PLANTS  
REPRESENTING A STEAM DUTY OF OVER 3 MILLION LBS. PER HOUR.

# JET CONDENSERS

*When corresponding with Advertisers, please mention "Electrical Engineering."*

discussion will be of a technical and controversial nature, and that it will be taken part in by the partisans of the three classes of engines.

Mr. J. CHRISTIE, Chief Electrical Engineer, Brighton, who will contribute a Paper on "Air Filtration," is a past-President of the Association, his year of office terminating with the very successful Convention in Brighton two years ago. He favours the "wet" filter, and will doubtless describe the plant on these lines which has been put in at Brighton to his design.

Mr. W. H. L. WATSON will read a Paper in conjunction with Mr. R. J. MITCHELL on "Electric Vehicles." Mr. Watson is Sales Manager in this country to the sole concessionaires here of the Edison battery, and is making much headway in developing the use of delivery vans. Mr. Mitchell is his assistant, and deals more with the technical side.

Mr. A. H. SEABROOK, Chief Electrical Engineer to the St. Marylebone Borough Council, who will introduce Messrs. Watson & Mitchell's Paper, has taken considerable interest in the question of electric vehicles, and not long ago placed a scheme before his council for a low charging tariff.

### THE DEPTFORD STATION OF THE LONDON ELECTRIC SUPPLY CORPORATION

THOSE who visit the Deptford Generating Station of the London Electric Supply Corporation will find interest from many points of view. Not only is plant still running which was installed in 1889, when Mr. Ferranti startled the engineering world by transmitting energy to London at 10,000 volts, but examples of generating sets and switchgear are to be seen marking the various subsequent stages of development, including the more modern instalments from which power is supplied for the single-phase traction scheme

Davey-Paxman dry back "Economic" boilers. Some of the larger boilers are fitted with the Temperley-Coburn system of steam-extracting pipes, which enables steam generated in the lower tubes to pass freely to the steam space, and this has been found to increase their evaporative capacity. Separately fired superheaters are used on some boilers. Great care is taken to

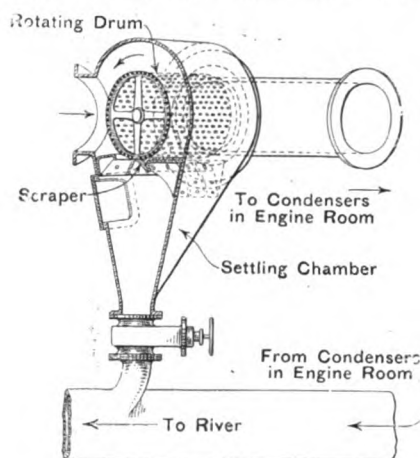


FIG. 2.—ROTARY STRAINER.

ensure the utmost possible boiler-house economy, and a special laboratory is maintained for fuel, water, and flue-gas analysis. Coal is unloaded from barges by grab cranes and taken to the bunkers by a Temperley transporter.

The lighting section of the engine-room contains a wonderful assortment of 10,000-volt single-phase alternators, including some of the original 10,000-volt Ferranti disc type machines driven

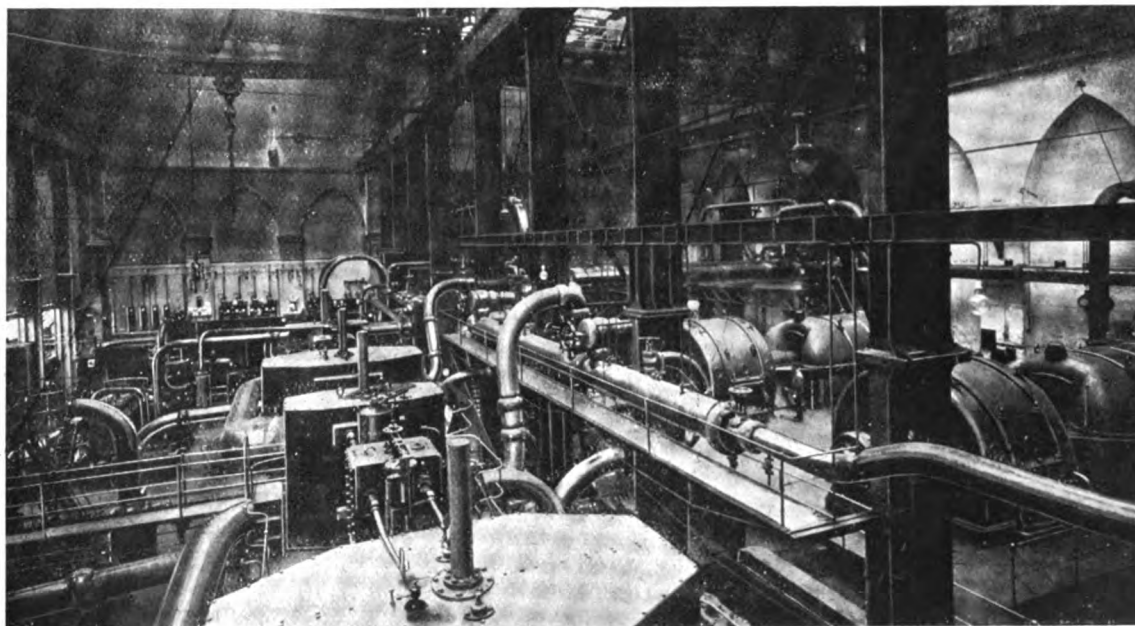


FIG. 1.—GENERAL VIEW OF ENGINE ROOM FROM NEW SWITCHBOARD GALLERY.

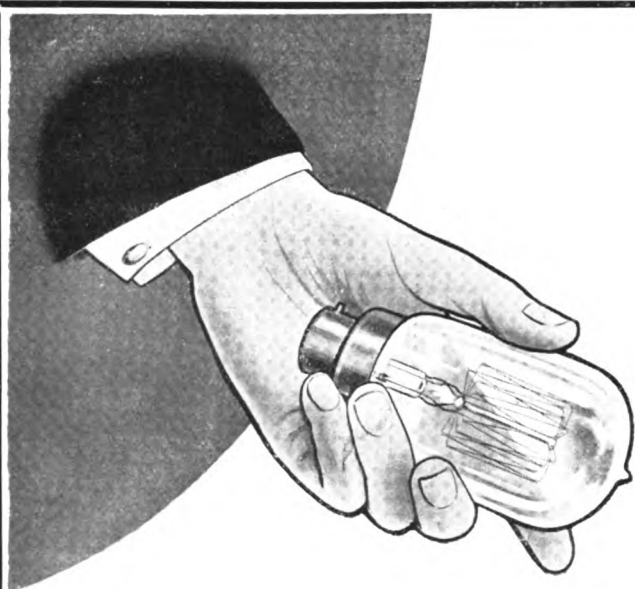
of the London Brighton & South Coast Railway, including steam turbine units of 10,000 h.p.

Interesting as it is to look back upon the old pioneering days, it is perhaps not necessary here to recount the whole history of the station. Started in 1889, it was the first station to generate and distribute extra high-tension alternating current. It was equipped originally with some 400-h.p. 2,500-volt sets from the old Grosvenor Gallery station, and the two 1,500-h.p. 10,000-volt machines, which are still at work. The much-talked-of 10,000-h.p. machines put in hand in the early 'nineties were never completed, but in this connection it is interesting to think that the recent extensions have involved turbines of this power. As at present arranged the station gives four distinct classes of supply: the original 85-cycle 10,000-volt single-phase lighting supply, a three-wire 2×230-volt D.C. supply for power and lighting, a three-phase 25-cycle 6,600-volt supply for large power consumers, and the 6,600-volt 25-cycle single-phase traction supply for the Brighton Railway. Generally speaking, the engine-room is divided into two parts, one for lighting and the other for power and traction. Both are served from one common boiler-house containing 24 Babcock & Wilcox boilers and 10

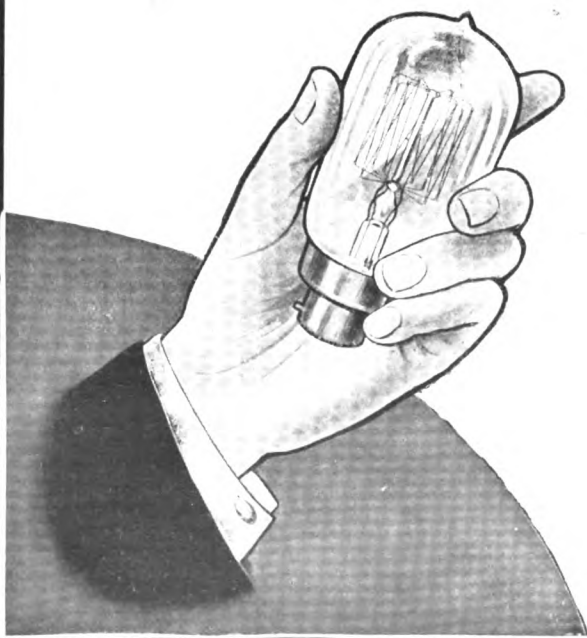
by various classes of engines, besides two B.T.-H. 10,000-volt alternators of more modern type. This generating plant is further supplemented by a 1,500-kw. Westinghouse 10,000-volt motor generator, which takes current from the traction side of the station. Even more interesting than the generating plant in the old part of the station is the original air-break 10,000-volt switchgear designed by Mr. Partridge, the company's Chief Engineer and Manager over 18 years ago, with 4 ft. 6 in. break, which is still in use. Mention should also be made of the special mains charging transformer used to avoid resonance effects, which is in daily use.

The next group of plant, dating from 1904, was installed for giving a temporary supply to the L.C.C. Tramways pending the completion of the Greenwich power-house. This consisted of two 2,000-kw. 6,000-volt 25-cycle Dick, Kerr alternators driven by Ferranti engines, and marks the entry of three-phase plant into the station. For a time these machines ran in parallel with the L.C.C. power-house at Greenwich. A general view of the engine room is given in Fig. 1.

When the company undertook to give a single-phase traction supply to the Brighton Railway, two more Dick, Kerr alternators driven by Ferranti engines were installed. Each of these sets is



**BRITISH  
MADE**



**FIR**

Mazda Drawn Wire Lamps  
be produced with filaments  
and the British Thomson-Houston  
control the British Letters

**Mazda**

**DRAWN  
LAMPS**

The Mazda Drawn Wire process has  
doubt and uncertainty of performance  
individual lamps as reliable as carbon  
of service is now open to metal  
added strength and increased economy  
are being successfully employed for Street  
Lighting and in innumerable conditions  
lamps could not be used otherwise.  
**No** lighting condition is there  
there are lamp-holders there  
used to the great satisfaction

**OVER 20,000,000 MAZDA  
IN USE TO-DAY—PROOF**

**The British Thomson**

Mazda House, 77, Upper

Branches: Manchester, Birmingham, Leeds,  
Glasgow, Swansea,



FIT

are the first lamps to  
filament from pure tungsten,  
n Co., Ltd., own and  
covering the process.

**Mazda**  
WIRE  
LAMP S

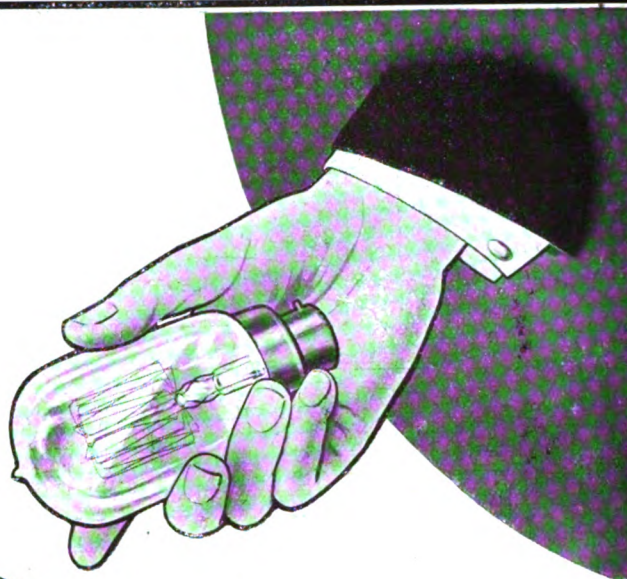
and a far-reaching effect, removing  
metal filament lamps and making  
ment lamps. A much larger field  
lamps which, because of the  
Mazda Drawn Wire filament,  
ighting, Motor Car and Omnibus  
where the early metal filament  
their inherent fragility.  
to Mazda—wherever  
Mazda Lamps are being  
their users.

**DRAWN WIRE LAMPS ARE  
SUPERIOR to THEIR MERITS**

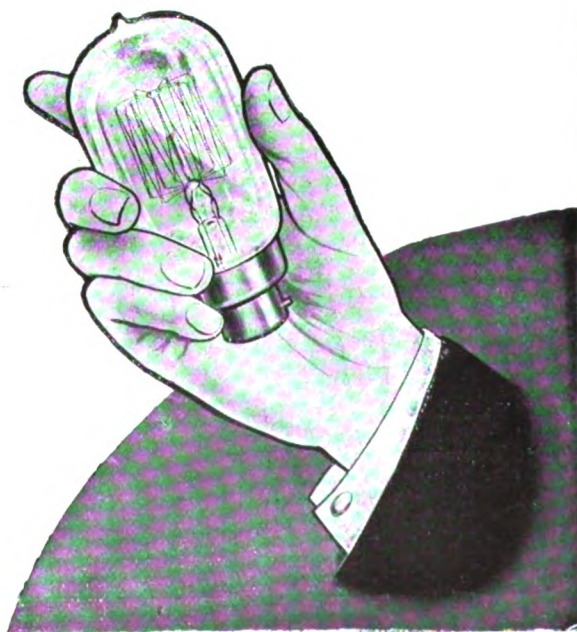
**Edison Co., Ltd.**

Street, London, E.C.

field, Newcastle, Middlesborough,  
and Dublin.



**BRITISH  
MADE**

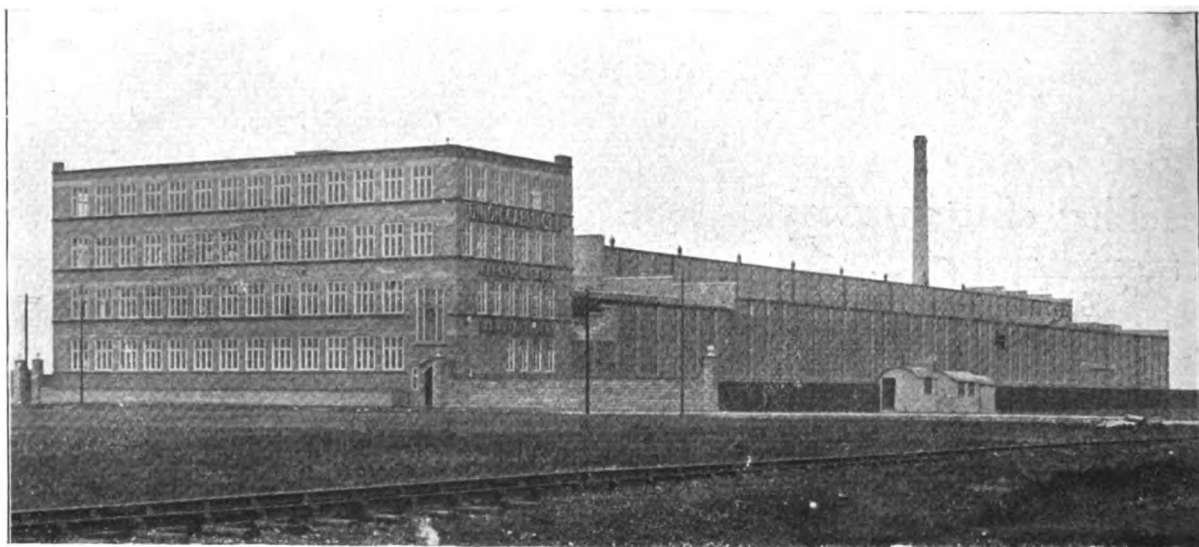


# UNION

## ALL UNION CABLE CO LTD

### PAPER INSULATED LEAD COVERED CABLES

ARE MANUFACTURED AT THESE WORKS



**DAGENHAM DOCK, ESSEX**

# CABLES



capable of giving 2,000-kw. single-phase or 2,500-kw. three-phase, and they are of specially substantial construction. The engines are fitted with Chorlton Whitehead governors. Condensing water is taken from the river and a special form of rotary strainer is used, designed by the engineers of the Corporation.

These strainers were made in the Corporation's own workshops, and were the outcome of a great number of experiments by the Corporation. They have given very satisfactory results, and can, moreover, be installed at an initial cost of about one-third of that of other strainers on the market. The strainer which is illustrated in Fig. 2 consists of a drum perforated with numerous holes, which rotates at about two or three r.p.m. in a cast-iron chamber. It is driven from the centrifugal pump shaft through reduction gear. Any leaves, straw, or other debris entering with the water adhere to the outside of the drum, and are removed by a fixed scraper, the position of which is seen in the figure. This is adjusted so as to have a "shaving" action on the drum surface, so that any solid matter may also be effectively removed, and it all gravitates through a duct at the back of the scraper into the lower part of the housing chamber, which acts as a settling chamber. From this, it is returned to the river through a sludge valve, connected to the return pipe from the condensers, and opened either automatically or by hand.

To meet further extensions in the single-phase traction on the suburban lines of the Brighton Railway, and also in the general power load of the station, a pair of 10,000-h.p. turbo-generators were installed about a year ago. The turbines are of the impulse-reaction type made by C. A. Parsons & Co., Ltd., and

to the large reactance coil kept permanently in circuit to limit the current on short circuit to 10,000 amperes. The whole of the voltage regulation is done by a Tirrill regulator with very satisfactory results. This regulator can be arranged to be cut out whenever a feeder overload relay acts to allow the pressure to drop on short circuit. The railway feeders are all arranged in duplicate. One feeder has an instantaneous trip and the other a time lag, so as to prevent the supply being cut off at the generating station at times of short circuit, the reactance coil and the feeders with the time lag being left in circuit.

Some further generating plant is being installed, but is not yet sufficiently advanced for a description to be included here. There is also a certain amount of sub-station connecting plant in the station for giving a D.C. supply to the immediate neighbourhood.

In spite of the use of plant which has been in service for over twenty years, this company has the lowest cost per unit sold of any company in London.

## THE WEST HAM ELECTRICITY WORKS

THE Electricity Supply Department of the Corporation of West Ham has often been pointed to as an example of one of the most progressive municipal undertakings, and its rapid development is interesting as being largely the result of the specially organised sales and publicity departments initiated by Mr. A. H. Seabrook and ably carried on by his successor, Mr. H. H. Couzens, and by Mr. J. W. Beauchamp, who is now Engineer and Manager. It is not now, however, our purpose to describe the commercial side of the undertaking, which has been dealt with on various occasions in our columns (see *ELECTRICAL ENGINEERING*, March 14th, 1912, p. 129), but to give some details of the generating station and the extensions necessitated by the continually rising load, which were designed by Mr. Couzens and are now being carried out. Among these, members visiting the station on Tuesday will find the new coal-handling plant, the suction ash plant, and the new water circulation system of special interest.

The station is situated at Canning Town in close proximity to the River Lea, and, roughly speaking, consists of parallel engine and boiler houses running at right angles to the river with the remodelled coal-handling plant at the river end, and the extensions where the new plant is being installed at the far end. In the older part of the boiler house we find 20 land-type Babcock & Wilcox water-tube boilers, with an aggregate evaporative capacity of 310,000 lb. per hour, with superheaters and chain-grate stokers, and a larger marine-type boiler for 37,000 lb. per hour by the same makers. Two further boilers of the same size and type are now being erected in the new part of the boiler house. Induced draught produced by steam-driven Sirocco fans is used for the old boiler plant, but the ejector draught system with one short steel chimney to each pair of boilers will be adopted in the extensions. In this case the fans will be electrically driven. The coal-conveying plant is being largely extended and remodelled, and will have a capacity of 60 tons per hour. The new equipment consists of an elevated gantry electric 4-ton jib crane by Carrick & Co. (Edinburgh), and an overhead telfer track running the length of the coal bunker, through the old to the new boiler house, and arranged to work in conjunction with the existing Temperley transporter if required. All this apparatus is driven by 550-volt D.C. motors, which take their current from the live side of the circuit-breakers controlling the traction supply. The coal collected by the crane from the barges is deposited either in the 3,000-ton reinforced concrete storage bunker on the wharf either direct or through the weighing machine on a travelling gantry over the store, or it can be fed, weighed or unweighed direct to the telfer machine. A view of the river end of the station, showing part of the coal-handling plant, is given in Fig. 1. The overhead bunker running along the centre of the old boiler house terminates in a two-way bunker and screw-conveyor capable of conveying coal from the old bunker line to the new bunkers.

An interesting feature of the station is the suction ash-collecting plant, which was installed by Babcock & Wilcox, Ltd. The general principle of this is shown in Fig. 5. A system of cast-iron pipes (B) runs along the ash tunnels, provided with removable covers beneath each ash discharge, and open at the far end. The other end leads to the top of the receiver C, which is capable of holding about six tons. A suction pipe E leads to the exhauster F, which is driven by a 50-h.p. motor, and the powerful suction produced causes all the ash placed in the pipe to be carried over into the receiver, which continues to fill up until its weight opens the cut-off valve D against

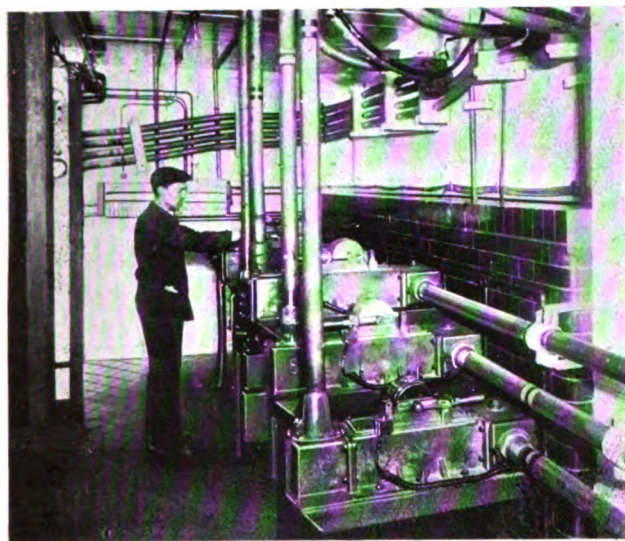


FIG. 3.—ENCLOSED ISOLATING SWITCHES.

are coupled to 7,500-kw. three-phase alternators made by Brown, Boveri & Co. These machines are self-ventilating and draw specially filtered air from ducts below. For this purpose a special air-washing plant has been installed for one of these plants by the Sturtevant Engineering Co., capable of dealing with 30,000 cu. ft. of air per minute.

These air filters are contained in a steel casing provided with two glazed inspection doors and with a tank at the base. The air entering this casing immediately comes into contact with a fine mist produced by a number of special spray nozzles, any impurities in the air falling with the water into the catch tank. The air then passes through a series of eliminator plates, which arrest any free or entrained moisture. The spray nozzles are supplied with water at the required pressure by a small motor-driven centrifugal pump, provided with a pot strainer in the delivery pipe. The tank is fitted with a ball-cock to make up any losses of water, and large drain and inlet pipes to admit of the tank being emptied and filled rapidly when it is necessary to change the water. The arrangement has several advantages over the cloth screen type of filter.

Like the reciprocating sets, the turbo-alternators can be used for single-phase or three-phase supply, and the specially arranged switches, which enable them to be put either on the three-phase power bars or the single-phase power bars, form one of the points of interest in the switchboard. The board was specially constructed by the British Thomson-Houston Co. to the design of the London Electric Supply Corporation, and among its special features may be mentioned the enclosure of the isolating switches in earth shields, with the current transformers also clamped outside the earthed covering. The general arrangement of these isolating switches is seen in Fig. 3. The main oil switches are of the B.T.H. Co.'s standard motor-operated pattern, and have been proved by tests to be capable of breaking enormous short-circuit currents. Attention should also be drawn



the air pressure, and the contents of the receiver are discharged. A travelling electrically-driven crusher, A, is provided to deal with hard clinker, but this has only been used on rare occasions. The suction pipe is of cast-iron, and all bends are fitted

were commenced consisted of two 1,200-kw. Bruce Peebles and two 600-kw. G.E.C. two-phase 2,000-volt alternators, and three 500-kw. Bruce Peebles D.C. 500-volt traction sets, all driven by Ferranti engines, and the more recently installed steam turbine

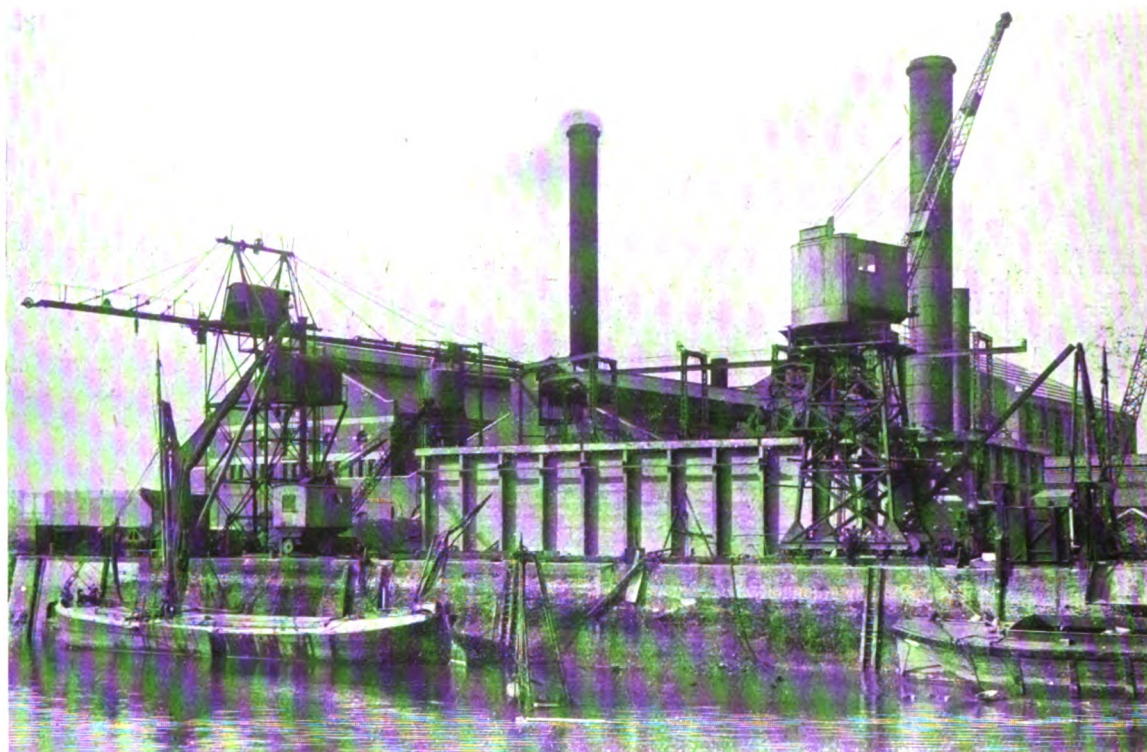


FIG. 1.—GENERAL VIEW OF WEST HAM ELECTRICITY WORKS, SHOWING OLD AND NEW COAL-HANDLING PLANT.

with removable pieces, which may be easily replaced in case of wear. A spray pipe is provided at the top of the receiver to quench the ashes. (Some further details of this apparatus were given in *ELECTRICAL ENGINEERING*, July 25th, 1912, page

plant, consisting of two 1,500-kw. two-phase Willans-Dick, Kerr turbo-alternators, one for 2,000 and the other for 6,000 volts, and two 3,000-kw., two-phase, 6,000-volt Westinghouse turbo-alternators. The way in which the turbo-generators were fitted

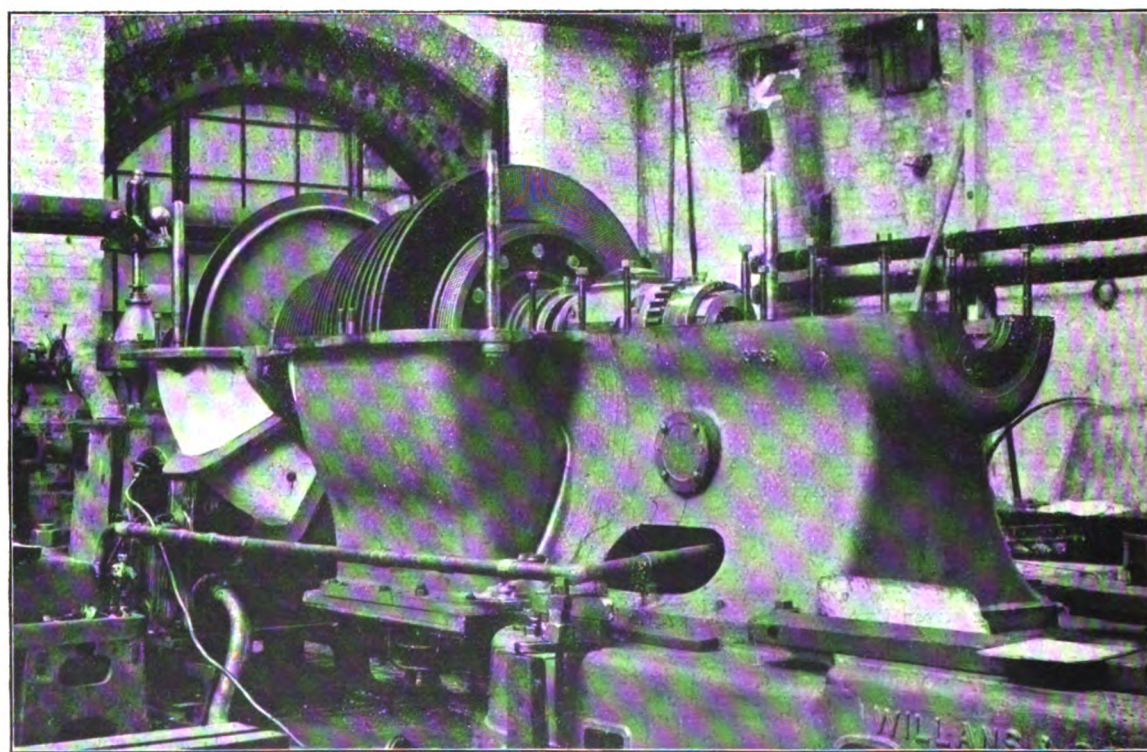


FIG. 2.—BOTTOM HALF OF CASING OF 5,000-kw. TURBINE WITH ROTOR IN PLACE.

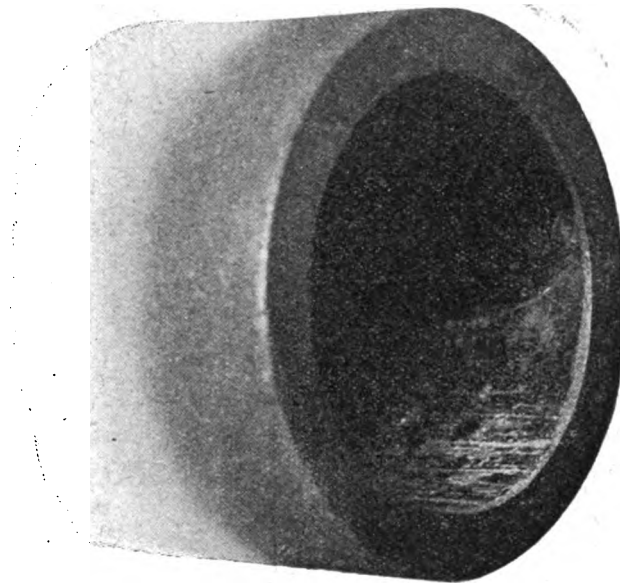
421.) It may be mentioned here that the make-up feed water is provided by an artesian well, and that an Archbutt-Deeley water-softening plant is in use.

The generating plant in the engine-room before the extensions

in between the reciprocating sets practically without adding to the floor space required is worthy of note. A pair of 500-kw. G.E.C. synchronous motor-generators act as the connecting link between the A.C. and the D.C. plant, and a group of trans-



# KEY FIBRE CONDUIT



Specimen of Key Fibre Conduit dug up after 9 years' use.

---

**DELIVERY FROM STOCK.**

---

## THE KEY ENGINEERING COMPANY, LTD.,

4, Queen Victoria Street,  
Mansion House Buildings,  
LONDON, E.C.

Telephone No. 7234 Central, London.  
Telegrams—"KEYPOINT, CANNON, LONDON."

Works—  
Trafford Park,  
MANCHESTER.

Elevator Road,  
Trafford Park,  
MANCHESTER.

Telephone No. 4945 Central, Manchester.  
Telegrams—"KEYPOINT, MANCHESTER."

A.B.C. Code, 5th Edition.

---

*When corresponding with Advertisers, please mention "Electrical Engineering."*

## IMPORTANT NOTICE.

### The New "ALKLUM" ACCUMULATOR

Is now Ready for **SALE**

#### SPECIAL ADVANTAGES

Contains no Acid. Contains no Lead.  
Has no Celluloid Case.

#### STRENGTH

Cannot be hurt with overcharging or running down to Zero.

**SIZE** It is less than any other Accumulator.

**WEIGHT** Is the Lightest in the World.

**LIFE** Has Ten Times the Life of Lead Accumulators.

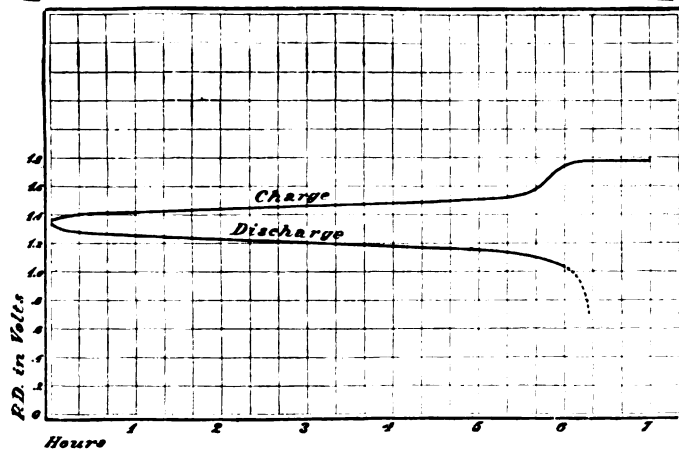
**CONVENIENCE** Has very wide charging rates.

#### RELIABILITY

The voltage keeps practically the same all the time the cell is used.

#### GUARANTEE

Is sold with a guarantee that it is superior to any other Accumulator in the World.



They may be seen at the

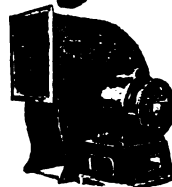
**MOTOR LIGHTING CO.,**  
13 Pantan Street, Haymarket,

where all those interested will be welcomed and receive full explanations.

Fully descriptive Catalogue sent on application to the makers:

**WORSNOP & Co., Ltd.**  
LAMP WORKS. HALIFAX, Eng.

## Cyclone Fans



Direct or Alternating Current  
**ARE THE MOST ECONOMICAL  
ON THE MARKET.**

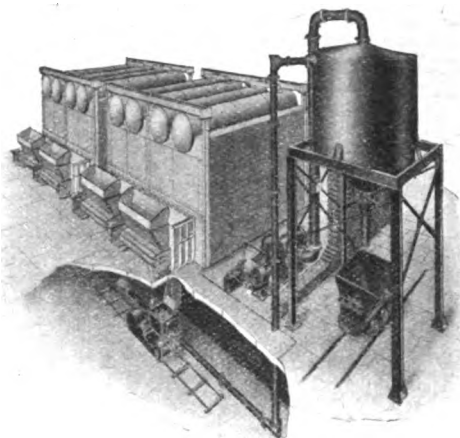
Because the Power Consumption is low, and therefore running cost small. It is the upkeep that tells.

OUTPUT EQUAL TO ANY OTHER MAKE.

Ask for our latest Catalogue, No. 186.

**MATTHEWS & YATES, Ltd.,** SWINTON, MANCHESTER.

## BABCOCK & WILCOX PATENT SUCTION LTD. ASH CONVEYING PLANT



Diagrammatic Illustration of Babcock and Wilcox Patent Suction Ash Conveying Plant, Showing Ash Breaker in Gangway or Cellar under Boiler-House Floor.

**For DISPOSING OF ASHES & CLINKER**  
Without Dust and with  
the Minimum of Labour.

Can be adapted to existing Plants and to all Types of Boiler and other Furnaces.

Telegrams:  
BABCOCK, LONDON.

Head Offices: 3540 HOLBORN (8 lines).

**ORIEL HOUSE, FARRINGDON ST., LONDON, E.C.**  
Works: RENFREW, SCOTLAND.

## "CALOR" ELECTRIC HEATING & COOKING APPLIANCES

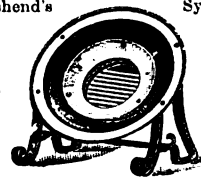
Townshend's

System (patented).

Food Warmers,  
Kettles, Irons,  
Grillers, Toasters, &c.

Liberal Discount.

Write to-day for List,  
just published, from the  
Patentees and Makers:



Absolutely safe.  
Thoroughly reliable.  
Guaranteed for 12  
months.

**AGENTS WANTED**

in many districts; also  
in Colonies and abroad.

Bright Glowing Electric Fire.

**TOWNSHEND'S ART METAL Co., Ltd.,** London Showroom—63, Holborn Viaduct, E.C.



**Ladders, Steps,  
Trestles,  
Scaffolds, &c.**  
Sale or Hire.

**HEATHMAN & CO.**  
10, Parson's Green,  
London, S.W.

When corresponding with Advertisers, please mention "Electrical Engineering."

formers placed in cells open to the air outside the main wall connect the 2,000- and 6,000-volt systems. The new generating plant now under erection in the extension to the engine-room consists of a 5,000-kw. Willans-Siemens 6,000-volt two-phase turbo-alternator running at 1,500 r.p.m. This turbine, which is shown under erection in Fig. 3, is of the combined impulse and reaction or "disc and drum" type, with a single impulse wheel and 27 rows of reaction blading. The generator will be ventilated by a motor-driven fan forcing air into the machine through a cloth filter. An overload capacity of 25 per cent. for three hours, and 50 per cent. for one hour, is guaranteed. The condensing plant for this set has Edwards air pumps and a live steam jet vacuum augmentor. There is space in the extended engine-room for at least two more 5,000-kw. sets.

The circulating water arrangements are undergoing considerable modification. Condensing water is taken from the River Lea. According to the original scheme, this water supply is not available at times of low tide, when a series of cooling ponds are made use of adjoining the station which formerly were part of a sewage treatment scheme. When the new water system is complete, however, water will be obtainable at all states of the tide, and the use of these cooling ponds will be discontinued. The new system involves a 36-in. suction pipe to the pump house, a delivery line of the same size along the engine room, and a 48-in. return, with branches and valves to allow the water to be returned either above or below the suction inlet, according to the direction of the tidal flow in the river. The equipment is large enough to deal with all the future plant for which the building extensions are designed, and the three electrically-driven Rees Roturbo pumps will have each a capacity of 70,000 gallons per hour. Only two of these, however, are now installed. The same form of rotary strainer

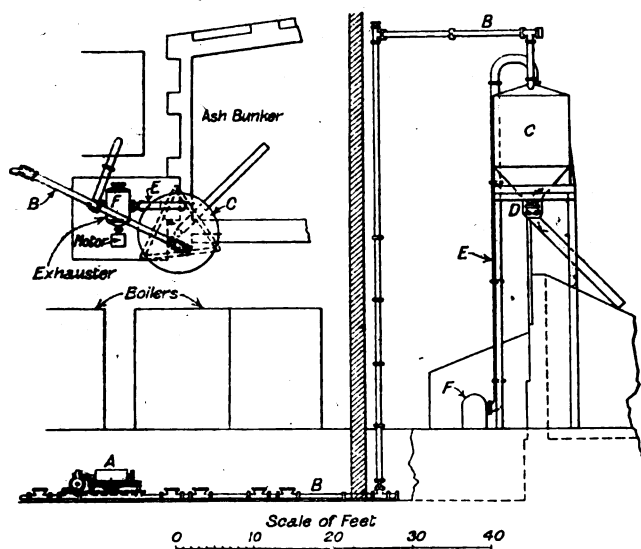


FIG. 3.—SUCTION ASH PLANT.

is used as at the Deptford station of the London Electric Supply Corporation, illustrated and described on another page of this issue.

The new switchgear, all of which was supplied by the British Thomson-Houston Co., is placed in a separate room parallel to the engine-room, and operated by solenoid remote control from a gallery along the side of the engine-room. The present capacity of the board is the control of three 5,000-kw. generators and nine 3,000-kw. feeders. The oil break switches are capable of opening circuits with a load of 20,000 kw., and have a stroke of 7 in. with two breaks per phase, under a head of 9½ in. of oil, and air buffer space of 9 in. The generator switches are provided with reverse tripping devices of the balanced type, unaffected by excess of current or potential, and fitted with air dampers for synchronising. In addition, maximum overload relays are provided, fitted with fuse-pattern time-limits. The feeder switches are also provided with fuse-pattern time-limits, having inverse time characteristics. An interconnector panel capable of carrying 10,000 kw. forms the link with the old board. The voltage is controlled by a Tirrill regulator, and surge arresters of the electrolytic type are installed.

The bulk of the supply from the station is at 6,000 volts, two-phase, at which pressure it is supplied throughout the dock and Silvertown districts and to the more important industrial district in the north. From the 6,000-volt mains an extensive system of 2,000-volt subfeeders radiates. At this pressure a very considerable number of moderate-sized works are supplied. The two-phase mains are in the form of twin-concentric lead-covered cables, and practically the whole of the cable system consists of British Insulated and Helsby material

drawn into stoneware ducts. The general low-tension supply is at 200 and 100 volts, single or two-phase, whilst the traction is partly furnished at 550 volts D.C. direct from the generating station, and partly through the medium of rotary converters off the 6,000-volt A.C. system.

At one of the sub-stations in Bridge Terrace an 800-kw. rotary converter has recently been installed by the British Westinghouse Co., which has several points of interest. It is a six-phase machine running at 600 r.p.m., and is fitted with a starting motor and a booster, direct coupled at opposite ends. Starting is arranged for either from the A.C. side by means of the starting motor, in which case synchronising is performed on the E.H.T. side of the transformers, or from the D.C. side by means of a starting switch and starting resistance. The rotary converts from a two-phase 50-period supply, of which the voltage may vary from 5,750 to 6,600 to continuous current at a voltage between 500 and 550. It is provided with an A.C. synchronous booster, which enables the attendant to obtain complete and independent control over the power factor, and the voltage on the continuous-current side. Thus a power-factor of unity or a leading power-factor may be maintained at any continuous-current voltage between the above-mentioned limits and with any A.C. voltage between 5,750 and 6,600. As a matter of fact, under the conditions which exist at West Ham, the machine runs invariably at full load with a leading power-factor of 90 per cent. By this means the lagging currents taken by other induction plant on the system are neutralised, with the result that the average power-factor over the whole of the system is considerably improved. This rectification of power-factor is, of course, an inherent property of the rotary converter, and, together with the high efficiency of this class of machine, constitutes an important advantage in favour of this type of converting plant.

The machine runs quite sparklessly on all loads up to 25 per cent. overload, which overload it is capable of withstanding for 24 hours. An interesting feature is the "mechanical oscillator" attached to one end of the shaft. Its function is to give a periodic oscillatory motion to the rotating part of the machine, in this manner effectually preventing the corrugating of the commutator and slip-rings, and thus giving the best possible commutating conditions. This is accomplished by a cam on the surface of which a ball rolls bearing against the end of the shaft. The continuous-current brushgear is of a novel design of a radial telescope type, which ensures a maximum distance between adjacent brushes, and practically eliminates the possibility of the machine flashing over when subjected to short circuits.

In conclusion, we wish to express our thanks to Mr. J. W. Beauchamp for his courtesy on the occasion of our representative's visit to the station, and for putting illustrations and descriptive details at our disposal.

## THE POWER HOUSE OF THE LONDON ELECTRIC RAILWAYS AT LOTS ROAD

THE famous Lots Road power house, supplying the greater part of London's underground railways, which will be visited on Wednesday afternoon, has the distinction of being the largest generating station in this country in point of output, although for its plant capacity it is compact even in its vastness. This is partly accounted for by the double-decked boiler-house, which, we believe, is the only one of its kind on this side of the Atlantic. With its present plant-capacity of 48,000 kw., the annual output exceeds 150 million units, and the peak-load is about 42,000 kw. The station is not inter-connected with any other, and supplies the whole of the District, Baker Street and Waterloo, Great Northern and Piccadilly, Charing Cross, Euston and Hampstead, and East London Railways, and part of the London, Tilbury and Southend Railway, as well as the Kingston section of the London United Tramways. A supply of power is also given to the London, Tilbury and Southend Co.'s workshops, and there is a scheme for giving a bulk supply to Richmond. Plant extensions will possibly be added before long, but no definite decision has been made as to the form they will take.

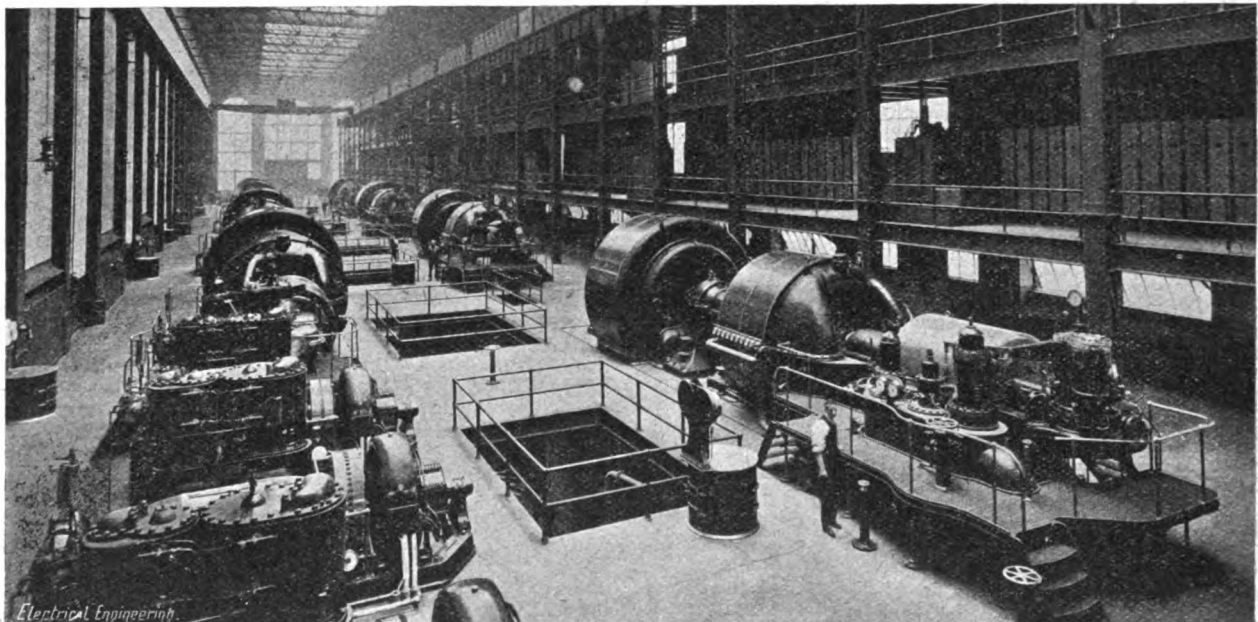
The site comprises 3½ acres, with a water frontage on the Thames and on Chelsea Creek of 1,100 ft., and a road frontage of 824 ft. The actual dimensions of the main building, consisting of boiler-house and engine-room running parallel, are 453 x 175 ft., not including the office block. The building itself is of steel enclosed with brick and terra-cotta, and the four chimney shafts (built by the Alphons Custodis Co.) are 19 ft. internal diameter and 275 ft. high. Coal can be obtained either by rail or river, and a remarkably fine coal-conveying

plant is at work. 400 or 500 tons of coal are consumed per day, and the bunkers themselves can accommodate some 15,000 tons. An additional cylindrical steel-lined pit or tank is now nearly completed, where a further 17,000 tons will be stored under water as a special reserve in case of strikes, &c. A special ash-handling plant is provided in a separate building, from which ashes are removed by those purchasing them as a by-product. This is served by a storage battery locomotive and pneumatic hoist, and in this connection it may be remarked that compressed-air power is employed for capstans, barge basin-gate mechanism, as well as for large condenser valves, &c., within the power-house. The boilers are of the well-known Babcock and Wilcox land type, 64 in number, arranged, as already stated, in two stories, and carried directly by the steel frame of the building. Floor space is available for 16 further boilers. Each has 5,212 ft. of heating surface, and they are arranged in groups of eight, each belonging to one generating set, but there is also steam connection between the groups. Chain-grate stokers and economisers are provided, and each boiler has its integral superheater.

A general view of the turbine-room is shown in the accompanying figure. There are eight main turbo-generators, besides an auxiliary set, and the separate steam-driven exciters, and there is floor space for two more large sets. The main generators are driven by horizontal pure-reaction type turbines made by C. A. Parsons and Co. (Newcastle-on-Tyne), running at 1,000 r.p.m. These are constructed in two cylinders arranged so that the flow of steam is in opposite directions. The governing on

in the foreground of the figure. They are four in number, each for 125 kw. at 125 volts. The exciter bus-bars can also be fed from storage batteries, of which there are two of 5,000 ampere hours' capacity, each capable of maintaining the full excitation for six hours. The travelling-crane motors, the oil-switch motors, and a part of the station lighting are also supplied from this circuit. All other auxiliary motors within the station are driven by three-phase, 220-volt motors. For this purpose, 220-volt, three-phase bus-bars for the auxiliaries are run high up on the turbine-room wall on the opposite side to the main switchgear, and these can be fed from one end by a separate 1,500-kw. Parsons turbo-generator set or from the other end by a bank of transformers off the main supply. Arrangements are also being made for the installation of transformers which will be able to be connected to each alternator, so that if desired each set can run its own auxiliaries independent of the rest of the station.

It now only remains to describe the switchgear and outgoing feeder system. The switchgear is carried on three gallery floors, which can be seen in the figure, and the whole equipment was supplied by the British Thomson-Houston Co., Ltd. (Rugby). The machine cables are taken vertically up to the generator oil switches on the first floor, which stand (as shown in the figure) well away from the compartments for the feeders coming down from above. Like all the other oil switches, they are of the B.T.H. Co.'s standard remote control, motor-operated pattern, and are of ample size to deal with the enormous currents which they might have to open on short-



GENERAL VIEW OF TURBINE ROOM AT LOTS ROAD, SHOWING PARSONS-WESTINGHOUSE TURBO-GENERATORS, EXCITER SETS IN FOREGROUND AND SWITCHGEAR GALLERIES IN BACKGROUND.

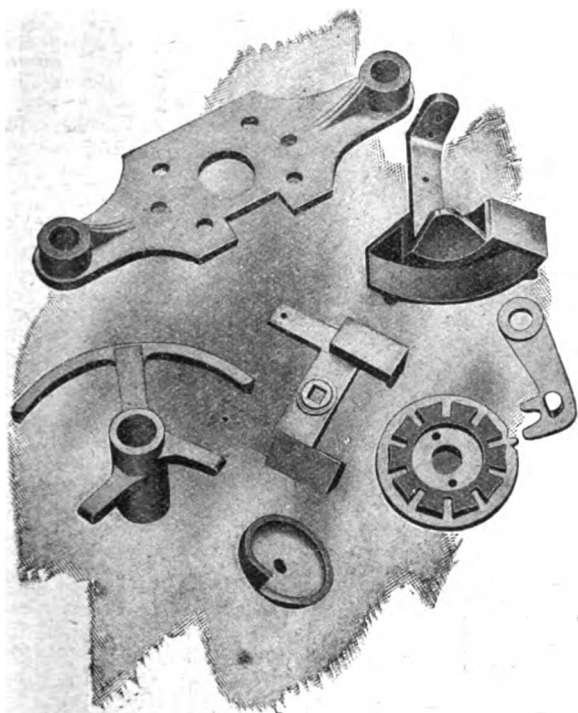
normal loads is by varying the continuity of the steam admission, but a second governor acts on a bye-pass when overloads are called for. They take steam at about 120° superheat, and are extremely efficient as regards steam consumption. The generators are of the British Westinghouse Co.'s manufacture. They have been somewhat altered since they were originally installed, with a view mainly to increasing their output, which is now 6,000 kw. at 11,000 volts, 33½ cycles, three-phase normal rating, and 50 per cent. overload for 2 hours. The increase in output over the original rating of 5,500 kw. was obtained principally by enclosing the machines and rendering them self-ventilating by drawing air from ducts below. The rotor itself forms the fan, so that no separate ventilating plant is required, nor are there any very elaborate air-cleaning plant. The condensing system consists of vertical condensers, each with 15,000 sq. ft. of cooling surface; these are located in pits between the engine foundations. The circulating water is supplied by 66-in. pipes laid to the edge of the channel of the Thames. Each condenser has a 20-in. centrifugal pump; the duty of the pump is simply to overcome the friction of the pipes, as the system is arranged on the syphonic principle, the top of the condensers being within 29 ft. of minimum low tide, and the circuit is closed. The intake and discharge mains are arranged for reversible flow, and the water passes through a revolving screen of novel design. The condensers are designed to work on the dry-vacuum principle, the air pump and the water pump being separate. A very complete oil-cooling and filtering plant is installed, and the size of this gives a good idea of the large scale on which everything is carried out.

The exciters are driven by the reciprocating engines shown

circuit. The second gallery contains the main bus-bars in separate compartments, one above the other, and divided into five sections coupled by oil switches of heavy breaking capacity. The third gallery contains the feeder bus-bars, which are divided into ten sections in a similar way, and each section is connected by an oil switch to the generator bus-bars immediately below. From these bars are taken 65 outgoing feeders. The duplicate feeders supplying the same sub-station are kept as far away from each other on the board as possible. The control boards are compactly arranged in a projection built out in front of the centre of the second gallery. In front of the operator is the desk-pattern generator control board of 11 panels (including bar-coupling panels), while the instruments for the machine circuits, including wattmeters and power-factor meters, are conveniently mounted just above the line of sight without interrupting the full view of the turbine-room. It may be mentioned here that the load has usually a leading rather than a lagging power factor, as practically the whole of it is to rotary converters. Voltage regulation is entirely by hand, and no automatic regulators of any kind are used. The feeder board of 18 vertical panels, containing the necessary small control switches, indicators, relays, and instruments, is behind the operator. The protective arrangements are as straightforward and free from complication as the rest of the station. The neutrals of the alternators are all kept earthed through a common bar, and a resistance limiting the current to earth to 1,000 amperes, and the current transformers in each phase, are connected between the windings and the neutral point, so that their insulation is not subjected to a high voltage. Plain overload tripping gear set fairly high, and without time-limit



# "PRANA" DIE-FINISHED CASTINGS



ARE MATHEMATICALLY ACCURATE  
 ARE INTERCHANGEABLE  
 ARE DEPENDABLE & ECONOMICAL  
 CAN BE REPEATED *ad lib.*  
 CAN BE SOLDERED (if required)  
 CAN BE NICKELLED, COPPERED, ETC.  
 CHEAPEN COST OF PRODUCTION

Holes, Slots, Teeth, Notches  
 cast with uniform accuracy.  
 No subsequent machining  
 being required. Fine screw  
 threads can be easily cut.  
 Coarse ones can be cast.

For further particulars apply to:

**AERATORS, LIMITED**  
 (Dept. 103)  
 UPPER EDMONTON, LONDON, N.

## WATTS UP !!

OVER 1,500,000,000 WATTS

CONTROLLED BY

**BERRY'S PATENT FOOLPROOF**

PUSH ON PULL OFF

**FUSED—SWITCHES.**

NUMBER INCREASING DAILY.

ENGINEERS AND CONTRACTORS WHO KNOW  
**WATT'S WATT** SPECIFY AND USE THIS  
 WELL-KNOWN SWITCHGEAR.

FITTED WITH SPECIAL REFLEX INDICATOR  
 FOR COOKING CIRCUITS  
 (NO RUBY LAMP REQUIRED).



Fused-Switch "On" Showing Red Glass  
 Reflex Indicator in Position.

**BERRY, SKINNER & Co.,**

**LONDON :**

78, UPPER THAMES STREET.

**BIRMINGHAM :**

SUFFOLK WORKS, OZZELLS STREET.

**MANCHESTER :**

65, KING STREET.

*When corresponding with Advertisers, please mention "Electrical Engineering."*

# FEED WATER

FOR

**Water-Tube or Lancashire Boilers**

**SHOULD BE PURIFIED**

IN A

# KENNICOTT

# WATER SOFTENER

**This being the only Plant which will  
Softens and Purifies Boiler Feed to  
the entire satisfaction of the City  
Electrical Engineer.**

---

*Full Particulars and Illustrated Catalogue from*

**KENNICOTT WATER SOFTENER CO.  
WOLVERHAMPTON.**

---

WHEN CORRESPONDING WITH ADVERTISERS, PLEASE MENTION "ELECTRICAL ENGINEERING."

feature, is fitted to each phase of the generator and feeder switches. Reverse-current trips are only used at the sub-station ends of the feeders. Excessive surges are taken care of by aluminium electrolytic arresters, which are found to be more reliable than spark-gaps. The auxiliaries are controlled from a separate board at one end of the turbine-room. A line of 64 ducts carries the feeders to the nearest point on the District Railway at Earl's Court, from which cables follow the railway routes to the various sub-stations.

### PUMPING PLANT AT THE NEW CHINGFORD RESERVOIR

**T**HE principal engineering interest at the King George's reservoir of the Metropolitan Water Board at Chingford is the installation of "Humphrey" gas pumps.

There are five of these pumps, four of which are capable of delivering 40 million gallons each, and one 20 million gallons per day. The pumps themselves were manufactured at the works of the Siemens Brothers Dynamo Works, Ltd., Stafford, to the designs of Mr. H. A. Humphrey, of the Pump and Power Co. (38 Victoria Street, S.W.). The general principle of the Humphrey pump is the use of a combustion chamber similar in function to the cylinder of a gas engine, but with the column of water to be pumped acting as the piston in direct contact with the exploding gas. There are thus no moving parts except the gas inlet and exhaust valves and the water inlet valves. Following the cycle of operations, the first explosion of a compressed charge puts the column of water in the U-shaped delivery pipe in motion, and gives it a momentum which carries it far beyond a point where the expansion of the gases is complete, and thus draws in more water through the inlet. Surging back, the water sweeps out the products of combustion, shuts the exhaust valve by its impact, and imprisons and compresses a certain quantity of the products of combustion in a pocket under the gas inlet valve, surging out again, it sucks in a fresh charge, and on the next rush inward compresses the charge ready for the next explosion. Thus the whole action depends on the swing of the body of water in the delivery pipe, which plays the part both of piston and flywheel. The inlet and exhaust valves are interlocked in an ingenious manner, whereby when the inlet opens and closes, it locks itself shut, and releases the exhaust valve, which in its turn, after opening and closing, locks itself and releases the inlet. The ignition is timed by an appliance resembling an indicator so that it occurs at the moment of maximum compression pressure. The pump is started by a stroke with compressed air followed by a sudden opening of the exhaust valve, thus initiating the oscillation of the water column which is afterwards continued automatically.

**The Illuminating Engineering Society.**—The annual report records a present total membership of over 400, of whom 35 are electrical engineers, 19 are connected with the gas industry, and the remainder interested in other ways in lighting generally. Seven meetings have been held during the past session, in addition to the annual dinner, and the committees on school and library lighting have continued their labours. There has been increased co-operation with kindred institutions, particularly in America and Germany, and the society has been represented at various congresses. Reference is made in the report to the Home Office Departmental Committee on industrial illumination and activity in other countries in the direction of securing improved lighting in factories, &c.

**Electrical Trade with China.**—It has sometimes been said that British electrical manufacturers are not receiving their share of the business that is to be had. In contradiction to these remarks, it is a pleasure to be informed by one of the largest firms in this field in China that their experience has been different. We hear, however, from the General Electric Co. that the General Electric Co. of China, Ltd., which was formed in 1911, have recently secured several contracts for the supply of electrical machinery for Chinese cities of Soochow and Changchow in Kiangsu Province. All this plant will be manufactured at the Witton Works of The General Electric Co., Ltd., in England. For Soochow, a Witton single-phase alternator capacity 375 kw. with high-tension switchboard is being supplied as an extension of the present generating plant. In the case of Changchow, which is a similar city, a Chinese company has been formed, and the contract secured for a Witton alternator about 200 kw. complete, with high-tension switchboard, Allen's engines, &c. Another contract recently secured has been for three Witton high-tension alternators with 14 panel switchboard for the lighting of Fatchan in Kwangting Province. We have received an interesting photograph showing the members of the staff (both Eastern and Western) of the G.E.C. Chinese house. The headquarters are at Shanghai, and sub-branches are located at Hongkong, Tientsin, and other places.

### THE I.M.E.A. BILL

**O**NCE more has the Incorporated Municipal Electrical Association brought forward its Bill to amend the Electric Lighting Acts. Sir William Howell Davies, M.P. for South Bristol, introduced the measure last week, and it was read a first time; the second reading of the measure is down for July 8th.

The Bill is almost identical with that introduced last year.

Clause 1 provides that any local authority authorised by Act of Parliament or Provisional Order to supply electricity "may provide, sell, let for hire, and fix, repair, maintain, and remove, but shall not manufacture for the purpose of sale or letting on hire electric lines, fittings, apparatus and appliances for lighting, heating and motive power, and for all other purposes for which electrical energy can or may be used, and may provide all material and work necessary or proper in that behalf. . . ." The charges in respect of this portion of a local authority's undertaking have to be adjusted so that they meet the expenditure, including capital charges; separate accounts have to be rendered to the consumers, and a separate account must be included in the annual accounts of the undertaking.

Under Clause 2 powers to provide electrical fittings, &c., are conferred upon companies.

Clause 3 authorises all electric supply undertakers to provide and maintain showrooms, to hold exhibitions, and generally to advertise the undertaking.

Clause 4 appears for the first time, and authorises electric supply undertakers to sell bye-products.

Clause 5 is the usual stand-by supply clause.

Clause 6 provides for the payment out of revenue of subscriptions and delegates' expenses in connection with associations dealing with the supply of electricity, provided that the number of delegates at any meeting does not exceed four.

Under Clause 7 a local authority is empowered to utilise its net profits for the formation of a fund for working capital, which, however, must not exceed one-half of the gross revenue of the undertaking for the time being.

Clause 8 authorises the borrowing for the purposes of working capital sums not exceeding one-tenth the amount expended upon the purchase of lands and the constructions of works prior to the expiration of three complete years from the commencement of the undertaking, or one-tenth of the amount which the undertaker has been authorised to borrow for the purposes of the undertaking prior to the expiration of that period, whichever amount is the larger. Any money borrowed under this section, however, is to be repaid within ten years from the date of borrowing, but the undertaker may postpone the commencement of repayment until two years from the date of borrowing.

The provisions of the Conspiracy and Protection of Property Act, 1875, are extended to electricity undertakings under Clause 9. They at present apply to gas and water works, and are intended to provide against strikes of workmen without proper notice.

Clause 10 provides against obstruction to officers of undertakers entering upon premises for meter reading or removal of fittings.

Clause 11 authorises the laying of cables in streets not dedicated to public use, at the request of the occupier of any premises therein. At present electric supply and similar undertakers have only rights to lay mains in public streets and not private thoroughfares.

Clause 12 empowers a number of electric supply undertakers to carry out jointly the provisions of Clauses 1, 2, and 3.

As will be seen the much-discussed wiring clause is again in the Bill, but apart from that, practically all the other provisions are non-contentious, and the passing of the Bill would undoubtedly facilitate the working of electric supply undertakings generally throughout the country, and obviate the necessity for separate applications to Parliament for these powers in private Bills. The promoters had hoped that the Institution of Electrical Engineers and the British Electrical and Allied Manufacturers' Association would have seen their way to give the Bill their official support. It is believed that many influential members of both Institutions feel that the passing of the Bill would be for the ultimate good of the industry, but owing to the absence of unanimity they have been reluctant to press their opinions. The point to be remembered is that the powers asked for in the Bill are already possessed by gas undertakings, which are thus able to make competition with electricity so much the more effective.

**The Electrical Trades Benevolent Institution.**—A promise of £100 from Mr. Justus Eck, who has just returned from a Colonial tour, has been received in connection with Mr. Byng's offer. There now remains £400 more to be promised to fulfil the conditions of Mr. Byng's original gift. It may be remarked that so far all the donations have been from individuals, and not from firms.

## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS :** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS :** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,342.

What is the greatest error commonly met with when using single-phase dynamometer-type indicating wattmeters on power-factors down to 0.3 with frequencies varying from 15 to 100 cycles per second? The instruments consist of a single moving coil for the pressure circuit, and two fixed coils for the current circuit, no iron being used.—"Vivo."

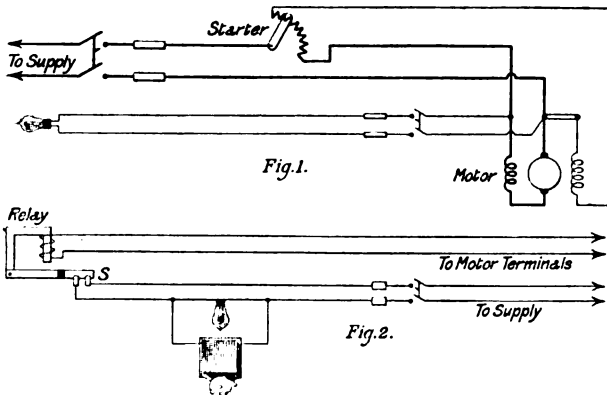
(Replies must be received not later than first post June 19th.)

### ANSWERS TO No. 1,340.

Please show how an ordinary incandescent lamp could be connected to a 25-h.p., 220-volt, compound-wound, D.C. motor circuit, to act as a signal at a distant point, in the event of the motor ceasing to run by any cause.—"SIGNAL."

The first award (10s.) is made to "PHIZ" for the following reply:—

If approximately normal voltage exists between the brushes of a D.C. motor, the machine must necessarily be running, since otherwise the rush of current through the armature would be so great as to blow the fuses or trip the overload release, thus cutting off the supply from the motor. It is therefore only necessary to connect the lamp so as to indicate whether any voltage exists between the brushes of the motor. The best way to do this is to make the connection to the terminal board of the motor itself in such a way that the lamp is in parallel with the armature, as shown in Fig. 1. So long as the motor is running, the lamp will burn, but if the motor is stopped



either by opening the main switch or the starting rheostat, or by the blowing of a fuse or the failure of supply, the lamp will be extinguished. In the event of an open circuit occurring on the shunt field, the motor will "run away," and immediately the overload device operates and stops the motor, the lamp will go out. It is therefore impossible for the lamp to be lit when the motor is not running, unless an open circuit exists in the series circuit of the motor itself. This might occur due to one of the following causes: (1) A "burn out" of the armature or a connection. This, however, would undoubtedly operate the overload release, stopping the motor and extinguishing the lamp. (2) If the brushes had been raised from the commutator for any reason, and not replaced, on attempting

to start up, the lamp would light, but the motor would not start. This would presumably be immediately noticed by whoever was attempting to start the motor. (3) It is conceivable that an internal connection might fail, due to the slacking off of a terminal nut. If this occurred anywhere between the terminals to which the lamp is connected, the motor would, of course, stop, and the lamp would remain alight (unless the connection fell in such a way as to cause a short circuit and operate the overload release). This is a somewhat unlikely contingency, but if it is desired to provide against the possibility, it could be done by making the lamp connections to the two "bus rings," which carry the current to the brush studs, instead of to the terminals of the machine. A tumbler switch should be inserted in the connections for the purpose of switching off the lamp while the motor is running, if this is desirable for any reason, and, of course, fuses will be necessary for the protection of the lamp circuit. If it is desired that the lamp shall be normally dark, but shall light up when the motor stops it will be necessary to use some form of relay on the lines shown in Fig. 2. The relay is connected across the terminals of the motor, instead of the lamp, and so long as the relay is energised, the switch S will be held open. Immediately the voltage on the relay coil falls below, say, half the normal voltage, the relay armature will fall and close the switch S, thus lighting the lamp. The advantages of this arrangement are that the lighting of the lamp is more likely to attract attention than its going out; also that it is possible to connect a bell in parallel with the lamp, as shown, to call immediate attention to the fact that the motor has stopped. The disadvantage lies in the increased complication and the fact that the normal condition of the lamp is unlighted. In the event of a mishap to the lamp circuit, such as the breakage of a filament or a failure of supply, the lamp would not indicate anything wrong, although in the latter case the motor would be stopped if it was dependent on the same supply. If the lamp is normally alight, as is the case with the connections shown in Fig. 1, a failure of the lamp circuit would extinguish the light and thus lead to a prompt investigation of the trouble.

The second award (5s.) is made to "E. H.," who writes as follows:—

There are three possible causes for a motor ceasing to run: (1) failure of the supply voltage, (2) an overload bringing the starter to the "off" position, and (3) a break in the electrical circuit at any other point except in the shunt, in which case the motor would speed up depending upon the nature of the load and the amount of series winding on the field. To indicate the stoppage of the motor, an incandescent lamp can be employed in two ways, either (1) to burn only when the motor is running, or (2) to light up when the motor stops. The latter alternative would be preferable, but it entails a much more complicated apparatus, since a second independent supply would be necessary, otherwise the lamp would not indicate the stoppage of the motor due to the first cause mentioned above. Hence we fall back upon the first method, and the simplest way to obtain the desired signal is to connect the lamp across the armature. It is well known that the speed varies as back E.M.F. of armature conductors in series  $\times$  flux

so that when the voltage falls to zero, the motor ceases to run, and the lamp is extinguished. The possibility of a break in the armature connections stopping the motor but leaving the lamp alight is exceedingly remote, since there are at least two paths in parallel through the armature. Another but more expensive method would be to couple a tiny shunt dynamo either directly or by belt to the motor, and connecting the lamp across its terminals.

Among the very numerous replies received there is general agreement that the simple connection of a lamp to light up when the motor is receiving its supply is the most satisfactory method. Many competitors, however, describe methods of carrying a lamp to light up when the motor stops, in some cases by means of a relay, and in some cases by contacts carried by the starter arm, but by no means all have realised that an independent supply is necessary for the lamp in this case. Others prefer centrifugal switches or similar devices varying in complexity, controlled by the actual rotation of the motor spindle.

**The Ghent Exhibition.**—A fine exhibit is being made by the Great Central Railway at the Ghent Exhibition. Among the special features is a scale model of the new Immingham Dock, 26 by 15 ft. in area, a locomotive boiler fitted with the Robinson superheater, and illustrations of the Great Central latest Sir Sam Fay express engine.



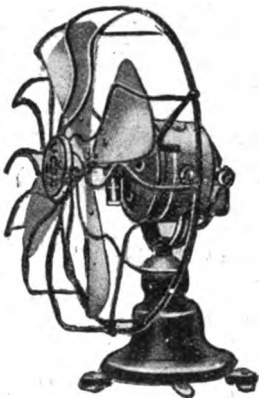
# ADAMS IGRANIC

CONTROL GEAR FOR SWING, ROLLING AND BASCULE BRIDGES.

ADAMS  
M<sup>C</sup>C<sup>O</sup>L<sup>D</sup>  
BEDFORD  
AND  
LONDON

## ELECTRIC FANS

APPROPRIATELY to the time of year, The General Electric Co., Ltd. (67 Queen Victoria Street, E.C.), have sent us some particulars of the large business which they are doing in their electric "Freezor" fans. This branch of their work is the subject of a special advertising campaign, in which they invite the co-operation of contractors. We have already given a full description of the extension to the Wotton Works which were built for the production of these fans (see *ELECTRICAL ENGINEERING*, June 13, 1912) and here small motors from 1/80 to 2 h.p. for continuous and for alternating current for all purposes are also made and very thoroughly tested before being sent out. The design of the motors and blades is such that the light weight pattern of 12-in. desk fan consumes no more than 25 watts. The patterns made include ceiling fans, oscillating fans, and revolving fans, as well as exhaust fans and punkahs of various designs for tropical countries. The Company have organised a system of express delivery which obviates the necessity for contractors to carry large stocks of fans, and they are co-operating with the trade to create a demand for fans by the preparation and issue of suitable literature.



## ELECTRIC TRACTION NOTES

Two important orders for electric trains have been placed. The London and South-Western Railway has ordered 84 motor trains (each having two 2-motor motor cars), from the British Westinghouse Co.—an order of about £280,000 in value. Particulars of the electrical equipment of the line appeared in our issue of December 12th, 1912 (p. 696). The London and North-Western Railway has ordered 40 trains, for the lines they are equipping electrically, from the Maschinenfabrik Oerlikon, a large Swiss firm, with works near Zurich, which town is, by the way, not in Germany, as is announced in a contemporary.

The Manchester tramway accounts for the past year show a net balance of £196,851, of which £100,000 is allocated to relief of rates and the balance to reserve. The number of passengers carried was 187,675,183, compared with 174,424,237 in the previous twelve months, and the total average working expenditure was 7'182d. per car mile.

The Brighton Corporation has adopted the recommendation to run trolley 'buses from North Street to Preston, over a two mile route. The initial cost is £5,600, and double-decked trolley 'buses are to be used.

Of the £6,000 profits from the South Shields tramways last year, a sum of £1,600 is to be transferred to relief of rates.

The working of the G. B. surface-contact system at Lincoln for 1912-13, again shows satisfactory results, the total expenses per car mile run being 6d., compared with 6'05d. in the previous twelve months, and 6'22d. for the Lorrain system of Wolverhampton for 1912. Compared with the average working costs of 79 other municipal tramways operating on the overhead system for 1912, the Lincoln figure is 6d. against 6'54d.

Mr. T. B. Goodyer, General Manager of the Croydon Corporation Tramways, calls our attention to the paragraph on page 325 of our issue for the 5th inst., in which it is stated that, with the exception of the L.C.C., the whole of the tramway and motor-bus services in the Metropolitan area are now under one control, and points out that there are a large number of municipal tramway systems in the Metro-

politan area which have not yet been absorbed. What we wished to convey was, that practically all the tube railways, tramways and buses in the County of London, except the L.C.C., are now under the one control.

## TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

A bill has been introduced by the Dutch Government for the laying of a new telephone cable between Holland and Great Britain. The length will be 165 kilometres, and the cost of £62,000 will be equally shared by the British and Dutch postal authorities. Landing places are proposed at Westkapelle (Island of Walcheren) and Orford Ness (Suffolk), and it is anticipated that the cable will be laid by September of this year.

The latest automatic telephone exchange in this country is to be at Newport. It is to be one of 2,000 lines, and of the same type as that in use at Epsom, the "Official Switch," and under erection at Leeds. All of these were supplied by the Automatic Telephone Manufacturing Co., Ltd., who have received the order for Newport.

An International Conference, upon which is represented Great Britain, Germany, France, Belgium, Denmark, Norway, Portugal, Spain, Sweden, and the Netherlands, is meeting in London to consider the measures which should be taken to secure, as far as possible, immunity from damage to cables caused by fishing vessels and anchors of vessels of all descriptions. The meetings are private, and expected to end at the close of this week.

The trial of Mr. Cecil Chesterton at the Old Bailey for criminal libel against Mr. Godfrey Isaacs, managing director of Marconi's Wireless Telegraph Co., ended on Saturday in a verdict of guilty, and a fine of £100 was imposed, together with payment of the costs of the prosecution.

The Ottoman Administration state that the route via Otranto Vallona cannot now be regarded as an Ottoman route. The Meshed line was repaired on 4th inst., and on the 7th the Moroccan Office stated that owing to the insecurity of the region traversed by courier between Arzila and Arbavua there is long delay on telegrams. The Portuguese Government has opened a wireless coast station at Lisbon for general public correspondence. The normal range is 350 kilometres, wave length 600, call signal C.R.F., and the coast rate is 50 centimes per word. On the 9th inst. it was only possible to send telegrams between Tangier and Arzila by wireless. The Jamaica-Colon cable of the West India and Panama Telegraph Company was down in May last, and is not yet repaired. Denmark, Egypt, the United States of North America, Holland, and Russia have ratified the final Protocol of the Radio-telegraphic Convention of London. Holland's adhesion also covers Curacao and the Netherland Indies.

**Cinematograph Regulations.**—The Home Office has amended the regulation only allowing electric light or limelight, and now permits the use of acetylene, provided that certain conditions are observed.

**I.E.E. Students' Section.**—The constitution of the Committee of the Students' Section of the Institution of Electrical Engineers for the session 1913-14 as determined at recent meetings is as follows:—Chairman, Mr. S. M. Hills; Vice-Chairman, Mr. R. E. Dickinson; Hon. Secretary, Mr. E. T. Driver; Hon. Assist. Secretary, Mr. R. A. McMahon. The extra-collegiate members of the Committee are Messrs. P. R. Coursey, E. L. M. Emtage, T. J. Hornblower, G. W. P. Page, J. C. Rennie, and H. K. Whitehorn; while the collegiate representatives appointed are Messrs. R. S. H. Boulding (City and Guilds, Engineering, College), J. G. Deedes (Finsbury Technical College), A. Deimel (King's College), H. Riley (East London College), and P. J. Wheeler (Northampton Institute).

## "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

### Specifications Published June 5th, 1913

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

**11,380/12. Resistors for High Temperatures.** G. COOPER (British Prometheus Co.). The surface is impregnated with a colloidal solution of one or more of the noble metals. To effect this a layer of oxide or other absorbent compound is formed on the surface of the resistor, the coating solution is then applied and subjected to heat and heavy pressure by a suitable machine. Four figures.

**11,388/12. Engine Starter and Lighting System.** W. H. SCOTT (Laurence Scott and Co.). In combination with an electric motor and epicyclic gear are a brake and clutches whereby should backfire occur the brake is released and the housing or disc of the planet wheels of the gear is freed, so that the gear is inoperative. When running the motor is driven as a dynamo, and may be arranged in conjunction with storage cells, so that it effects the lighting of the car. This arrangement was shown at the last Motor Car Exhibition at Olympia (see ELECTRICAL ENGINEERING, Vol. VIII., p. 651, Nov. 21st, 1912). Seven figures.

**11,586/12. Switches.** P. V. HUNTER and W. L. SHAND. The circuit is broken in two points, the contacts being drawn apart so that two arcs are formed close together, with the current in each flowing in opposite directions, so that they repel one another, and are blown out. Six figures.

**11,870/12. A.C. Mercury Vapour Lamps.** E. E. DARMOIS and M. A. E. LEBLANC. An inductance is connected in series with the lamp which has a pair of electrodes for each phase. The supply pressure across the lamp and inductance must not be less than 800 volts at 50 cycles per sec. To start up the lamp is heated and this is made easier by surrounding the tube adjacent to one electrode with a metal conductor connected to the other electrode. To reduce the temperature of the mercury electrodes, iron, nickel, or other metal with a higher conductivity is inserted in the mercury. Eight figures.

**12,270/12. Starting Mercury Vapour Lamps.** P. G. TRIQUET. To effect lighting by rotation of the lamp around the axis of the tube or one parallel to it, eccentrically arranged pockets are provided. The lighting tube itself is of such shape that a quick colliding and separating of the mercury jets flowing simultaneously from the bulbs ensues, so that it is lighted by a small oscillation of 15° or 20°. Six figures.

**15,774/12. Doubling the Frequency of an Alternating Current, also a Wireless Receiver.** M. PLOHL. D.C. and A.C. windings are arranged beside or opposite each other, so that their fluxes mutually link during one half-period, and during the other half-period they form a common field. A secondary winding excited by this field will have double the primary frequency. To obtain continuous action two alternately acting pairs of D.C. and A.C. windings may be connected in series. Instead of the A.C. electromagnetic oscillations may be introduced in the winding, whereby the field so produced may be used to indicate the oscillations. The apparatus may, therefore, be used as a receiver for wireless. Five figures.

**22,364/12. Submarine Telegraphy.** J. GOTT. An extension of the system covered by specification No. 10,534/12 (see ELECTRICAL ENGINEERING, Feb. 27th, p. 120). A double current key and two separate or a split battery may be used. The connections are such that one key transmits current impulses of equal strength (dots), and the other key also transmits impulses of equal strength, but of greater power (dashes). By means of the relays described in the prior specification upon opening either keys the polarity of the current to the line is reversed. Four figures.

**30,059/12. Relays.** F. H. NICHOLSON. A U-tube containing a conducting liquid, e.g., mercury, is pivoted so that it can freely turn. A magnetic flux is maintained by a U-shaped electromagnet directly through the conducting liquid in the central portion of the U-tube through which the feeble currents are caused to pass. The interaction of the flux produced by this current with the permanent flux sets up a flow of the liquid, which therefore rises in one of the end chambers and falls in the other. The centre of gravity being thus disturbed the tube tilts and closes the local circuit. Two figures.

### Specifications Published To-day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, E.C., at the price of 8d. each, post free.

Summaries of some of the more important of these patents will appear in our next issue.

Names in italics indicate communicators of inventions from abroad.  
Arc Lamps: SOC. ANON. OFFICINE GALILEO [Remote control of search-lights] 12,449/12; ANGOLD [Magazine] 18,908/12.

Distributing Systems, Cables and Wires, Insulating Materials, &c.: WATERS [Distribution] 11,559/12; BLOUSTEIN [Distribution] 11,584/12; ECKMANN [D.C. motor load equalising] 11,597/12; B.T.-H. Co. (G.E.Co., U.S.A.) [Siliceous insulator] 19,927/12; BOSCH [Bending fibre tubes, &c.] 28,489/12.

**Dynamos and Motors:** LECOCHÉ, 28,766/11; SIEMENS-SCHUCKERT. [Dampers for A.C. machines] 11,957/12; ALLMÄNNA SVENSKA ELEK. AKTIEBOLAGET [Alternator windings] 7,776/13.

**Electrometallurgy and Electrochemistry:** MARKS (Elec. Smelting & Aluminium Co.) [Channel furnaces] 19,607/12; ELLIS [Aluminium nitrides] 25,630/12; ENGLE [Alkaline gelatinous electrolyte] 2,395/13; [Copper oxide plate] 2,396/13.

**Heating and Cooking:** MARTIN [Heater] 12,075/12; CARRON [Gloves and mittens] 18,080/12; MOREAU [Heat radiators] 28,667/12.

**Ignition:** HARTFORD and MASTRANGEL [Engine starter] 14,929/12; BOSCH [Automatically adjusting] 4,693/13.

**Storage Batteries:** MAURICE [Charging and storing cells for hand lamps] 12,505/12.

**Switchgear, Fuses, and Fittings:** SOAR [Woven net resistances] 13,213/12; SIEMENS DYNAMO WORKS and BROOKS [Electromagnetic switchgear] 15,659/12; BERRY and MARKHAM [Iron-clad] 18,349/12; LAKE (J.B.M. Elec. Co.) [Dynamo regulators] 18,425/12; PAGE [Switches] 18,980/12; COX [Controller contact fingers] 19,740/12; SOC. ED. GARBEAU & P. DELAUX [Regulators] 21,813/12; BERRY [Indicators for switches] 22,539/12; HAEFFEL [H.P. connector] 119/13; ELECTROMOTOR EQUIPMENT Co. and BRENNER [Combined locks and circuit breakers for lift gates] 1,433/13.

**Telephony and Telegraphy:** DEGENHARDT [Automatic telephony] 3,987/12; BROWN [Telephony] 4,067/12; DITCHAM, MATTHEWS, and GRINDELL MATTHEWS W.T. SYNDICATE, LTD. [High frequency oscillations for wireless telephony] 6,486/12; MERTON [Wireless] 11,714/12.

**Traction:** ANGUS [Railway signalling] 3,828/12 and 5,916/13; [Point lock control and operation] 5,918/13.

**Miscellaneous:** GRAY and BURNSIDE [Gyrostatic apparatus] 9,246/12; HILL [Lamp signalling] 11,997/12; HOADLEY [Coal-mining] 14,494/12; COLE [Portable self-contained tell-tale and dash-board lights] 23,732/12; ANGEL and CREANE [Fitting lamps to firemen's helmets] 23,814/12; RIETKÖTTER and CLAES [Electromagnetic ore separators] 24,435/12; SMITH [Electrocuting animals] 2,152/13 and 2,199/13; PARSONS and WADDINGTON [Pendulum bell indicators] 4,890/13; KRUPP [Ordnance alarm signal] 5,872/13.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Dynamos and Motors:** FYNN, 11,214/13; SIEMENS-SCHUCKERT. [A.C. commutator motors] 11,315/13.

**Electrochemistry:** SOC. GEN. DES NITRURES [Manufacture of aluminium carbides] 11,091/13.

**Incandescent Lamps:** WESTINGHOUSE METALLFADEN GLÜH-LAMPENFABRIK [Rendering metals and alloys ductile and malleable] 11,017/13.

**Instruments and Meters:** LANDI [Direction indicators] 1,198/13; [Revolution counters] 1,199/13.

**Storage Batteries:** SABLON [Plate protection] 8,469/13.

**Switchgear:** GORTON [Automatic S.P. switch] 608/13.

**Telegraphy:** DOS SANTOS [Stations] 11,243/13.

### Expired Patents

The following are the more important Patents that have become void through non-payment of renewal fees.

**Dynamos, Motors, and Transformers:** SIEMENS-SCHUCKERT. [High-speed commutators] 4,240/07; CROMPTON & Co., J. C. MACFARLANE and H. BURGE [Motor-generator supplying constant current] 3,626/08.

**Electrometallurgy:** K. HIORTH [Reduction of iron ores] 3,680/08.

**Switchgear, Fuses, and Fittings:** W. E. BARTON [Q.B. switches with quick make: also circuit breakers] 3,762/05.

**Traction:** C. DE KANDO [Stator casings for motors in electric vehicles] 3,989/03; W. R. SYKES [Visual and audible signal cabin indication of position of train in block section] 4,406/06; A.E.G. [Pneumatic raising and lowering gear for overhead collectors] 4,263/07; A. SPENCER [Control of gas lamps on trains] 3,779/08; SIEMENS DYNAMO WORKS (Siemens-Schuckert.) [Combined tightening gear and section insulator for overhead contact lines] 4,112/08.

**Miscellaneous:** W. J. RIDER [Advertisements] 4,296/06; R. WAYGOOD & Co. and R. CAREY [Pneumatic gate operating gear for lifts] 4,423/07; J. C. CHALMERS and W. A. ROBERTSON [Number indicators] 3,615/08; K. O. LEON [Steering torpedoes] 3,854/08; A. GREENWOOD [Remote indicator for doors] 20,753/08.

## LOCAL NOTES

**Belfast: The New Power Station.**—With regard to the proposed new power station of the Corporation, a question has been raised as to whether the Corporation has the power to erect a new generating station upon lands not specified in an Act of Parliament or Provisional Order. The City Solicitor has reported his opinion that the Corporation has this power subject to the consent of the Board of Trade, but in view of the importance of the question, the opinion of counsel is to be taken on the point.

**Burton-on-Trent: Overhead Mains.**—The Board of Trade has sanctioned the erection of overhead mains for the supply of electricity to the sewage pumping station at Clay Mills. The Board of Trade reserves the right to reconsider the use of these overhead mains at the end of five years.

**Bury: Electricity Accounts.**—There was a loss of £642 upon the working of the electricity undertaking to March last, compared with a loss of £1,276 in the previous twelve months. It is pointed out in the report that no less than £11,219 have been required for interest and sinking fund charges. The debit balance has been taken from the reserve fund. The revenue for the year was £2,923 more than in the previous year, which is the largest annual increase since the undertaking was established, with the exception of the year when the electric tramways came on to the mains. An arrangement has been made with the Radcliffe Urban District Council to take a supply in bulk from the Corporation instead of extending the Radcliffe Works. A supply under this agreement is now being given.

**Croydon: Electricity Accounts.**—In his annual report, Mr. A. C. Cramb, the Borough Electrical Engineer, calls particular attention to the increase in the sales for power purposes, and also for heating and cooking. He points out that the cost of electric heating is comparatively low, and that this business can be developed much easier than that of cooking, where the cost of apparatus is such that few people will buy it, and he adds that it is hopeless to expect any material increased business in cooking until the Corporation take in hand a satisfactory scheme for developing it by hiring out cookers at reasonable rates. In this connection attention may be called to the I.M.E.A. Bill, which is abstracted on another page, and of which Mr. Cramb has been a most ardent advocate for many years.

**Dromore: Electric Lighting.**—The Board of Trade has refused to grant the Council an electric lighting Order.

**Dublin: Proposed Increases of Salary.**—With reference to the recommendations of the Electric Light Committee to increase the salaries of the City Electrical Engineer, the Deputy City Electrical Engineer, and the Chief Engineer of the Distribution Department, as mentioned on page 282 of our issue for May 15th, a deputation of ratepayers waited upon the Corporation last week to protest against these increases, mainly on the alleged ground that in 19 years the ratepayers have only had £9,000 from the electrical undertaking, which has cost £750,000.

**Durban: Electric Heating and Cooking.**—According to H.M. Trade Commissioner for South Africa, the efforts of the Corporation in encouraging the use of electricity for cooking and heating purposes are meeting with considerable success, and the result of the introduction of a cheap apparatus designed by the Borough Electrical Engineer, is that many electric cooking and heating outfits have been installed.

**Felixstowe: Proposed Purchase of Electricity Undertaking.**—The negotiations with Dr. Liebbrand, who proposed to make an offer to purchase the electricity undertaking from the Council, have been abandoned.

**Halifax: Gas and Electricity Competition.**—A proposal by the Electricity Committee that the charge for current for lighting purposes should be 4d. per unit up to 1,200 units per quarter, and 2d. per unit for all consumption in excess of this amount, has been referred back. The objection seemed to be that an all round revision of the charges by the electricity undertaking, including power consumers, should be undertaken. Oddly enough, the proposal to refer back came from the Vice-Chairman of the Gas Committee, with which the Electricity Committee is in very active competition. In fact, some of the members of the Council are beginning to regard this competition with apprehension, and the Mayor has suggested that if the Gas and Electricity Committees cannot come to some agreement in the matter, the Council must deal with it.

**Hastings: Electric Lighting Accounts.**—There was a net profit of £556 upon the electricity undertaking last year.

**Hull: Electricity Supply.**—A proposal by the Electricity Committee to take over the Hessle electric lighting Order has been defeated in the Council, the vote being 29 for and 20 against. It was pointed out that the principal capital expenditure would be from £10,000 to £12,000, but the Electrical Engineer estimated that on the first year there would be a loss of £500, after which he anticipated profits.

**Lincoln: Electricity Accounts.**—The net profit on the electricity undertaking last year was £2,538, compared with £3,038 in the previous twelve months. The number of units sold increased by 21.5 per cent. during the year, but in spite of the large increase in the price of coal, the amount used per unit generated has been slightly decreased.

**London: L.C.C.**—The County of London Electric Supply Co. has, under a notice served upon it by the London County Council, already established six testing stations in its southern area. As the result of further negotiations three testing stations are now to be installed in regard to the Company's North London area.

**St. Pancras: Street Lighting.**—The Electricity and Public Lighting Committee is to report as to improving the lighting of the main roads of the borough.

**Stepney: Electricity Accounts.**—There was a net profit of £11,507 on the working of the electricity undertaking for the year to March last, in spite of the considerably increased price of coal. This profit is £1,250 less than in the previous year, due to the above cause.

**Manchester: Rateable Value System of Charging.**—The Electricity Committee has adopted the Norwich system of charging, as an alternative rate at the option of the consumer, to the existing tariffs for domestic supplies. The new rate is on the basis of 12½ per cent. on the net rateable value of the dwelling house, plus ¾d. per unit for all current used. The adoption of the new tariff is contingent upon the consumer agreeing to instal for domestic power purposes a certain minimum number of kilowatts, according to the rateable value of the premises, in addition to the existing lighting requirements.

**Peterborough: Electricity Accounts.**—The deficit of £145 on last year's working of the undertaking has been met out of the reserve fund.

**Rochdale: Bulk Supply.**—The question of the terms upon which a bulk supply shall be given to the Heywood Corporation is engaging the attention of the Electricity Committee.

**West Ham: New Domestic Tariffs.**—The following alternative tariff has been agreed to:—The price for all energy used for lighting, heating, and cooking is to be ¾d. per unit, in addition to an annual charge of £10 per kilowatt of lamps installed, with a minimum payment of £2, and 2s. for every additional 10 watts. An allowance up to 25 per cent. may be made for lamps for occasional use. For heating and cooking the annual charge is 10s. for the first kilowatt, and 6s. 8d. per kilowatt for additional apparatus. After the first kilowatt the charges are subject to division into tenths, e.g., 1s. 8d. per 100 watts for apparatus between one and two kilowatts capacity.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

### Generating Stations, Sub-Stations, Mains, &c.

**Australia.**—In connection with the electrification of the Melbourne suburban railways, the following plant is required:—Surface condensers, air and water extraction pumps and motors, circulating water and sump pumps with motors. Consulting engineers, Messrs. Merz & McLellan, 32 Victoria Street, S.W. (See advertisement on another page.)

**Bedford.**—The Local Government Board Inspector, who

## THE RECORD ELECTRICAL Co., Ltd.

LONDON OFFICE:  
CAXTON HOUSE,  
WESTMINSTER, S.W.

Telephone:  
3057 Victoria.  
Telegrams & Cablegrams:  
"Infusion,  
London."

**MEASURING  
INSTRUMENTS.**

RECORD'S PATENT.

Write for Prices & Particulars.

WORKS:  
BROADHEATH,  
MANCHESTER.

Telephone:  
164 Altrincham.  
Telegrams & Cablegrams:  
"Infusion,  
Altrincham."

recently postponed an inquiry concerning a loan of £11,590 for the purpose of receiving further information, continued it yesterday.

**Belfast.**—A loan of £35,000 is to be applied for in connection with the electricity undertaking, including additional arc lighting.

**South Africa.**—*The British and South African Export Gazette* states that the Kalk Bay and Ermelo Municipalities will shortly be inviting tenders for electrical plant.

**Wigan.**—A new turbo-alternator, &c., is to be installed at an estimated cost of £8,700.

**Worcester.**—Certain alterations are to be made at the sub-stations at an estimated cost of £750, to meet objections raised by the Electrical Inspector of Factories.

**Worthing.**—The new plant, for which, as we announced last week, a loan is to be sought, includes a 260 kw. Diesel engine generating set with provision in the engine room for an additional 260 kw. set and 350 kw. set.

### Wiring

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Aberdeen.**—New buildings for provincial committee for training teachers, costing £49,000.

**Barrow-in-Furness.**—New secondary school.

**Bristol.**—Electric lighting of new wing, General Hospital. Secretary, Guinea Street.

**Bury.**—New mill for Peel Mill Spinning Co.

**Croydon.**—Forty-six dwelling houses, Wharfedale Gardens D. Weighton, 78 North End.

**Derby.**—Additions to Borough Asylum.

**Farnworth.**—New fire station.

**London: L.C.C.**—Electrical installation at the Caldecot Road elementary school, Denmark Hill, S.E. 192 lighting points. Chief Engineer, July 2nd. (See advertisement on another page.)

**Nottingham.**—New cinematograph theatre. Architect, F. Ball.

**Oxford.**—Proposed City museum.

**Paisley.**—Four-storey building for Co-operative Manufacturing Society.

**Ravensthorpe.**—New school.

**Sheffield.**—Infants' Department at Greys Stone school. Secretary, Education Offices. New telephone exchange. H.M. Office of Works, London.

### Miscellaneous

**Birmingham.**—Twelve months' supply of electrical accessories for the Electricity Department. City Electrical Engineer. June 23rd.

**London: Stepney.**—Twelve months' supply of arc lamp carbons. Borough Electrical Engineer. June 30th. (See advertisement on another page.)

**Sweden.**—The Swedish State Railways Administration require 206,700 arc lamp carbons, and 44,100 incandescent lamps. Copies of the specification, &c., may be seen at 73 Basinghall Street, E.C.

### TENDERS RECEIVED AND ACCEPTED

**Liverpool.**—A further order for 4,000 Robertson lamps has been secured by the General Electric Co. from the Corporation, for the purpose of illumination, in honour of the forthcoming visit of His Majesty King George.

**London: L.C.C.**—The following tenders have been received for alterations to the electric lighting on Westminster Bridge:—S. Pontifax & Co., £72 5s.; J. Biggs, £150;

W. Sugg & Co., £216 4s. 6d. The first-named tender is recommended for acceptance.

**Manchester.**—The following tenders have been accepted:—General Electric Co., two 50 h.p. three-phase motors; Siemens Bros. Dynamo Works, Ltd., switchgear, bus-bars, &c.; Holden & Brooke, Ltd., electrically driven boiler feed pump; Bruce Peebles & Co., two 750 kw. motor converters; British Electric Transformer Co., a supply of 75-k.v.a. transformers; W. T. Henley's Telegraph Works Co., and Electrical Engineering & Equipment Co., low-tension cable; W. T. Henley's Telegraph Works Co. and C. Macintosh & Co., paper-insulated and rubber-insulated cable respectively.

### APPOINTMENTS AND PERSONAL NOTES

Mr. M. N. Jacks, director of Humphreys, Ltd., and Mr. J. Norman Ampler have joined the Board of Scholey & Co., Ltd. (151 Queen Victoria Street, E.C.).

Mr. Justus Eck, of the Union Electric Co., has returned from his tour to Australia, Tasmania, New Zealand, Canada, and the United States. In Melbourne he read a Paper on "Indirect Lighting by Arc Lamps," before the Victorian Institution of Electrical Engineers, and received an invitation from the Engineering Society of Queensland to read a paper before that body. Unfortunately lack of time compelled him to decline. Mr. Eck expresses himself satisfied in every way with his tour, and particularly with the cordial reception universally extended to him by members of all branches of the electrical industry.

Mr. H. E. Blain, who has been General Manager of the West Ham Corporation Tramways since 1903, has resigned to take up an appointment elsewhere.

### MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. George Smith & Son, 5 Philpot Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night, was £69 5s. to £69 15s. (last week £71 to £71 15s.).

**Benjamin Electric, Ltd.**—Mr. G. Campbell, Sales Manager of this firm, informs us that the accounts and order departments are now managed at 1a Rosebery Avenue (Tel.: City 2407), but the sales offices and showrooms are still at 117 Victoria Street, S.W. (Tel. Victoria 1297).

**Edison & Swan United Electric Light Co.**—According to correspondence in the financial papers, there seems to be some prospects of the debenture consolidation scheme (referred to in our last issue) meeting with opposition by the holders of first debentures.

**The Washington Industrial Property Convention.**—The International Convention for the Protection of Industrial Property, as revised at Washington in 1911, has been signed by the United Kingdom, Germany, Italy, Japan, the Netherlands, San Domingo, Austria and Hungary, Spain, the United States of America, France, Tunis, Mexico, Norway, Portugal, Switzerland, New Zealand, Ceylon, Trinidad, and Tobago, and is now in force between these countries. The Arrangement for the Prevention of False Indications of Origin of Goods, as revised at Washington, has been signed by the United Kingdom, Spain, France and Tunis, Portugal, Switzerland, and New Zealand.

## KAYE'S LATEST PATENT SERRATED STEEL SEAMLESS OIL CAN

Sole Makers

# JOSH. KAYE & SONS LTD.

(Managing Director: W. K. KAYE, M.I. Mech.E.)

## Lock Works, LEEDS,

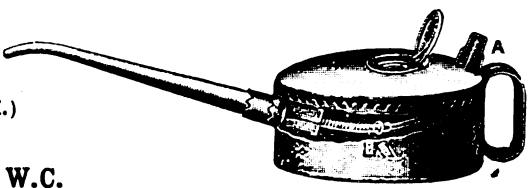
And 93, High Holborn, London, W.C.

FITTED WITH

### New Patent Thumb Button and Patent Seamless Spout.

Also in Copper or Brass for Electrical Purposes.

Contractors to H.M. Navy, War Department, Home Office, and Indian State Railways.





# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 338 [Vol. IX., No. 25]

*All rights reserved.*

THURSDAY, JUNE 19, 1913.

[PRICE ONE PENNY.]

*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES AND TECHNICAL COLLEGE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

*Other Advertisement Rates on Application.*

#### *Latest Time for Receiving*

Letters for Insertion, Tuesday *first post*

Small Advertisements and Official Announcements, Wednesday *first post*.

Displayed Advertisements, Tuesday *first post*.

Corrections in Standing Advertisements, Monday *first post*.

All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 208-206, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Circling, Fleet, London."

Telephone No.: 5509 Holborn

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

THE 18th Annual Convention of the Incorporated Municipal Meeting is being held this week in London. Mr. J. E. Edgcome, the President, in the course of his opening remarks, made allusion (amid applause) to the wrong policy of municipal corporations in imposing an age limit of forty upon candidates for posts of chief engineer; in view of the technical and commercial experience necessary, men over forty might often, he thought, be better fitted for such positions than younger men. He then read an Address by Mr. Shawfield, who had been elected President last year, but had to resign on leaving municipal employ. In his address, Mr. Shawfield expressed himself in favour of extending wiring powers to all municipal electricity departments; he discouraged the allocation of profits to rate relief instead of to building up a reserve fund, the provision of working capital, and expenditure upon extensions and improvements; he looked forward to large reductions in the price of electricity as the initial capital charges were extinguished by the operation of the sinking fund; he suggested that gas supply should ultimately take the form of non-illuminating producer gas, which would be used by the suppliers of electricity for the production of electrical energy; and he reviewed the relations between electricity committees and their responsible officials, recommending that the Chief Engineer should have full control both of the technical and financial side, and that the pay of technical assistants should always be adequate to their duties and responsibilities. (Page 351.)

DR. S. Z. DE FERRANTI opened a discussion on "Prime Movers." Oil fuel, he thought, should be left to the motor-car, the Navy, and the Mercantile Marine, and, in comparing the gas engine with the steam turbine, he gave his reasons for believing that the balance of advantage was with the latter. In the discussion, Colonel Sinclair gave some low steam consumptions of a reciprocating engine suitable for small stations; Mr. Seaton derided the practice of making the contractor carry out the reception tests of plant instead of these being made by an independent expert; Mr. H. S. Russell spoke in favour of a number of scattered Diesel engine stations being used instead of a large steam station with sub-stations; Mr. Chattock had made a comparison of the cost of steam and gas engine stations, which showed a distinct advantage to steam; and Mr. Richardson had obtained a similar result as between Diesel and steam; Mr. Weekes described a method of utilising high pressure exhaust for heating purposes in sugar and soap works; Mr. Gray gave some interesting figures of the economy obtained with his gas engine and bye-product recovery plant; Mr. Wordingham favoured the employment of gas engines of moderate size supplied with gas from gas works; and Mr. Chamen agreed absolutely with Dr. Ferranti. (Pages 353 to 356.)

A REPRESENTATIVE exhibition of heating and cooking apparatus is being held at the Institution of Electrical Engineers during the I.M.E.A. Convention. (Page 356.)

AN extremely practical discussion on electric cooking was held at the meeting of the "Point Fives" on Tuesday evening. It was considered even more important that the hiring charge be kept low than that the price of energy should be put down to  $\frac{1}{2}$ d. per unit. (Page 357.)

To obtain all-round equity a new tariff for electricity supply was suggested in a Paper by Mr. F. Simpson read recently before the Yorkshire Section of the Institution of Electrical Engineers at Leeds and Sheffield. The tariff is based on the analysis of published accounts for the last 15 years, from which, on the author's "business" basis, it appears that very few undertakings make any profit at all. The tariff it is suggested should be subject to yearly revision, but it was severely criticised by several speakers. (Page 360.)

At the Annual Congress of the Tramways and Light Railways Association, held last week at Blackpool, Mr. E. H. Edwards made some suggestions for increasing the profits on interurban lines by the use of less elaborate cars and by encouraging goods traffic. In another paper, Mr. F. Bland reviewed the development of tramway track design. The subject of railless traction was dealt with by Mr. H. England, and Mr. A. V. Mason read a paper on tramway rules and regulations. (Page 361.)

THE Electrical Contractors' Association held their annual dinner on Tuesday (Page 362.)

SOME particulars are given of the Cumberland electrolytic method of preventing scaling and corrosion of boilers and condensers. (Page 362.)

At the last meeting of the Institution of Electrical Engineers a Paper on telephone transmission calculations was read by Mr. A. J. Aldridge, who developed a graphical vector construction applicable to a number of practical problems, and proposed a new reference standard telephone line. (Page 363.)

METHODS of differentiating between alternating and continuous current mains and ascertaining if they are live and if they are carrying current, are asked for in our Questions and Answers columns. (Page 365.)

WE give a few particulars of the electrically-driven model warships used in the display at the Earl's Court Exhibition. (Page 365.)

AMONG the Specifications published by the Patent Office on Thursday last were several relating to telephony and telegraphy. A system of cable protection where there are cables in parallel is covered in a specification by E. G. Waters, and the use of a weight or spring for resetting the carbon catches in magazine flame arc lamps is protected by H. E. Angold. The grant of a patent to C. A. Midgley and A. H. Vandervell for a variable speed constant pressure dynamo is opposed. (Page 366.)

MOTOR omnibus competition has almost wiped out the surplus on the L.C.C. tramways, but measures are to be taken to meet the competition more successfully. Expenditure of £1,000,000 has been sanctioned on the Post Office tube railway. (Page 367.)

SOME notes on the Marconi report are given under Telephony and Telegraphy. (Page 367.)

A CONSIDERABLE advance has been made in the heating and cooking load at Brighton, but the net profit of £1,406 is less than that for the previous year on account of an increase in the rates and price of

coal.—Some of the employees of the Leeds Electricity Department have been on strike, but there has been no danger of interruption to supply.—It has been decided in the Court that in view of the Limerick Electricity Department having charged a price less than the maximum allowed by their Order, they have no power to levy a rate to meet the deficit on the undertaking. (Page 369.)

CONVERTING plant is required at Stepney; cables at Newcastle-under-Lyme; and a switchboard, battery, and booster at Limerick. (Page 369.)

## ARRANGEMENTS FOR THE WEEK

(TO-DAY), THURSDAY, JUNE 19TH.

*Incorporated Municipal Electrical Association.*

10.15 a.m. Annual Convention. Empire Theatre, Kingston-on-Thames. (1) "Air Filtration," by J. Christie (2) "Electric Vehicles," by W. H. L. Watson and R. J. Mitchell, introduced by A. H. Seabrook.

3.0 p.m. Trip to Weybridge.

FRIDAY, JUNE 20TH.

*Incorporated Municipal Electrical Association.*

10 a.m. Annual general meeting at Institution of Electrical Engineers, followed by special general meeting for amendment of Articles of Association.

SATURDAY, JUNE 21ST.

*Incorporated Municipal Electrical Association.*

9.30 a.m. Visit to King George Reservoir, Chingford.

THURSDAY, JUNE 26TH.

*National Physical Laboratory.*

3.0 p.m. Opening of new buildings by Mr. A. J. Balfour.

*Institution of Electrical Engineers.*

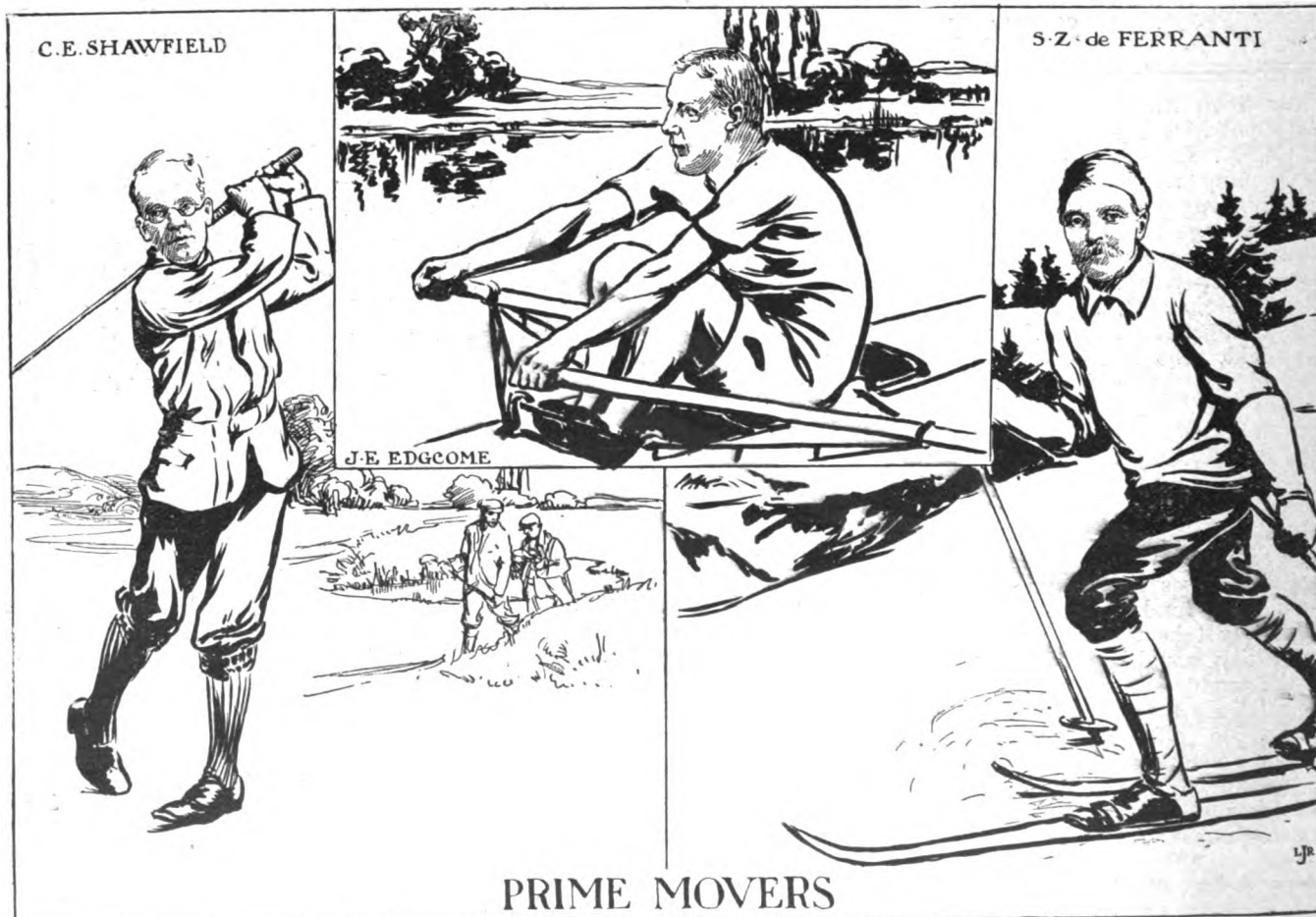
9.0 p.m. Conversazione at Natural History Museum.

## The London Electrical Engineers.

(TO-DAY) THURSDAY, JUNE 19TH.—C. Company. FRIDAY, JUNE 20TH.—D. Company. MONDAY, JUNE 23RD.—A. Company. TUESDAY, JUNE 24TH.—B. Company. THURSDAY, JUNE 26TH.—C. Company. FRIDAY, JUNE 27TH.—E. Company. Infantry Drill, 7 to 9 p.m. Technical Instruction for all members of the Sixth Rate and for all Candidates for Higher Rating, 7 to 9 p.m. Musketry Instruction, 7 to 10 p.m.

SATURDAY, JUNE 21ST.—Main Party for Bere Island parade at Headquarters at noon.

SATURDAY, JUNE 29TH.—All Companies parade at Headquarters at 8 p.m. for Ceremonial Parade on Wimbledon Common. Dress: drill order, service dress, black louts and putties. The Officers' Drill Cup Competition will be decided on the turn out for this and the Royal Review Parades. Members are asked to turn up early. Regimental business transacted 10 a.m. till noon.



## EIGHTEENTH ANNUAL CONVENTION OF THE INCORPORATED MUNICIPAL ELECTRICAL ASSOCIATION

THE attendance at the Convention of the Incorporated Municipal Electrical Association held in London this week constituted a record. A list of 252 members who had up to Wednesday last week intimated their intention of attending the meeting was published in our last issue, but since then a large number of other visitors decided to come, and the total number rose to about 350. For the convenience of members we prepared a list of names supplementary to that published in our last issue, and this was distributed at the meeting on Tuesday. The number of lady visitors was also exceptionally large.

Mr. J. E. EDGCOMB (Chief Electrical Engineer, Kingston), President of the Association, took the chair on Tuesday, when the Association met in the building of the Institution of Electrical Engineers, and were welcomed by Mr. W. DUDDELL, the President of the Institution.

In the course of his remarks Mr. DUDDELL said that it was extremely appropriate that the Association should have its headquarters in the Institution building. Any advance in the electrical industry affected all sections. Looking back upon the history of the Association, he recalled that when it was started in 1896 it was a very small body, and one criticism levelled at it was that it "hurried" too much. But looking through the proceedings of the last few conventions, it seemed that the members had considered very seriously all the important subjects which affected the electrical industry. His wish was that the deliberations of the present convention would lead to good results, and that any resolutions which might be arrived at would benefit the electrical industry as a whole. He was quite certain that working for the industry as a whole they would promote the welfare of the particular branch in which they were interested.

In tendering the Association's thanks to the Institution, Mr. EDGCOMB said that most of them were, and they all ought to be, members of the Institution, which was the senior institution, and they must feel that coming to this building they were more or less coming home. If he might be allowed to congratulate the Institution through Mr. Duddell, it would be on the formation of the Industrial Committee, which, under the very able chairmanship of Mr. Hugo Hirst, was doing, and would continue to do, very good work for every branch of the profession.

Mr. EDGCOMB then explained why it was that he was not delivering a Presidential Address.

Members, he said, had naturally looked forward to being presided over by Mr. Shawfield, who was unanimously elected last year to the position of President, but in giving up his position as Chief Electrical Engineer at Wolverhampton, Mr. Shawfield had been obliged to give up his position as a member of the Association. The Council had then decided to elect for the remainder of the term a Past-President, and the choice had fallen on him (Mr. Edgcomb). He had felt, however, that the members were still entitled to receive a Presidential Address from Mr. Shawfield, especially as he himself had already given a Presidential Address seven years ago. Although Mr. Shawfield had been obliged to give up his connection with the Association upon leaving municipal work, he hoped that at no very distant date they would be able to bring him amongst them again as an Honorary Member.

### SUGGESTED SLIDING SCALE OF SUBSCRIPTIONS.

There were two other points on which he would like to touch, the first being in the nature of an apology and the second in the nature of a protest. In his Presidential Address seven years ago, he had expressed the hope that at no distant date the Association would start an Information Bureau. But when he vacated the Chair he had been elected Honorary Treasurer, and he was afraid that the enthusiasm of the President had since been somewhat damped by the financial caution of the Treasurer. Consequently, the matter must be delayed until they found some means of increasing their revenue. He would suggest that such a means would be found in a sliding scale of subscriptions or donations from the larger municipalities. At the present time all municipalities, large and small, paid a practically nominal subscription, but it seemed to him that it would be fair that the larger undertakings should pay a larger subscription *pro rata* either upon capital expenditure or profits.

### "TOO OLD AT FORTY."

The second matter, as he had said, was in the nature of a protest. Lately several municipalities had thought it wise to include an age-limit restriction when appointing engineers and managers of their undertakings, and he would like to point out strongly that no possibly good purpose could be served by this.

(Applause.) The fact that there was no such restriction would not in any way tie the hands of a municipality when making the selection of their engineer, and they would be able to select suitable men of any age they thought fit. He considered that in these days, when the Chief Engineer and Manager of a big undertaking had to have experience, not only on the engineering side of the profession, but also on the commercial side, a man who had already had very considerable experience in the generation and distribution of light and power, with all its many and varying responsibilities, must be better fitted to take charge of a large undertaking than a younger man who, from his age, had not had time to get that experience. He was not at all in favour of the view that a man is "too old at forty." (Applause.)

As Mr. Shawfield was unable to be present himself, Mr. Edgcomb then read his address.

### MR. C. E. C. SHAWFIELD'S ADDRESS

THE position of President of the Incorporated Municipal Electrical Association is undoubtedly one which carries with it many and varied responsibilities, and those members of your Association who have passed the Chair will doubtless agree with me when I venture the opinion that the preparation of the Presidential Address is by no means the least of these responsibilities. It is, I believe, the first time in history that the opening address has been given by other than the President for the time being, and I desire to express to you my thanks for the honour you did me when you elected me your President twelve months ago. It was with very real regret that I found myself compelled to lay down the reins of office, owing to my vacating municipal service.

At the time of the formation of the Municipal Electrical Association in 1895, electricity supply was truly in its infancy, and, like most infants, progressed with somewhat weak and faltering steps. In what was quite a large central power station in those days there would often be found a neatly-arranged row of generating sets of sizes ranging from 10 kw. to deal with the day load, up to monsters of 50 or even 100 kw., designed to cope with the peak load, which occurred during the evenings in December. At that time, absolute continuity of supply was a dream seldom realised, and there were few householders or shopkeepers who did not keep a supply of candles and matches in readiness for the expected breakdown. It is difficult to realise that in the eighteen years which have elapsed since the first meeting of your Association was held in London, the electricity supply infant has grown into such a remarkably well-developed and healthy adult, and that it is now surrounded by a numerous and healthy progeny of allied industries and undertakings.

One of the most remarkable features in connection with the growth of electricity supply during recent years is the enormous increase which has taken place in the application of electricity to industrial purposes, and the rapidity with which its status has changed from being that of a luxury to be enjoyed by the few, to that of a necessity which is demanded by the many. A cheap supply of electricity is now as necessary to the welfare of the community, as a whole, as is a cheap and ample supply of water or the provision of a well-designed system of drainage. There can be no doubt that the rapidly increasing use of electricity by manufacturers for motive power purposes has had a marked effect in improving and purifying the atmosphere of our large industrial centres, and this will doubtless have been brought to the notice of many members of this Association by the decreasing frequency of the fogs, upon which many of us formerly depended for the improvement of our lighting load factor.

When reviewing the present position of public electricity supply in Great Britain, and the progress that

has been made since its inception, one is struck by the fact that, so far as the provinces are concerned, the great bulk of the industry is under municipal control, and the question immediately arises—has the progress that has been made, been in spite of, or because of, municipal ownership? As in most matters of policy in this country, public opinion appears to be sharply divided upon this question, and whilst one section asserts that municipal control is essential to the proper regulation of the supply of public necessities, another party as loudly condemns it as being economically unsound. I must confess that after seventeen years of municipal work, I am unable to give my adherence to either of these opinions, because although it is perfectly true that in certain instances electricity supply has languished whilst under local government administration, there are other instances where magnificent results have been achieved, second to none that have been shown by any private enterprise. Moreover, it must be remembered that in certain cases the opponents of municipal trading have done their best to thwart and hinder those who were endeavouring to develop municipally-owned undertakings on business lines, and when their efforts have been partially or wholly successful they have pointed the finger of scorn at their victims and held them up as typical illustrations of municipal mismanagement.

It must be borne in mind that during the early years of electricity supply, the establishment of a central station in many of our provincial towns would probably not have been possible, except for the fact that municipalities were able to raise capital at relatively low rates of interest, and the fact that a large number of small stations have been provided and operated by municipalities under conditions that no private company could have survived, has resulted in a vast amount of valuable experience having been obtained in the design and arrangement of generating plant and distributing systems, of which we are now beginning to reap the benefit. Much has been said for and against the principle of municipal trading in the past, and I have no desire to add further to what is too frequently a profitless discussion. The fact remains, however, that whether for good or for evil, Parliament has committed to the municipalities of this country the control of the supply of electricity to the bulk of the community, and it rests with the members of the Incorporated Municipal Electrical Association to see that this trust is not misplaced.

One of the most curious anomalies of the present position of the public supply of electricity in this country is, that whilst a municipality is empowered to generate and distribute electricity throughout its area, and to make contracts with consumers as to the terms and conditions of supply, it is practically debarred from installing in a consumer's premises the apparatus which is necessary to enable that consumer to utilise the electricity which the municipality has for sale. That is to say, that whilst a local authority is permitted, and even encouraged, to spend tens of thousands in generating plant and distributing mains, it is not permitted to spend tens or hundreds in the purchase and installation of wiring, fittings, and motors. You are told that this restriction is placed upon you because if you entered into the business of supplying fittings and installations, you would be competing with private enterprise, and that you have no right to use money borrowed on the security of the rates to finance a retail trading department. The supporters of this theory apparently ignore the fact that the existence of an electric supply undertaking postulates the provision of means to enable the electricity to be consumed. In London, and in a few of the larger provincial towns, this necessity can be, and is, to a large extent, provided by private enterprise, but many of you who are associated with stations in smaller communities, know

only too well that the average wiring contractor has not the capital or the staff, and too frequently also has not the ability to adequately supply the requirements of consumers. It is true that some municipalities have been fortunate enough to obtain, by means of private Acts, full powers to carry out wiring and installation work of all descriptions and to sell and fix electricity consuming devices. The Corporation of Wolverhampton has possessed these powers since 1899, and after fourteen years' experience of the practical operation of these powers, I can unhesitatingly affirm that both the electricity department and the local wiring contractors are in a flourishing condition. If a municipality has only the restricted powers given under the Electric Lighting Clause Amendment Act—by which wiring work can only be carried out through a contractor—the result is of very little use to either party. I sincerely trust that this Association and the municipalities which it represents will continue to press for the general concession of those powers to all municipalities which are at present confined to a section only.

I am entirely opposed to what I regard as the vicious practice of rate relief from the profits of electricity undertakings [*cheers*], and I sincerely trust that the members of this Association will do whatever lies in their power to discountenance these donations. This subject was exhaustively dealt with by one of your past Presidents about two years ago, and I can only express my heartfelt concurrence with his expressions of opinion. I would go further and say that whilst municipally-owned electricity undertakings should be self-supporting, their surplus earnings should be allocated firstly, to the accumulation of an adequate reserve fund, secondly to the provision of working capital, and that any balance remaining should be devoted to the extension and improvement of the undertaking. It has frequently been stated by one of the inspectors of the Local Government Board that to borrow capital for extensions with one hand whilst giving surplus profits to the relief of rates with the other is virtually equivalent to borrowing money for purposes of rate relief. I cannot help agreeing with him on this point.

Much has been done in recent years in the direction of lowering the average rate of charge per unit to all classes of consumers, but I firmly believe that much still remains to be done in this direction, and that if municipally-owned electricity undertakings as a body were to go boldly for a drastic reduction in prices, they would not only be more faithfully performing their duties to the community as a whole, but they would also reap a rich reward in the shape of increased output and better financial results. As a general principle I believe that practically every central station can afford to sell electricity at a profit, at a lower price than that at which none but a specially circumstanced private generating plant can produce it, and it should be the aim of every undertaking to supply from its mains every unit of electricity consumed within its area. There is a great temptation to enlarge upon this question, but as I have already inflicted upon you one paper on this subject, I must not trouble you farther.

Up to the present the history of electricity supply in this country has been one of constant warfare against gas competition, both for lighting, heating, and motive power, and it may now be safely affirmed that electricity has won for itself an assured and unassailable position as regards public and private lighting and for motive power purposes, whilst it is making a strong attack upon the hitherto impregnable position of heating and cooking. The time is now rapidly approaching when a large part of the present capital liabilities of electricity undertakings will be liquidated by the operation of the sinking fund, and when this day arrives, it seems probable that such a general reduction in the selling price of electricity will be possible that its prac-





# DELIVERIES

OF  
**“FREEZOR”**  
ELECTRIC FANS

## IMPORTANT ANNOUNCEMENT

*re*  
**Express Delivery Service.**

Owing to the vagaries of the British climate and the consequent element of uncertainty that exists with every contractor in deciding what quantity of Fans shall be kept in stock, we have inaugurated a new system of express deliveries which should relieve anxiety in this direction and enable the Trade to fill their orders direct from our stocks with a minimum of delay.

This arrangement should prove of value to all Contractors who are handling “Fans” as it permits of “free” trading on a minimum stock basis.

During the winter months we have accumulated vast stocks of “Freezor” Fans of all voltages at our London Showrooms, and various Provincial Branch Establishments, and can deliver any quantity by return.

*Write for Particulars of this New Delivery Service.*

### THE GENERAL ELECTRIC CO., LTD.,

**Head Office:** 67, Queen Victoria Street, London, E.C.  
Telephone: LONDON WALL 3600 (20 lines).      Telegrams: “ELECTRICITY, CENT. LONDON.”

**Branches:** Manchester, Glasgow, Birmingham, Newcastle, Cardiff, Dublin, Belfast, Bristol, Swansea, Liverpool, Leeds, Sheffield, Nottingham, Hull, Southampton.

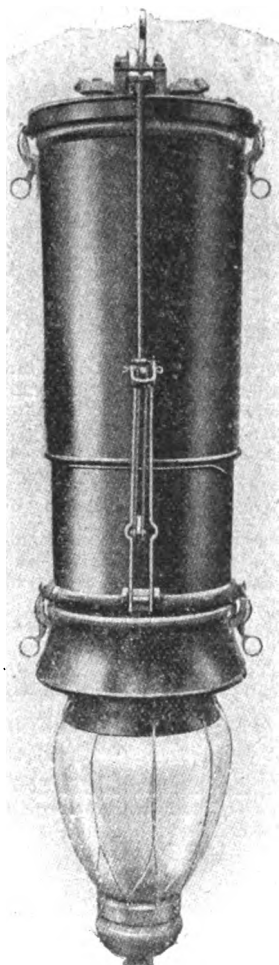
**“FREEZOR” FANS**  
EXPRESS  
DELIVERY SERVICE

**"ANGOLD"**  
PATENT  
**MAGAZINE**  
**FLAME LAMP**

The most successful Arc Lamp for the lighting of Streets,  
Public Places, Docks, Railways, Large Engineering Works, etc.

Amongst many Municipalities  
using "Angold" Magazine  
Flame Lamps are the following :

ABERDEEN  
ALDERSHOT  
ASHTON-UNDER-LYNE  
BIRKENHEAD  
BIRMINGHAM  
BLACKBURN  
CANTERBURY  
DUNDEE  
GLASGOW  
GREENOCK  
HACKNEY  
LUTON  
LIVERPOOL  
MANCHESTER  
PAISLEY



Amongst many Municipalities  
using "Angold" Magazine  
Flame Lamps are the following :

PERTH  
POPLAR  
ROTHESAY  
SALE  
ST. PANCRAS  
SOUTHWARK  
STRET福德  
SUNDERLAND  
SUTTON COLDFIELD  
WEDNESBURY  
WILLESSEN  
Etc., Etc.

Used by many leading Corporations for years with highly satisfactory results.  
**MANY REPEAT ORDERS RECEIVED.**

**THE GENERAL ELECTRIC COMPANY, Ltd.**



Head Office : 67, Queen Victoria Street, London, E.C.

Telephone : LONDON WALL 3600 (20 lines). Telegrams : "ELECTRICITY, CENT. LONDON."

Branches : Manchester, Glasgow, Birmingham, Newcastle, Cardiff, Dublin, Belfast,  
Bristol, Swansea, Liverpool, Leeds, Sheffield, Nottingham, Hull, Southampton.



When corresponding with Advertisers, please mention "Electrical Engineering."

tically universal adoption for lighting and motive power purposes will become inevitable.

Hitherto, the competition between electricity and gas has been beneficial both to the competitors and to their consumers, but I have thought that the time may arrive when it may be to the interests of both parties, and of the community generally, that instead of competition, there should be co-operation, the suppliers of gas devoting their energies to the economical production of non-illuminating producer gas, which could be used by the suppliers of electricity for the production of electrical energy. If such an arrangement were possible, it would assist in the husbanding of our coal resources and would bring a little nearer that flat rate of something less than one halfpenny per unit which at present seems rather a Utopian vision.

The question of the management of electricity undertakings, especially as affecting the relations between the Electricity Committee and their responsible officials, is rather a delicate subject, and is usually more suitable for discussion in camera than for an address of this description. The success or failure of any undertaking depends in no small measure upon the degree of confidence which the Committee reposes in their Chief Engineer and Manager, and I would most respectfully urge that the Chief Engineer of every electricity undertaking should be given full control, not only of the technical, but also of the financial side of the department, subject, of course, to the strictest audit by the Accountants' Department and the public auditors. He should have complete control of the general staff of the department, and all matters of discipline and of the remuneration of employees should be left to his discretion. He should also be provided with a competent and well-paid technical staff. I am afraid that in too many cases (some of which I am personally acquainted with) the rates of pay of the technical assistants in some of our large undertakings are entirely inadequate to their duties and responsibilities. The best asset that any electricity undertaking can possess is a loyal and zealous staff, who have at heart the commercial and technical well-being of the concern, and in order to secure this, it is necessary that every member of the staff of every grade shall be made to feel that he is a trusted and responsible official, and that he is adequately remunerated for his services.

In conclusion, I particularly wish to express my appreciation of the real benefit which accrues from membership of the I.M.E.A. The actual work done by the Association through its Executive Council is of the greatest importance to the electric supply industry as a whole, but of even greater benefit than this is the good feeling which is promoted amongst the component members of the Association. It is a surprising, but nevertheless pleasing, fact that any member can practically call upon the experience and resources of the whole of the rest of the members in case of any difficulty which he may encounter, and any assistance that he may ask for is given with the utmost freedom and willingness. I have been a member of the Association since shortly after its formation, and have had the privilege of being a member of the Executive Council for the last seven or eight years, and I much regret that the fact of my leaving municipal work involves my leaving also the I.M.E.A. I particularly desire to thank the members of the Executive Council and the officers of the Association for their loyal co-operation and support during my brief term of office as President, and to express my sincere hope that I shall frequently have the opportunity of renewing the many friendships which I have formed amongst you.

A discussion on the relative merits of steam, gas, and oil generating stations was then started by Dr. S. Z. de Ferranti, who contributed the following short Paper:—

## PRIME MOVERS FOR ELECTRIC POWER

By DR. S. Z. DE FERRANTI.

NOTWITHSTANDING the amount that has been written regarding the different systems of driving electric generators, the subject still seems to be one of considerable interest. The position to-day is that the steam turbine is in possession of the field, and that gas and oil engines are looked upon as likely alternatives. Many people believe that it is only prejudice or the fear of doing something new that prevents engineers from using these two latter methods for generating their power. I do not, however, agree with this view, and believe that engineers are using the only means that are at present economically available for the work they have to do.

Electricity is being produced on a larger scale every day, and it appears certain that to obtain the full benefits of electric working the current must be produced in large stations supplying extensive areas embracing all classes of demand. As we are dealing with prime movers for electric power, I will, therefore, consider the question from the point of view of the comparatively large generating station. The essential qualities of a power-producing plant are reliability and low cost as regards capital running and maintenance. The question before us may be considered in detail under the following headings:—

- (1) Nature of fuel consumed, its availability and cost.
- (2) Amount of fuel consumed per unit generated.
- (3) Standby losses.
- (4) Labour involved in running.
- (5) Cost of upkeep of plant.
- (6) Capital cost of plant.
- (7) Size of units, simplicity or complication.
- (8) Reliability and proved capacity for work required.

As we are a coal-producing country it is evident that coal is our natural fuel. The very fact of oil being so sought after as fuel for certain purposes puts it out of the question for general power production. In the first place, the automobile on land must consume and even now consumes large quantities of light oil. For the Navy oil is so eminently suitable as fuel that the demand in this direction will always raise its price above that due to its heat value. Furthermore, if there is ever a surplus after supplying the Navy, there remains the vast and ever-increasing demand by the Mercantile Marine who will always be able to pay more for it than land consumers could do.

It is, therefore, clear that coal must be our fuel where operations are carried on on a large scale. In the future, the oil consumers above mentioned will even be partly supplied from the bye-products of our coal, instead of our burning any appreciable amount of oil for making electricity. It is, therefore, vital that our power-producing plant should be coal burning. The plant must be made suitable for the fuel, and not fuel found to suit a particular form of machinery.

We have next to consider the thermal efficiency of the plant for producing electricity. By this I mean the percentage of the heat in the fuel turned into current. A good steam turbine and boiler plant will to-day give back 15 per cent. of the energy of the fuel as electricity. As high an efficiency as 18½ per cent. has actually been obtained in practice. It is probable, however, that this is by no means the limit of economy, and that developments in this class of machinery will result in an efficiency of 25 per cent. being obtained in the near future.

The next coal-burning machine that we have to consider is the gas engine. With it we have to consider not only the efficiency of the machine itself, but also that of the gas-producing plant. When the system is considered from this point of view its efficiency is probably between 20 per cent. and 22 per cent. With this process there should, of course, be worked bye-product recovery. Although it appears evident that in the future all coal must be gasified and its bye-products recovered, it does not seem that present knowledge enables this to be done at sufficient profit for it to be generally adopted.

In the oil engine we have a machine which represents the highest efficiency yet realised. Moreover, test figures and those obtained in practice agree very closely. The efficiency as already defined may be taken at between 28 per cent. and 30 per cent.

The question of standby losses may next be considered. In the oil engine there is practically no loss under this heading. In the gas engine there is the producer loss, and in the turbine the boiler loss. These will vary very much with the nature of the load, and where the plant is well designed and run and the load factor is good they may be reduced to a small quantity. Both the oil engine and the

gas engine are, however, badly handicapped in relation to the steam turbine by their incapacity for dealing with overloads which the station must always be in a position to meet.

With regard to the question of the labour involved in running and maintaining the plant; as matters stand to-day the turbine installation is undoubtedly the best, but it is hard to make a direct comparison as the number of generating units with either gas or oil would be so great. It is, however, certain that the plant which is the simplest will always have the advantage, and where one is purely rotary and the other reciprocating there can be no question at all.

In the matter of capital cost the turbine system is again much the best, the simplicity, large units and small space occupied contributing to this result. The size of the units on the turbine system compared with those on the other system is perhaps the greatest determining factor in the case. The turbine is to-day adequate in fulfilling the demand, whereas the other two systems are not. Moreover, combined with its boilers and auxiliary plant, it is a simple means of generating power.

Reliability of operation is, of course, vital, and here again the turbine system scores on account of its great simplicity and because in working its parts are not subjected to either high or uncertain stresses.

In practice the turbine system has proved its capacity to meet the demand that is made on power-producing plant. All this goes to show that the course now followed by engineers in the selection of their plant is the right one, and that they really have no option in the matter. Looking at the question in the light of possible developments of the future, I cannot help thinking that as long as engines are used the rotary principle will be followed. For the moment the steam turbine system will be perfected so as to improve its efficiency and fuel consumption; later on, when the turbine can be made of the internal combustion type better economies will be obtained.

#### DISCUSSION.

COLONEL SINCLAIR (Chairman, Swansea Electricity Committee) said that there were still power stations in connection with individual works, and even for small towns, and perhaps for the linking up of small hamlets where the reciprocating engine still had a look in. His people had comparatively recently had occasion to instal a reciprocating engine of a comparatively new type for works driving, that known as the "Uniflow" engine—Professor Stubbs' patent. This had only two valves, and was a single-cylinder engine with no exhaust valves, the piston in moving from end to end uncovering a number of circular holes in the periphery of the cylinder and allowing the steam to pass to exhaust. In all other respects it was very similar to any other reciprocating engine. He had two of these connected to 300-kw. continuous-current generators with a booster and a 1,000 ampere-hour battery. The load varied from  $\frac{1}{2}$  h.p. to 500. The manufacturers on tests of these engines got well within their guarantee of slightly under 9 lbs. steam per I.H.P. with a 170 lbs. pressure and 225 deg. of superheat. These engines had now been running for two years, and the latest result was that, after a continuous year's working, one of these machines generated  $1\frac{1}{2}$  million units (load factor  $44\frac{1}{2}$  per cent.), and the coal used per unit was 3.62 lbs. The operating costs were:—wages, 0.0934; coal, 0.202; material, 0.0244; repairs, 0.0291, making a total of 0.3489d. per unit. The coal used was 13,500 B.Th.U., the average pressure 165 lbs., and the average superheat 200 degrees. During the coal strike his machines ran for five weeks with 25 per cent. overload the whole time, and that, of course, did not tend to excessive economy. Included in the figures, also, was a large amount of experimental work, the units for which were not metered. He hoped he had made a case for reciprocating engines for small stations.

Mr. G. D. SEATON (Richardsons, Westgarth and Co., Ltd.) said that a few years ago at the Annual Dinner of the Manchester Section of the Institution of Electrical Engineers, Dr. Ferranti was entrusted with the toast of "The City of Manchester and the Royal and Ancient Borough of Salford," and let fly a terrific speech on the iniquities of municipal trading. The great charge he had made against municipal electrical engineers was that they hindered progress by accepting the lowest tender. But it was almost impossible for people who had had no previous experience in steam turbines to avoid accepting the lowest tender. Supposing, for example, a man was in the market for a 2,000-kw. alternator. He would put in the usual advertisements, in which it was definitely stated "We do not bind ourselves to accept the lowest or any tender"—although, of course, they did in nine cases out of ten. In reply to such an advertisement there would be about ten offers, and for a week the engineer was busy laboriously scheduling these tenders, and there might be two or three alternatives to each. Probably it would be found that the only way in which the machines varied from one another was in the matter of price, and this variation on a 2,000-kw. machine might be from £600 to £800 between

the highest and lowest tender. It was quite as likely as not that it would be found that the lowest steam consumption would be associated with the lowest price, and, of course, the engineer naturally wondered why he should not accept that tender. The whole thing rested on the question of tests, and the test was about the most Gilbertian and most incomprehensible thing that he could possibly imagine, for the engineer simply let the makers test their own machines. As a German engineer once said to him, "It is a good arrangement, because you can make the figures what you want." He knew that the engineer supervised the tests, but was there any man among them who dared say that he knew all about "diddling"? His advice was that if they wished to hasten the millennium to which Dr. Ferranti had referred, they should buy their plant on merit and have it tested independently, and, further, they should publish these tests in the papers. If he were buying a turbine himself he would lay it down as a fundamental that, in no circumstances whatever, should the makers have anything to do with the tests. He would entrust the test to the company to which Mr. Michael Longridge belonged (the British Engine, Boiler and Electrical Insurance Company). The tests which he had seen carried out by Mr. Longridge were very different affairs from some of the so-called municipal tests.

Mr. H. S. RUSSELL (Messrs. Mirrlees, Bickerton and Day) said that he could not agree that the claims of the oil engine, and especially the Diesel oil engine, could be dismissed as lightly as Dr. Ferranti had done. He had argued that if electrical energy was required on a considerable scale over a fairly large area, it must necessarily be the best thing to confine all the generating plant into one huge station and distribute it over the area. That, of course, meant extra high-tension transmission, which was one of Dr. Ferranti's favourite things; it meant, also, a large number of sub-stations with motor generators or rotary transformers, and the employment of men in these sub-stations. His contention was that a far more economical scheme was to put down Diesel-driven generators in the sub-stations, and to dispense with extra high-tension transmission and the generating station. There would also be a big gain in efficiency, because of the saving in losses in transmission and in transformation. It was not much use trying to save 10 per cent. in generating costs if they were losing 15 or 20 per cent. in transmission. Dr. Ferranti said in his Paper, "As we are a coal-producing country, it is evident that coal is our natural fuel." That statement, however, contained an economic fallacy, because there were obviously conditions which might arise which might make it advantageous for us to export our coal and import some alternative fuel, such as oil. He would give a parallel case. Ireland was a bacon-producing country, and according to Dr. Ferranti the whole of Ireland should be fed on Irish bacon; but the fact was that the whole of the Irish bacon was exported—the Irishman himself ate imported Canadian bacon. Even if it were admitted that coal was the best thing to use, it did not follow that steam-raising was the best use for it. Dr. Diesel had said in his Paper before the Institution of Mechanical Engineers last year that as tar and tar oils are three to five times better utilised in the Diesel engine than coal in the steam engine, a much better and more economical utilisation of coal is obtained by first transforming it into coke and tar by distillation, using the coke in metallurgical and for other heating purposes, and burning the combustible bye-products and part of the tar itself in the Diesel engine under exceptionally advantageous conditions. In the *Engineer* of October last year it had been stated that by special processes for the production of tar oil from bituminous coal, as much as 18 gallons per ton, or 40 per cent. of the coal, could be converted into tar oil, and as the fuel consumption in the Diesel engine was probably less than one-quarter that of the steam engine, it was obvious that even with coal as a fuel the Diesel engine had the great advantage. There were other advantages which everybody was well aware of, such as the absence of stand-by losses and the fact that the engine was ready for starting up at a moment's notice. Comparisons of steam and oil station costs also overlooked the wastage of coal during storage, which might amount to anything from 10 to 25 per cent. There was one other point, namely, the question of supply and the price of fuel oil. Where oils were distilled for the purpose of obtaining petrol and other light oils, it was the residual that was made use of as fuel in the Diesel engine, so that it was obvious that the greater demand there was for petrol the greater would be the supplies of Diesel engine-oil available. The present high price of fuel oil was not due to monopolies or any rigging of the market, but was entirely due to the want of transport facilities for bringing the oil over. As soon as the tank steamers which are now being built came into service, oil would go down to its normal price again, and there was no reason to trouble about a shortage for 100 years. His firm was full with orders for Diesel engines for a long time to come, and those who were contemplating putting down Diesel engines could do so now in the full knowledge that fuel oil would be cheap again before they could obtain delivery of their engines.

Mr. R. A. CHATTOCK (Chief Electrical Engineer, Birmingham) said that the criticisms of Dr. Ferranti's Paper which had been made were hardly justified by his own experience. Recently he



was in want of a very large plant in Birmingham to deal with his extensions and developments, and had made a comparison between steam and gas-generating plant. With the capital cost of the plant, the cost of labour for working interest, and sinking fund, fuel consumption, and all the items usually considered in works costs taken into account, he had ascertained that for a producer gas station working on a load factor of 27 per cent., which was about the average to be anticipated in Birmingham, the cost per unit was 12 per cent. higher with gas than with the steam plant. Also in the case of a gas-driven station using town gas of high calorific value—about 500 B.Th.U. per cubic foot—and reckoning gas at 6d. per 1,000 cubic foot, the working costs were 41 per cent. higher than steam. He agreed that a 27 per cent. load factor was considered low for a gas-driven station, but plant of this kind would have represented eventually something like 70 per cent. of the generating plant in the undertaking, and therefore it was impossible to treat it differently from the steam plant already there. The size of the units which he considered for the steam turbine plant were 5,000 kw., and for the gas plant 4,000 kw., which was the largest that had been commercially made up to the present. He also considered 1,000 kw. gas-engine sets, and the figures worked out slightly higher than in the 4,000 kw. sets, chiefly due to the extra cost of labour in running. This brought him to Mr. Russell's recommendation of Diesel engines in substations. For an undertaking requiring 100,000 kw., which was quite a usual figure nowadays for the large towns, it would be necessary to have something like 200 Diesel oil engines, and the labour cost of handling those engines appalled him. Dr. Ferranti had drawn attention to the incapacity for dealing with overloads which oil-driven stations suffered from. This was a very important point when it was necessary to call upon the plant to deal with sudden emergencies due to breakdown or fogs. Reliability and continuity of supply were things which must always be kept in the front rank of requirements.

Mr. R. W. WEEKES referred to the statement in Dr. Ferranti's Paper that "A good steam turbine and boiler plant will to-day give back 15 per cent. of the energy of the fuel as electricity, as the high efficiency of 18½ per cent. has actually been obtained in practice." He, however, wished to talk about a steam plant which he had installed in various places in large units, in which 83 per cent. of the heat that the engine took was turned into electrical energy. The 81½ per cent. of the energy of the fuel which is not being turned into useful work went into the circulating water, and in the works they would be visiting that afternoon, was simply warming the Thames. Unfortunately they were obliged to waste that heat in most instances, but there were a large number of works and factories, such as soap works and sugar refineries, where steam heating was required. In these places low pressure boilers were installed in which the steam was made at 60 lbs. and used at 12 lbs. They burned coal in very much larger quantities than municipal electricity undertakings, and it was usual to find 800 tons of coal being burned in a week: he knew one case in which the figure was 2,000. If in these works high pressure boilers were installed, working with high superheat, and the steam was passed through a turbine, and then used for the heating process, there was very little loss. In one works in which this method was used, only 6 per cent. of the total heat in the steam was lost. In a particular works in 1900 he put in high-pressure boilers and high superheaters working up to 700 degrees. The engines were Easton engines, and the steam consumption was down to under 16 lbs. per kw. hour. He went back to those works in 1908 or 1909, extended the high-pressure boilers, but instead of highly economical steam engines he used a simple steam engine with one expansion. The maximum load on that plant was only 400 kw. The steam was taken into the engine at 200 lbs., and was turned out at 65 lbs. The steam consumption in the engine was 65 lbs. per kw. hour, but the nett result of the change was that in 1911 a saving of 4,000 tons of coal was made, and between the years 1909 and 1911 the expenses were reduced by £3,000.

Mr. H. GRAY (Chief Electrical Engineer, Accrington) said that they had all had experience with steam turbines, but he was probably the only member, so far, who had had experience with gas bye-product plant. At Accrington he had had such a plant in operation for eight months. It was not justifiable to give any accurate costs for anything less than 12 months' running, but he would mention a few leading details. He had two 1,000-h.p. units, with ammonia- and tar-recovery plant, &c. His object had been only to let the gas plant deal with a 24-hour load (i.e., 100 per cent. load factor), and to let the steam plant take the peaks, and he had almost realised this, as one or other of the sets had been running all the eight months at an average of 82 per cent. load factor. A 100 per cent. load factor was not attainable owing to the unfortunate occurrence of Sunday with its very light load. The plant had never been held up yet, although turning out 86,000 units a week. The fuel for the last three months had averaged 1.56 lbs. per unit, corresponding to 0.125d., and the bye-product plant produced 0.01d. per unit, which was therefore more than half the total fuel costs. This result had been attained with local fuel (Lanca-

shire steam slack), and if he had gone further afield for his coal he might have shown lower costs still. He noticed that Dr. Ferranti's costs did not include stand-by, and he should therefore mention that the cost of keeping a 1,250-h.p. producer ready for work within a quarter of an hour was only that of half a ton of coal a week, which was quite negligible compared with the fuel required for stand-by with boiler plant. For taking overloads, steam plant was, of course, the best, but, when working in the manner he had indicated, the steam plant took the overloads, and it was equivalent to putting a steam cylinder on a gas engine. Finally, he said that he could run a gas engine up to speed in 20 seconds, and could synchronise it within a minute.

Mr. E. E. HOADLEY (Chief Electrical Engineer, Maidstone) said that they could not all be engineers of such large stations as had been mentioned by Dr. Ferranti and Mr. Chattock. A short time ago, when he was preparing to put in a new 750-kw. set, he obtained the guaranteed oil and steam consumptions from makers of the two classes of engines, and as he knew from his own practice the lbs. of coal per lb. of steam, he was able to make a comparison of the fuel costs in the two cases. On the basis of the 2½ million units which would be supplied next year by that set alone, and taking account of fuel, labour, lubrication, repairs, and capital charges, he had found that steam would be cheaper.

Mr. C. H. WORDINGHAM (Chief Electrical Engineer, Admiralty) said that most of them were familiar with Dante's Inferno, but they were all familiar with what he might call Ferranti's Paradiso. All of them present thought of the future to some extent, but perhaps the Paradiso when only large-scale generation would be in existence was a good way off. They must remember that small generators would continue to be used for some time, and to interest a good many people. Some few months ago he ventured to air his views on this subject, and suggested that a good deal of good might come to the electrical industry by generating electrical energy in those places where the demand was small by means of gas engines. He had been soundly thrashed, however, by both sides, but naturally he was still of the same opinion. A great deal might be done by means of gas engines of moderate size supplied with gas made by those who had made it the business of their lives to produce gas cheaply.

Mr. H. RICHARDSON, Vice-President (Chief Electrical Engineer, Dundee), said that, in view of Mr. Chattock's comparison of steam and gas engines, the meeting might be interested in hearing similar comparisons between steam and oil engines. He had found that a 5,000-kw. turbine, complete with its auxiliaries, boilers, and coal bunkers, would cost £30,000, and, from the maker's own figures, four Diesel sets would be required for the same work, and their cost would be £58,000. This was exclusive of the value of the extra space required in the latter case. The fuel costs in the case of the Diesel set would be 0.15d. per unit, as against 0.1d. per unit with the steam sets in use at his generating station at Carolina Port (or, say, 0.11d. per unit, as the price of coal had risen). Moreover, the coal market was less unsteady than the oil market, and as to the future of the latter he had only interested prognostications to go upon. There was a field for oil-engine stations in rural and other smaller districts which were chiefly residential and not industrial. He could not see Mr. Russell's loss of 15 to 20 per cent. loss in transmission. There might be that loss in the distributing mains for an hour or two a day, but there was certainly not 15 to 20 per cent. transmission loss on the whole output of the station. Mr. Gray had said that the occurrence of Sunday was unfortunate, but for those running internal-combustion engines it was very fortunate indeed. He also pointed out that the costs of a water-power plant were not necessarily less than those of a coal-driven station. He had made inquiries in Europe, Canada, and the United States, and had found that, if account were taken of the capital cost of the civil engineering work in connection with the water supply and the long transmission lines, it was hopeless to compete with the costs of steam plant. In Switzerland, for instance, electrical energy was sold at 50 to 60 per cent. higher prices than to large engineering works in this country.

Mr. W. A. CHAMEN (South Wales Electrical Power Distribution Company), said that he was at one time minded to go in for huge gas generating stations, and one great reason that he had not done so was the difficulty of getting satisfactory generating sets in large units. All that the makers could offer him was a lot of small sets, or some big sets built up with a lot of small cylinders. When he was in trouble two or three years ago, with the coal strike in South Wales, he thought he might get assistance from oil as fuel under his boilers if the coal supply was interrupted. There was a large amount of oil available on the other side of the Bristol Channel at the Avonmouth Docks, but the Great Western Railway Company would not take it through the Severn tunnel, and he would have had to pay carriage on it right round by Gloucester. The price of oil was not the least disappointing item, and it was impossible to put one's finger to a price which could be relied upon. There were, nevertheless, cases in which oil engines

could be used with advantage, and Dr. Ferranti had hinted at them. He had had seriously in view the putting in of a 150 kw. or a larger oil engine as a stand-by to a particular generating station, in which the plant was not of a very economical type. Under the conditions, however, it seemed wrong to spend capital upon this stand-by plant, and therefore, in the end, he kept the station more or less under-steamed, coupling up the Lancashire boilers into a thermal heating system, all the blowouts being connected together, and all the inlets, &c., the boilers being filled up to the neck, and by burning one boiler it was possible to keep the whole lot hot, in order to deal with any emergency at short notice. Although not entirely satisfactory from the purely engineering point of view, it was the best practical solution he could arrive at in that instance. Mr. Russell seemed to imagine that sub-stations must have attendants, but that was not so at all. As a power company engineer he endorsed entirely the views that had been put forward by Dr. Ferranti.

THE PRESIDENT (Mr. J. E. Edgecome) said that before calling upon Dr. Ferranti to reply he would like to say a word, particularly in reference to what had been said by Dr. Ferranti that the navy and marine service would take the whole of the oil fuel coming into the country. The only hope he had at Kingston, where, like Mr. Hoadley at Maidstone, he was running quite a small station, was to run on water gas tar. In fact, he would be doing this soon, as already some very interesting runs had been made, but the only difficulty at the present time was to get hold of the tar, because it seemed to be almost a universal practice to ship the tar direct to Germany, where they dealt with it and recovered the various by-products. It seemed that in the future, unless something was done, we should be shipping water gas tar to Germany, and then arranging to import water gas tar from there to England.

Dr. S. Z. DE FERRANTI, in the course of his reply, said that he had been much impressed some two years ago, by the plant at Gary, on Lake Chicago. At the great steel works there, where gas was a by-product, and there was an ample supply of good quality from the blast furnaces, they had installed some sixteen 2,000 kw. gas engine-driven alternators. The engine-house was an immense one, the installation was fairly big, 32,000 kw. altogether, and it was working under conditions which gave it every chance. There was a practical demonstration of the thing on a fair scale; why was it that the Commonwealth Edison Company, one of the biggest makers of electricity in the world, who made about as much as all London put together, did not instal a similar plant and put up producers to work it by? All that he could say was that the Commonwealth Company were money makers, their living depended upon supplying the public at a sufficiently low rate, and they had found that it did not pay them to do this. Their latest station, North West Power Station, was started up with 20,000 kw. turbine units. Since then they had ordered from Sir Charles Parsons a 25,000 kw. unit, and they had just contracted for a 30,000 kw. machine from the General Electric Company (U.S.A.). It was a most fortunate thing that Mr. Gray, of Accrington, had put down gas-engine plant, which he was quite sure it would pay his Corporation to use, and it was going to be of immense service to the community in getting experience in a most important direction. This experience would help to supply a link in the chain which went to form the future work of generation when all the coal would be turned into gas. If the system described by Mr. Weekes were used generally all over the country, we would be overflowing with sugar and washed away with soap. Mr. Chattock had had to solve a definite business problem, and he was satisfied that it had been solved in the most efficient way that was at present available. Mr. Russell ably represented Messrs. Mirrlees, Bickerton & Day, the makers of Diesel oil engines. Mr. Day was an old friend of his, and he had had the opportunity of seeing the splendid works which had been erected here for the manufacture of Diesel engines, where they were produced in as perfect a manner, from the scientific and business point of view, as one could imagine, and he was delighted to know—what he knew before Mr. Russell spoke—that notwithstanding the high cost of oil, the firm had business which would occupy them to the fullest extent for at least two years. It only showed that it was fortunate that municipal electrical engineers did not depend on Diesel engines for generating electricity, because under the circumstances the supply would run very short. As to Mr. Hoadley's remarks, when he commenced to speak, he (Dr. Ferranti) had made the note that he would not pretend to recommend steam for comparatively small sizes, but Mr. Hoadley had told them that as the result of an actual trial, by getting the prices, he had found that it paid to instal steam. Dealing with the question generally, he thought it would be a very desirable thing if municipalities and companies could work together and avoid the installation of these small generating units and small generating stations, and in spite of the fact that he entirely disagreed with municipal trading, it would also be a good thing to the same end if municipalities could supply outside the areas at present allotted to them. He could only say that, as municipal trading was in existence, let municipal electrical engineers do it well.

## EXHIBITION OF HEATING AND COOKING APPARATUS, &c.

AN interesting exhibition is being held during the run of the Convention at the Institution of Electrical Engineers of electric heating and cooking apparatus and other appliances connected with the domestic uses of electricity. This display, which has been organised for the Incorporated Municipal Electrical Association by the British Electrical and Allied Manufacturers' Association, is being held in the "Common Room" of the Institution to the left of the main entrance, where some twenty selected firms have prepared representative displays. For the convenience of our readers we describe these in the order of their position, commencing on the right of the doorway of the first room.

The first stand we come to is that of A. P. Lundberg & Sons (Liverpool Road, N.), who have a case full of samples of their well-known products in the way of switches, plugs, and other installation material, including the ingenious two-way intermediate and other switches of which they developed such a complete series covering every possible variation of single and multiple lamp control. Considerable help is given to the understanding of the uses of these by the ready wired-up demonstration awards that are also shown. There are many points of detail in the apparatus that repay close examination.

On the adjoining stand Ferranti, Ltd. (Central House, Kingsway, W.C.), make a fine show of some of their latest heating and cooking appliances. Some artistic patterns of their electric-fire type of radiator with its glowing disc of quartz, are on view; and the cooking apparatus, in which the leading feature is the use of a single pattern of readily interchangeable disc-shaped heating unit, includes examples of small ovens, a table cooker with hot-plate on the top and grill below, and simple hot-plates in various forms, all of good substantial construction.

The Electrical Co. (122-124 Charing Cross Road) exhibit heaters of the Bastian quartz type, but their stand is more devoted to the small motor and its domestic and other applications. Small motors are shown both alone and coupled to fans, small drilling machines, &c., and such kitchen appliances as mincing, slicing, and potato-peeling machines.

In the corner of the first room is a complete cooking range, exhibited by Bertram Thomas (Worsley Street, Hulme, Manchester). The Gray patent oven included in this apparatus is solidly made, with large heat capacity and well lagged to retain the heat. The disposition of the heating elements is such as to maintain a good circulation of air inside the oven. Control is partly by means of a series parallel switch at the side of the oven at the bottom. The hot-plates, &c., at the top are controlled by switches ranged along the side.

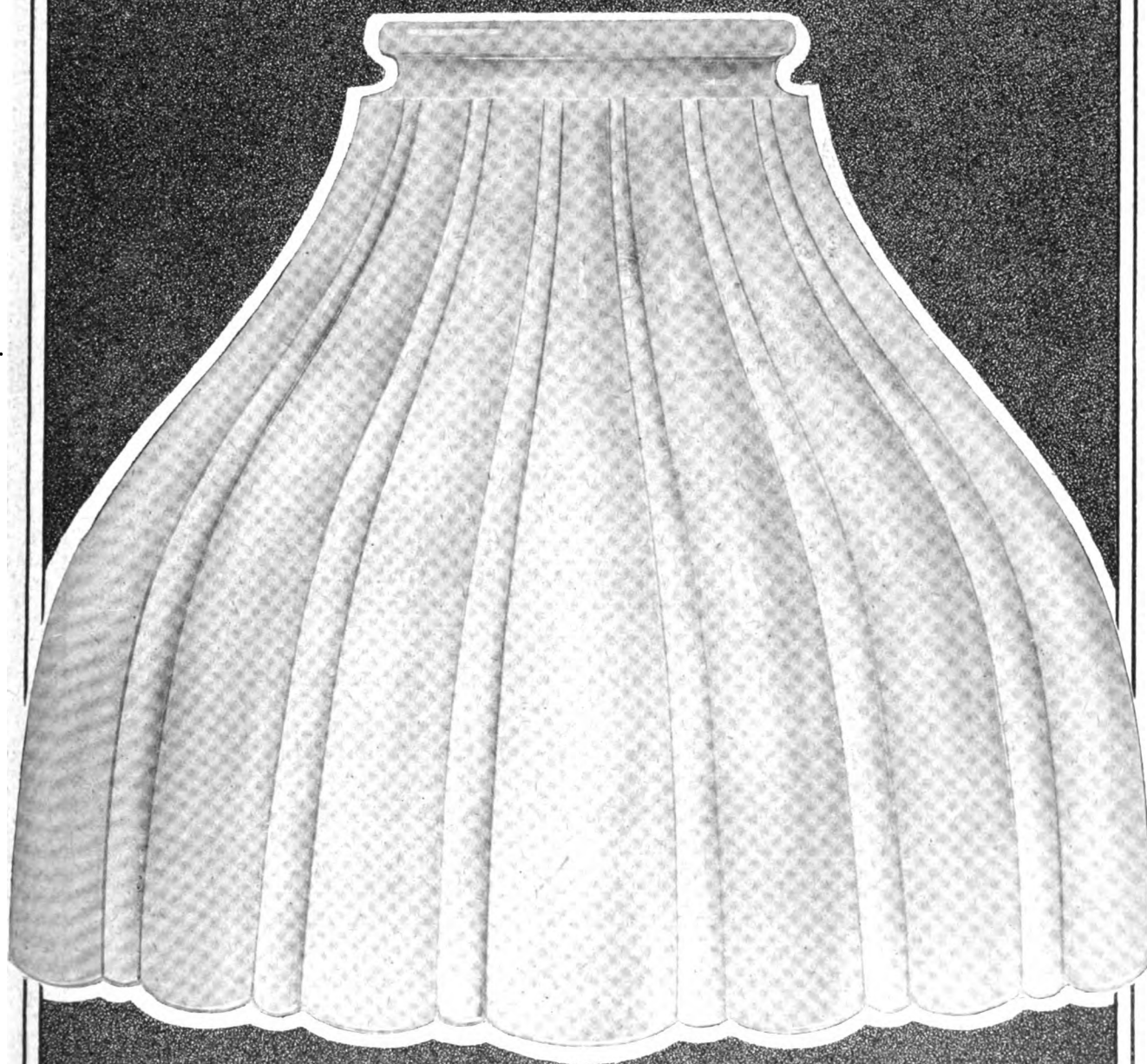
Passing to the next room and still keeping to the right, we come to the stand of the Dowsing Radiant Heat Co. (105 Great Portland Street, W.) It goes without saying that this company have an excellent display of radiators both of the familiar lamp type, of which they were the pioneers, and of their newer "hot bar" pattern with quartz-embedded heating elements. A special point about the latest form of these is the way in which the back part of the inside of the case is illuminated by a lamp so that the spaces between the glowing part do not appear dark. An extensive show of electric irons is also made, from the largest to the smallest, and special attention should be paid to a rack of heavy tailors' or laundry irons, arranged so that when laid in the rack they plug into suitable contacts for heating-up automatically, and are free from the inconvenience of a flexible lead when in use. It is, of course, to large irons of considerable heat capacity that this method is particularly suitable.

Siemens Bros. Dynamo Works, Ltd. (Caxton House, Westminster, S.W.), have a stand of varied interest surmounted by a row of lanterns for outside use containing high candle-power Wotan lamps. The well-known "Z" cartridge fuse is represented in several forms and sizes, and other exhibits include fans and examples of meters of various descriptions.

Messrs. Berry, Skinner & Co. (78 Upper Thames Street, E.C.) show the latest patterns of their well-known ironclad switches, including their "Dreadnought" fused switch with red and green glass reflex indicators, showing at a glance whether the switch is on or off. In the "on" position of the switch the red glass is held up in front of the green one, but falls out of the way when the switch is off. Another

# "Equilux"

GLASS WITHOUT GLARE

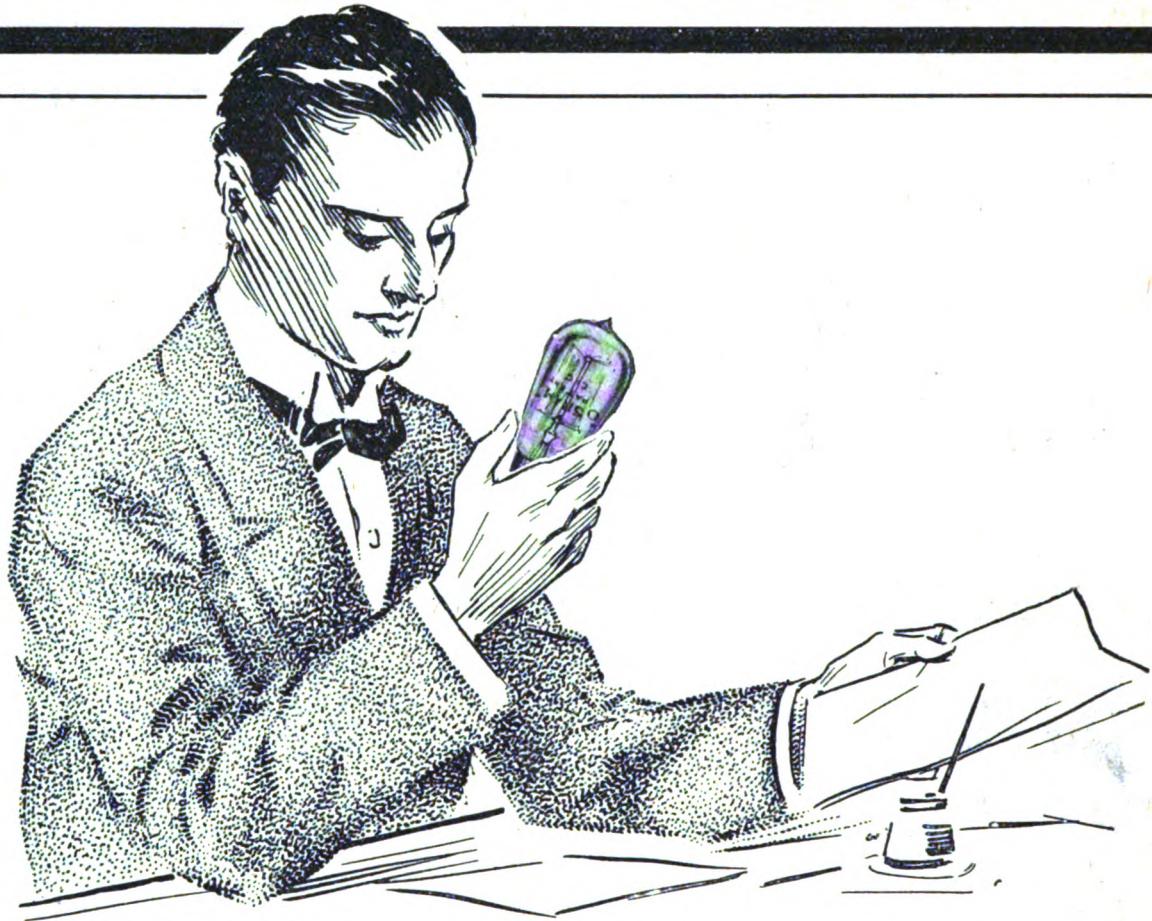


The most Perfect Glassware.  
*Write for descriptive Price List.*

ADVERT. OF THE GENERAL ELECTRIC CO. L<sup>2</sup> 67, QUEEN VICTORIA STREET, LONDON EC

WHEN CORRESPONDING WITH ADVERTISERS. PLEASE MENTION "ELECTRICAL ENGINEERING."





**Before you can come to any safe decision** as to where to place your lamp contract for the forthcoming lighting season, there are many vital points which should receive full consideration. You must look beyond the advertisements in the Trade Press—look past the reputation of the lamp itself, and consider the organisation which manufactures and distributes.

**A successful lamp and a successful organisation** are your guarantee of successful sales.

**The OSRAM Lamp of to-day has an enviable record.** Consumers are satisfied that it is the one lamp on which they can absolutely rely, and you know the value of your customers' good-will.

We have created the demand by extensive advertising direct to the consumer, and ensured its retention and increase by manufacturing what is known as the **Strongest Lamp** and the **Lamp with the Longest Life**. In face of such facts your choice must be

# OSRAM

DRAWN

WIRE

LAMPS

*Advt. of The General Electric Co., Ltd.—Head Office: 67, Queen Victoria Street, London, E.C.*

*When corresponding with Advertisers, please mention "Electrical Engineering."*



part of their stand is devoted to a display of the well-finished forms of teapots, coffee-pots, chafing dishes, and other apparatus recently put on the market by the Brompton and Kensington Accessories Co., for whom Messrs. Berry, Skinner & Co. are agents.

The stand of the Reason Manufacturing Co. (Lewes Road, Brighton) is largely devoted to their well-known electrolytic meters, which are shown in several sizes down to their very compact midget meter for 10 amperes, which is no more than  $6\frac{1}{2}$  in. by 3 in. by  $2\frac{1}{4}$  in. in size. The working of these meters is demonstrated by an illuminated model so proportioned that the movement of the indicating column of mercury as it is displaced by the accumulating gas can readily be seen. Other specialities include a neat and compact complete service set including meter, fuses and sealing box all in one small case. A convenient form of hand lamp is also shown.

A display of electric fans has been arranged by Feld Bros. (25 Budge Row, E.C.), who also show a few radiators and portable instruments.

One of the most interesting stands is that of the General Electric Co. (67 Queen Victoria Street, E.C.), who have a fine display of the various sizes of their "Magnet" irons, and such self-contained apparatus as kettles, toasters, breakfast cookers and table grills in many varieties, such as have been described in our columns from time to time. They also exhibit a new 8-ampere, 220-volt oven, of which they have just made a thousand for the Australian market, and have sent a sample to each member of the "Point Fives" to be tested. The oven is fitted with a thermostat on Nightingall's system. At the side of the oven is a thermometer, and contacts are made when it registers 200, 300, 400, or 500° F. A controlling switch can be set to cause a magnetic cut-out to break the circuit when any one of these temperatures is reached, and to cut the heating elements in again should the temperature fall below the point selected.

Another very complete exhibit of electric heating and cooking apparatus is that of the Electric and Ordnance Accessories Co. (Cheston Road, Aston, Birmingham), who show complete "Eclipse" cooking ranges in more than one size as well as a host of such small self-heated domestic appliances as milk heaters, saucepans, kettles, urns, toasters, small water heaters, hot-plates, &c. Radiators and fans are also shown.

The stand of Venner & Co. is principally devoted to their well-known time switches, and to examples of the Chamberlain & Hookham meters.

The British Thomson-Houston Co. (Rugby) have several types of electric kettles on show, and attention should be directed specially to an enamelled kettle which is provided with an immersion heater attached to the lid, and removable with it, avoiding the inconvenience of the flexible lead being attached to the kettle itself. Examples of their well-known "Calorite" irons are to be seen, as well as their latest designs of radiators for offices, business premises, &c., in cast-iron frames, both with heaters of the lamp and wire patterns.

The British Westinghouse Electric and Manufacturing Co., Ltd. (Trafford Park, Manchester), devote some of their space to a display of meters of various patterns, and also show a type of voltage regulator which we believe is new. Of heating and cooking apparatus proper they have a selection of irons, breakfast cookers, kettles, and other apparatus, as well as a few examples of radiators.

Lastly, we have the stand of the Armorduct Manufacturing Co. (6 Farringdon Avenue, E.C.), where are shown the latest forms of the "Magic" self-contained vacuum cleaner, a portable blower of similar construction, and a new form of electric oven. The bright outer casing of this, which carries the heating element distributed all round its inner surface, is counterbalanced after the manner of a gas holder, and is capable of being lifted clear of the shelves supporting the material to be cooked, while still retaining the hot air. Wiring material is also shown.

## MEETING OF THE "POINT FIVE" ASSOCIATION ON TUESDAY EVENING

A MEETING not on the official programme, but nevertheless practically a part of the proceedings of the Convention, was a dinner of the "Point Five" Association on Tuesday evening at the "Delico" electric restaurant, followed by a general discussion on the extension of the use of electricity for domestic purposes. Mr. A. S. Blackman (Borough Electrical Engineer, Sunderland) presided, and delivered the following address after expressing satisfaction at the

# IMPORTANT NOTICE.

The New

## "ALKLUM" ACCUMULATOR

Is now Ready for SALE

### SPECIAL ADVANTAGES

Contains no Acid. Contains no Lead.  
Has no Celluloid Case.

### STRENGTH

Cannot be hurt with overcharging or running down to Zero.

**SIZE** It is less than any other Accumulator.

**WEIGHT** Is the Lightest in the World.

**LIFE** Has Ten Times the Life of Lead Accumulators.

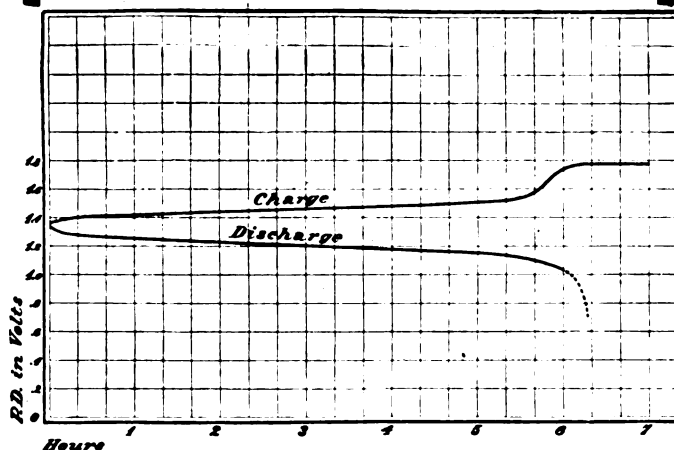
**CONVENIENCE** Has very wide charging rates.

### RELIABILITY

The voltage keeps practically the same all the time the cell is used.

### GUARANTEE

Is sold with a guarantee that it is superior to any other Accumulator in the World.



They may be seen at the

**MOTOR LIGHTING CO.,**

**13 Pantan Street, Haymarket,**

where all those interested will be welcomed and receive full explanations.

Fully descriptive Catalogue sent on application to the makers:

**WORSNOP & Co., Ltd.**

LAMP WORKS.

HALIFAX, Eng.

large numbers. They had originally expected about 30, but actually 120 diners had come.

#### The Association.

As many of those present are aware, the "Point Five" Association has sprung from the suggestion, thrown out by Mr. Seabrook at Harrogate last year, to form a  $\frac{1}{2}$ d. per unit Dining Club, among the Managing Engineers of Undertakings supplying electricity for cooking and heating, at the rate indicated. The idea was warmly taken up, and the first meeting, held in July last, when seven Managing Engineers were present, representing, with one exception in consequence of illness, every undertaking in the country supplying electricity for domestic purposes at  $\frac{1}{2}$ d. per unit.

Since that date several meetings have been held, at which the dining feature has been a diminishing quantity, and the technical discussions have absorbed an increasing proportion of the time; in fact, the subjects demanding urgent attention have been so many that the last meeting was devoted entirely to the consideration of tariffs and apparatus.

The meetings of the Association have already been productive of valuable papers by the engineers responsible for the initiation of the '5 tariff in Poplar, Southampton, Luton and Bradford, and we have avoided the trouble so many older institutions and associations experience, in obtaining papers, by changing our Chairman at every ordinary meeting. The Chairman is responsible for an address, which is supposed to occupy five minutes—actually takes about ten, and frequently gives rise to a discussion lasting two or three hours. These discussions are of an intensely practical nature. In addition to tariffs and apparatus, selling and publicity methods, and, in short, everything pertaining to the advancement of electricity supply for domestic purposes comes within the purview of the Association.

#### The Tariff.

So far as private houses are concerned, the time is now ripe for a general forward movement in the direction of making the electricity supply entirely supplant the gas service. This can, of course, only be done by the adoption of electricity for such purposes as cooking and heating, and many other domestic uses, and no serious progress can, under ordinary circumstances, be expected, unless electricity is sold, for purposes other than lighting, at not more than  $\frac{1}{2}$ d. per unit. Where this has been done, and the sale of heating and cooking and other consuming devices energetically pushed, the load and diversity factors obtained from private houses has improved in a surprising manner. Put shortly, the load factor obtainable from private houses is largely what the tariff makes it, provided always that the supply is pushed by an energetic sales department; and this proviso is necessary, because the applications of electricity to various household uses are continually increasing. Heating and cooking by no means exhaust the multifarious uses which are developing; as vacuum cleaners, small motors, and other accessories account for quite a large number of units, without making their presence felt from a plant and mains capacity point of view.

With regard to the unit charge, we, in Sunderland, tried  $\frac{3}{4}$ d., and as the result of a good deal of activity, a number of consuming devices were sold and put into use; the consumers were pleased with the comfort and convenience, but the cost of using was so great that we were faced with the alternative of either letting the apparatus fall into disuse, and of abandoning our cooking and heating development for the time being, or of materially reducing the unit price, which was accordingly reduced to one halfpenny.

With few exceptions the electricity supply undertakings throughout the country are in a position to supply electricity for heating, cooking, and miscellaneous domestic uses at this price. The tariff has been for some time in extensive and growing use in places of such divergent characteristics as Poplar, Southampton, Bradford, Marylebone, Luton, Barnes, Reading and Sunderland, and as the result of experience with the tariff the responsible managers of these undertakings are energetically extending the use of it.

An objection sometimes urged against the development of a general domestic load under the '5 tariff is the fear that consumers, having discovered a good thing, would come on at such a speed that generating plant would prove insufficient, mains and services be found inadequate, and other troubles of a similar nature materialise. It is probable that these fears largely arise from lack of experience, and it is questionable what proportion of those suffering from them appreciate that the diversity of a heating, cooking and miscellaneous domestic load is in order of 20 to 1. If the rate was reduced to  $\frac{1}{4}$ d. per unit or less, there would still be no fear of

consumers coming on faster than the supply authority wanted them, and since the sales department was organised in Sunderland, some three years ago, nothing in connection with it has impressed me more than the control a selling department gives over the development of the load. A well-organised sales department can develop, or, if need be, check, the load in any desired direction; and everyone with experience of the working of the '5 tariff will agree that anything in the nature of the load running away with one need not be feared for a moment.

The greatest stumbling block to the development of electrical heating and cooking in towns which have adopted the '5 tariff is the cost of the apparatus, and it is to be hoped that electricity supply undertakers will appreciate that the lack of a low-priced tariff throughout the country is largely responsible for the prevailing high prices. Manufacturing costs are largely dependent upon quantity, and as manufacturers have at present to look for their principal market to a comparatively small number of towns, it follows that when the number of these is greatly increased, as it assuredly will be in the near future, the market for heating and cooking and other similar apparatus will correspondingly expand, and prices drop.

#### The Mechanism.

And now just a few words with regard to apparatus. While the "Point Five" Association is doing all it can to standardise domestic tariffs, I would ask manufacturers of consuming devices and accessories whether they cannot assist the object we have in view, and incidentally themselves, by standardising in some respects. I know that this is a thorny subject, and one frequently met with the reply that standardisation spells stagnation, but the truth of that must depend upon the degree of standardisation attempted.

The plea that it is too early to attempt standardisation will not avail, because one of the accessories most in need of attention has been in use in approximately its present form for the last fifteen years or more; I refer to the plug and socket. The requirement is that the spacing, diameter and length of the pins be defined for standard amperages, and yet, after all these years, it is often impossible to send a consuming device out, wired up to a plug, with any certainty that it will fit the consumer's sockets of similar ampere rating. There are upwards of ten different spacings and diameters of 10-ampere plug pins in use, and the chaos is so great that plugs rated at the same amperage in the same house are often not interchangeable; and matters tend to get worse rather than better. The benefit resulting from the standardisation of plugs and sockets would be immense. It is surely a pity that the inherent advantages of many portable domestic consuming devices should be discounted in consequence of a lack of concerted action.

Another point upon which standardisation might well be considered is with regard to hot-plates. Overall diameters and the position, sizes and conformation of the terminals and fixing arrangements could surely be uniform; and the design of the hot-plate the same whether for use in the top plate of a cooker, as a heating element of an oven, or as an independent piece of apparatus. In mentioning standardisation to manufacturers one is apt to be met with the reply that the manufacturer in question has been fully into the pros and cons of design, and that the expenditure of a considerable amount of time and money has satisfied him that his particular designs are preferable to all others, and that he would not regard it as an advantage to turn out cookers to which other makers' hot-plates could be fitted.

But I ask manufacturers to consider the matter from the electricity supply manager's viewpoint. The position is that electricity supply undertakings will from now onwards expend considerable and increasing sums of money upon heating, cooking, and other domestic consuming devices and accessories for hire purposes; and the quantity of apparatus that can be so placed will very largely depend upon the rates at which it can be hired. In arriving at these rates, considerable regard will have to be paid to the risk of obsolescence, because, notwithstanding the state of reliability to which the articles in question have now attained, it will not be disputed that the near future is likely to witness further improvements, and the consequent depreciation to existing stock could undoubtedly be greatly minimised by such a measure of standardisation as would ensure interchangeability of parts.

I have been requested to say that the Association will welcome expressions of opinion as to whether radiant or convected heat is preferable for ovens. The question is one upon which considerable difference of opinion prevails, some people being of opinion that radiant heat is best for meat, and convected for bread, while others suggest that convected heat

is better for all classes of oven work; and it would be of great assistance if settled ideas regarding the comparative value of the two heats prevailed. In connection with this point it must be borne in mind that an oven which may be an outstanding success in the south of England, where people for the most part do not bake their own bread, may be a failure in the north, where, speaking generally, they do.

## DISCUSSION.

Dr. S. Z. DE FERRANTI, who opened the discussion, said that it was very largely a question of price, which would settle the use of electricity for domestic purposes. Between two and three years ago he had tried unsuccessfully to get the I.E.E. to start a campaign. The only result, however, had been the informal discussions on the causes preventing the more general use of electricity for domestic purposes, from which as yet little had resulted. What had to be done now was to extend the scope of the Point Fives Association so as to bring in as many as possible to follow its enlightened lead. So long as there were only a few giving the low tariff they could not give the benefit of an extended market to manufacturers, so that they could reduce the price of the apparatus. As time went on, a better load factor would be obtained. It wanted someone to discover a method by which a 24-hour load factor could be obtained by taking an equal current over the 24 hours, and giving out the heat as required by the consumer.

Mr. J. H. BOWDEN (Chief Electrical Engineer, Poplar) referred first to the various criticisms—anonymous and otherwise—sent to him as the first Chairman of the Point Fives. For instance, he had been asked how could he sell at a lower price than his generating costs? To such letters he replied that it was not his business to teach the writers their job. The main point, he said, was to arrive at an assessment of the primary charges, not an assessment by another department but by the Engineer, so that each charge should bear its proper proportion to the capital cost. It was a great convenience, for instance, to be able to tell a man who took a house that the charge for lighting would be so much, no matter how much light he used. It should be their endeavour in some way to get rid of the running costs altogether, say by selling by-products.

Mr. A. F. BERRY (British Electric Transformer Co.) congratulated the Point Fives upon having wakened up the country. It was nine years, he said, since he had taken out his first patent for electric cooking apparatus; he had had to wait a long time for a development of this branch of the industry, but now the price charged per unit was lower than his most ambitious dreams. There were, however, still difficulties, on account of the necessity of obtaining a rental; people objected often to paying 10s. 6d. a quarter, and perhaps a "straight rate," higher than 0.5d. per unit, would be the best. He regretted that there were not more "straight" people. A consumer preferred to pay 1d. a unit and know that it was 1d. a unit, to paying 1d. a unit and guessing what it was. There were thirty municipal authorities who hired his cookers, and ten different rates. Possibly one of the things which retarded development of heating and cooking was the former insistence of canvassers that there is "no heat in electricity."

Mr. H. H. HOLMES (Sales Manager of the Marylebone Electricity Department) said that the cost of a complete range to the consumer must be comparable with that of a range for gas or coal cooking. He had found (rather to his surprise) that the cost of a complete electrical equipment for commercial cooking purposes was actually less. The charge for hiring must be fixed at a suitable figure; if too low, it might mean a loss to the Department, so that the business would have to be abandoned; and if too high, the business would not be developed. His experience was different to that of Mr. Berry, for he found that rentals up to £3 a year could be obtained. The cost of maintenance could not be judged until about two hundred cookers were on the mains, and then a fair average could be struck. He found that about 25 per cent. of the cost of the cooker was a rental which would cover cost and maintenance. To include part of the maintenance charge in the cost per unit was not fair to those who bought their cooking plant outright. He expressed surprise at the use of the word "canvasser" by corporation engineers. One never heard of manufacturers depreciating their salesmen by talking of "canvassers"; they called them "accredited representatives." He strongly believed in the policy of sending out cookers on approval, and he found at Marylebone that the returns were less than 8 per cent. Lady demonstrators were also a necessity, and in rich districts more important than in middle class. In one house there had been a succession of six cooks, and each successive one had condemned the electric cookers, and had to be taken in hand by a lady demonstrator. This was not altogether an evil, however, as four of them went to other situations and insisted there on having electric cooking. In Marylebone the cooking business was developing at such a rate that it was at present merely limited by the time required to obtain delivery from the manufacturers. He insisted that more attention should be paid to larger sized radiators. They should be sufficiently large to heat the room, and this was more important than that they should have a nice appearance.

When an inquiry was made for a radiator the first question that should be asked was, What is the size of the room?

Mr. T. ROLES (Chief Electrical Engineer, Bradford), explained the system of charging in use there, which he found that the consumers preferred. The charge was 3s. in the £ on the rateable value of the house, plus 1d. per unit. This was not ideal, but was understandable by the multitude, who did not know what a kilowatt was or what they could get for it. It had made an enormous increase in the output, and during the last two years the average price obtained per unit had been 1.69d. They had worked the tariff out on the basis that the 15 per cent. on an average just covered the lighting accounts, so that the additional 1d. was practically for heating and cooking.

C. R. BELLING said that, if the cost of apparatus were to be reduced, the Sales Departments would have to be content with a lower discount than they now demanded. It was very hard to compete with the cost of gas fires, as quite good little gas fires could be purchased for 35s. net. The question of standardisation was very difficult. His company was now getting out a new 5-ampere plug, and had decided upon  $\frac{1}{2}$ -in. centres and pins  $\frac{1}{2}$  in. long by  $\frac{3}{16}$  in. diameter, but they were open to alter this if it was shown that any other size would be better. It was his experience that, in cooking meat, it was best first to use radiant heat for about half an hour to sear, then to use convected heat for the actual cooking, with a little radiant heat again for the final browning. Radiant heat was also very useful for bread baking.

Mr. R. W. HUGHMAN expressed the opinion that they need not fear being swamped with cheap units which were more likely to make them float with increased buoyancy. He recommended co-operative publicity on a very big scale.

Mr. HAYDN HARRISON expressed his disagreement with everybody who had spoken. Dr. Ferranti, he said, could not have his 24-hour load unless he could persuade everybody to have meals at different times. [Dr. Ferranti here explained that Mr. Harrison had not understood what he had said, and repeated the substance of his remark with regard to the 24-hour load.] Continuing on this point, however, Mr. Harrison spoke of the large output of gas for cooking at midday on Sundays. It was also, he said, a wrong time to talk about standardising when one found that one cooker took double the energy of another. On the other hand, such details as plugs and sockets should have been standardised years ago.

Mr. M. C. H. CLINCH, who is the proprietor of the Restaurant, said that he had first taken on an electrical restaurant a little over two years ago. Being an American, he acted on the principle that "it would not hurt him to try it once." He had found this quite successful, and had in consequence taken the Delico Restaurant, where they served from 1,200 to 1,500 lunches a day. In such a case the initial cost of the outfit was not so important as the annual costs, and he was glad to say that, beyond a fixed charge for the lifts, he had had no maintenance expenses on the apparatus at all. On the other hand, he found great advantages in working compared with gas or coal cooking. He spoke altogether in a most enthusiastic manner about the results.

A wire was then read from Mr. HUGO HIRST, wishing the Association an enjoyable evening and success to their cause.

Mr. R. W. SCHOFIELD (Ferranti, Ltd.) said that as a consumer he thought the price should include hire; a tenant of a house did not want to buy his apparatus. He thought that standardisation as to the shape of cookers would be dangerous, and did not favour standardising the current consumption for hot plates, as this would bear hardly on those which were more efficient. Standardisation, he thought, should rather take the lines of stating the maximum size of the apparatus, stipulating for interchangeability of units, saying whether switches should be on the cooker or the wall, specifying fuses for each unit, earthing, &c. Such things as fixing a definite size for cookers, or whether they should have top side or bottom heat, should not be standardised. He said that a supply company without a showroom should be ashamed of itself, and suggested that contractors should stop asking for apparatus on sale or return, but should pay a sum, say about £10 a year, for the privilege of using the Corporation or company's showroom.

Mr. F. S. GROGAN (British Electric Transformer Company) regretted that membership of the Association should be confined to engineers who charged only 1d. per unit. He was in favour of a lower hiring charge and a higher charge per unit. At Derby, for instance, within a few months, 70 cooking consumers had been obtained, and the charge was 1d. per unit and 4s. per quarter for hire of the apparatus, with free wiring. This, he maintained, was better progress than had been made at Sunderland at 1d. per unit, and required a far smaller selling staff. He deprecated the standardisation of ovens by the "Point Fives," and said that a Point Five oven would be only half an oven unless the manufacturers were with them. He argued that there was no difference between radiant and convected heat in a cooker, and that it was all a question of temperature.

Mr. H. GRAY, designer of the electric oven made by Messrs. Bertram Thomas, and Mr. ROSE, spoke briefly, and were followed by

Mr. B. SANKEY (Chief Electrical Engineer, Whitehaven), who  
(Concluded on page 362.)

## PRICES CHARGED FOR ELECTRIC POWER

A PAPER with this title, by Mr. S. Simpson, was discussed by the Yorkshire Section of the Institution of Electrical Engineers at Leeds on April 16th and at Sheffield on April 23rd.

A review of the returns of many electrical supply undertakings throughout the country would indicate, said the author, that in comparison with most industries an adequate and true profit on capital invested is not being made.

In whatever form the capital is raised it must be repaid by an annual charge on the undertaking before any true profits can be taken out of the business. Of the factors which must be taken into account, so as to arrive at the deterioration which has taken place in an undertaking, the chief consideration is obsolescence, for unless adequate provision is made, a time must arrive when an amount will have to be debited to profit and loss account, which should in strictness have been borne by previous years. The improvement producing this obsolescence might be a very serious competitor to present methods, but would not itself carry a sufficient profit margin to cover the dead weight of interest on capital expended on the superseded plant, &c. This obsolescence would run right through the undertaking to the land and buildings since each is adapted to meet the original needs of the other. Since the depreciation rate must be considered purely as an estimate, the view that residual value be regarded as an asset at the end of the life period appears more reasonable than a prior valuation which in itself could only be an approximation liable to large error. Of the alternative methods of dealing with depreciation, the author commends the principle of an annual charge, but the appreciation and renewals funds should be kept separately; but he favours the methods in which a fixed percentage is taken annually out of the receipts. From a survey of the past 15 years or more he thinks that an average depreciation within 15 years should be allowed for, and local authorities should treat it exactly as an ordinary business undertaking would.

Analysing the published returns for 1912, the author deduces two tables: (A) covering 21 local authorities of 16 to 28 years' working, each with 2,000-kw. or more of plant, and with total capital costs per kilowatt of plant, £60 or less; and (B) covering 38 local authorities of 7 to 15 years' or less working, each with 2,000-kw. or more of plant, and with total capital costs per kilowatt of plant, £60 or less. These distinctions were adopted so as to see what advantage the younger undertakings had had from the earlier development work of the older ones.

The amortisation of the capital account on a 15-year basis to bear  $3\frac{1}{2}$  per cent. interest on outstanding principal is taken as an annual charge per £100 of capital expended of £8 14s. This figure covers depreciation and minimum interest; to this amount must, therefore, be added working expenses, including cost of fuel, oil, waste, water and stores, wages, repairs and maintenance, rents, rates and taxes, management, salaries, office, legal and insurance expenses, and set against revenue account before contingencies and true profit can be arrived at. On this basis only a few of the undertakings show any substantial profit. In the case of Table A the total net production costs per unit sold are 1'44d., and in the case of Table B 1'328d. (the units sold being 325 million and 169 million respectively), while the average prices obtained are 1'375d. for A, and 1'23d. for B, thus showing a loss of 0'065d. and 0'098d. respectively. The standing charges are 0'823d. and 0'663d. in the two cases, and the works costs come out to 0'617d. and 0'665d. To bring about "financial stability" by obtaining an increased price per unit, new tariffs are evolved. The charges arrived at are based on a 24-hour unrestricted service, and questions of contingencies and profit are eliminated. In Table A the stand-by plant is 30 per cent. of the total installed, and in B 25 per cent. The capital costs per kw. installed are £48'75 and £42 in the two cases. From this the author deduces a standing charge of £6'05 per kw. of plant in the first case, and £4'85 in the second, to which he adds the average works cost graded for different load factors according to a certain scale, varying in the case taken from 23 per cent. reduction at from 5 to 10 per cent. load factor to a maximum of 27'5 per cent. reduction at from 20 to 40 per cent. load factor.

The charges so deduced come out as follows:—

Load Factor.	A.	B.
5 per cent.	4'3470d.	3'7870d.
10	2'4580	2'1710
20	1'4400	1'3280
40	0'8635	0'8135
80	0'5520	0'5360

From this table it appears that the present prices charged for supply at load factors up to 10 per cent. are generally remunerative, and that the losses are made on the supply at higher load factors, i.e., on industrial power supply. Unless the tariff is based on these lines all round, equity is not obtained. The author suggests that accounts should be subject to revision annually with regard to (1) diversity obtained, (2) correct maximum demand, and (3) power factor in the case of A.-C. supply. In the latter case 0'8 is taken as the standing power factor. For unity power factor a rebate of 20 per cent., and for a power factor of 0'75 an increase of the standing charge of 17'5 per cent., increasing to 131 per cent. in the case of 0'5 power factor is suggested.

In order that the tariff shall be equitable, a minimum annual payment equivalent to half the estimated total revenue should be enforceable. In conclusion, the author draws attention to the fact that where an outside supply is given to an industrial concern the productive value of the extra capital thus set free, which if a private plant were installed would be required, should be taken into account in fixing a competitive charge.

### DISCUSSION AT LEEDS.

Mr. T. ROLES (City Electrical Engineer and Manager, Bradford), in opening the discussion, said that it appeared from the tables that Bradford was making the handsome profit of minus 10 per cent. However, about five years ago they were making a net profit of £2,000. The experiment was made of increasing the charges for power from 1d. to 1½d., but the power users were up in arms against the increase, and the load did not increase. The speaker then prevailed on his committee to cut the price down again, with the result that the load rapidly improved, and last year the net profit rose to £9,000. The Author based his figures on the endeavour to give equity to all classes of users, and although this was excellent in theory, it was practically impossible of realisation. They could afford to lay a main specially to a mill requiring 200 to 300 kw. at the present prices, and obtain their profit from the lighting load and small power users. If these large consumers were not to be supplied they would have to confine themselves to a small area and increase the charge for lighting.

Mr. WRIGHT was of the opinion that where profits have been shown they have been made at the expense of the small consumers. He had made a comparison of the relative cost of driving a mill by steam taken from actual costs, and the same mill by electricity calculated from results obtained in actual practice. The total annual cost for 711 i.h.p. was £1,586, allowing all charges, which was equal to 4½d. per loom per week. With electric driving he figured it out at £4,273, or 1s. per loom per week. It was apparent that on the question of power supply only, electricity at present prices could not compete with steam; any suggestion to raise the prices would therefore be folly.

Dr. R. POHL (Chief Engineer, Phoenix Dynamo Manufacturing Co., Bradford) did not consider there was any necessity to wipe out all the capital costs in 15 years, and the high value of the standing charges as shown by Mr. Simpson he thought was largely responsible for the poor results shown in the tables. He agreed that at present the lighting consumer paid for the power load which enabled present profits to be made. We had, however, only touched the fringe of the possible private house demand, and if the prices were reduced the number of users would increase so rapidly, both for lighting and cooking, that no increase in the price of power supply would be necessary. Referring to the question of power factor, he would point out that this could be increased by using squirrel-cage motors of larger power than at present allowed, instead of slip-ring motors.

Mr. H. S. BINNS (Leeds) supported the Author, and instanced Coventry, which showed a profit of 17 per cent. Taking both of the tables together, about 25 per cent. of the stations showed a slight profit. Criticising Mr. Wright's figures, he said that actual results show the cost of electric driving to be 5d. per week per loom, and not 1s. The cost of power in weaving cloth is only equal to  $\frac{1}{4}$  per cent. of the total cost of manufacture.

Mr. R. H. CAMPION (Borough Electrical Engineer, Dewsbury) said that until they could get some satisfactory system of storage to cope with the maximum demand it would be necessary to provide stand-by plant, which meant increased capital cost and standing charges. It was these items which required relative reduction, instead of the prices for power being increased.

Mr. J. E. SCHOFIELD (Sales Manager, Yorkshire Electric Power Co.) thought that as manufacturers have increased the prices of their goods 5 per cent. to 15 per cent., and did not find business decline, the same ought to result in the case of power supply.

The discussion eventually developed into a more or less informal talk, in which Mr. Wilson Hartnell (Chairman) and Messrs. E. S. Rayner (Doncaster), J. C. B. Ingleby (Leeds), W. Lang (Leeds), and H. Brown (Bradford), took part, the general feeling being that it was hopeless to think of increasing the charges for power.



Mr. SIMPSON, in replying, said the period allowed for writing off capital was originally high, but it had now been cut down considerably. Improving the load factor and increasing the turnover would not be any advantage unless they brought their fair share of profit.

#### DISCUSSION AT SHEFFIELD.

Mr. H. E. YERBURY (Chief Electrical Engineer, Sheffield Tramways) considered 15 years was too short a period for the repayment of loans. Sheffield in 1912 obtained 30 years for the Tramways Power Station and cables. One must not lose sight of the fact that the majority of the municipal supply stations were not a burden on the rates, and it was not their function to make large profits.

Mr. H. A. NEVILLE (Corporation Electricity Works, Wakefield) agreed with the main principle of 15 years' repayment, but would vary the period of repayment for each section of the capital outlay. He did not support the opinion that the lighting consumer was paying for the losses on the power supply. It was obvious that the long hour consumer at a low price is more profitable than a short-time user at a higher rate.

Mr. W. N. Y. KING (Sheffield) considered it would not be equitable to charge large and small consumers their share of works cost in proportional rates to their demand. The running costs would, to a certain extent, be independent of the load factor, and a heavy load would demand a larger generating set, which of itself would be more efficient. It was quite sufficient for municipal supply stations to pay their way.

Mr. J. C. B. INGLEBY (Leeds) said that he would like to cut down the cost of buildings, subways, &c., and to extend the period of repayment.

Mr. E. J. MARSH (Electrical Superintendent, Sheffield Tramways Power Station), taking the consumer's standpoint, referred to the competition with gas, which in Sheffield was at the low price of 10d., making it impossible to increase the charges for electric power with any prospect of success. He considered it was a mistake to have so many methods of charging—a customer wanted to know in plain figures what it was going to cost him, without a number of conditions. He considered a flat rate based on the number of units used would be preferable to the more elaborate systems suggested.

Messrs. J. E. Schofield, F. J. Lowe (Leeds), W. E. Burnand (Sheffield), and the Chairman, Mr. W. B. Woodhouse (Thornhill), also spoke, after which the Author, in replying, said they had to feel their way and consider the matter from every point of view before settling down to a definite system of charging.

## THE CONGRESS OF THE TRAMWAYS AND LIGHT RAILWAYS ASSOCIATION

THE Fifth Annual Congress of this Association was held at Blackpool on Thursday and Friday last. The mornings were devoted to the discussion of Papers, and excursions were made in the afternoons. The members and visitors were entertained at a banquet on Thursday by the Mayor and Corporation of Blackpool, and a dance ended the proceedings on Friday.

On the first day's meeting, a Paper was read by Mr. E. H. Edwards (General Manager, Lancashire United Tramways Co.), entitled "Possibilities for Increasing Profits on Interurban Lines." The author thought that in tramway undertakings of this nature, as distinct from city systems, economies might be effected by the adoption of less elaborate uniforms, saving of car body maintenance by simpler construction and decoration. He did not agree with Mr. Hooghwinkel that the track should be lightened, especially in view of the increase of motor lorries using the same roads. There was often extravagance in overload construction which could be avoided. With regard to increasing revenue, he encouraged the development of goods traffic in competition with the motor lorry. This, if successful, would decrease the wear on the track by these vehicles, and incidentally reduce the track maintenance. Also a large proportion of the goods traffic could be run at night, and the load factor of the undertaking would be much improved.

The next Paper, by Mr. F. Bland (Edgar Allen & Co.), reviewed tramway-track practice from 1883 to 1913, showing the gradual development from the Marshall patent automatic point of 1882 to the forms now used. The various forms of track rail used at different times, culminating in the British Standard rail, were reviewed, and the successive use of chilled iron, crucible steel, and manganese steel for points and crossings was traced. The details of modern track were summarised, and it was mentioned that mechanically controlled points were now quite out of date, being superseded by electric point controllers.

The first Paper to be read on the second day was by Mr. H. England (General Manager, Yorkshire (West Riding) Electric Tramways Co.), on "Railless Traction Legislation." The author explained how the clauses in the Light Railway Act of last year relating to railless traction came to be mutilated and finally dropped, so that expensive and lengthy procedure by private Bill

still remains the only course. He then proceeded to give digests of 15 Acts which had been obtained by local authorities and three by companies. These comprise Dundee, Leeds, Bradford, Chiswick, Rotherham, Halifax, Northampton, Aberdare, Brighton, Hove, Sheffield, Keighley, North Ormesby &c., Stockport, Ramsbottom, Chesterfield, and Rhondda. (Of these only Dundee, Leeds, Bradford, Rotherham, and Stockport are as yet running.) In these Acts the time of completion allowed generally varies from two to five years, and in most cases the form of the vehicles has to satisfy the Board of Trade. The degree to which carriage of parcels or goods is allowed varies very much; only Brighton and Stockport have full powers. In some cases the use of trolley vehicles is allowed for the conveyance of sanitary refuse, road materials, &c. It is usual for the Board of Trade to take powers to make provisional orders authorising the use of trolley vehicles on new routes. It is apparently not possible to obtain powers in the same Act for subsequent conversion of trolley routes into tramways. Through running is only allowed for at Stockport. Trailers are not usually contemplated, but may be used by consent of the Board of Trade at Ormesby and Rhondda, while the consent of the County Council is also required at Keighley. The cost of road widenings is shared in varying proportions by the road authority and the operators. The road maintenance question is the most important. The Rotherham undertaking contributes 3d. per car mile, with an annual minimum, but may have to pay more if this turns out inadequate, and somewhat similar conditions obtain in Brighton, Chesterfield, Sheffield, Keighley, and Ramsbottom. In Rhondda, however, the liability is definitely limited to 3d. per car mile.

There are various protective clauses regarding bridges, gas mains, drains, &c., and in some cases undue onus as to clearing snow is put upon the operators. In Brighton the local omnibus company is prohibited from working the same routes, and the Keighley Corporation is prohibited from competing with railways, but in general no attempt is made to prevent competition. Some costs of railless traction schemes are also analysed in the Paper. At Bradford the working expenses come out at 6'62d. per car mile, compared with 4'65d. at Leeds and 6'61d. at Rotherham. These do not include interest, sinking fund, &c., which bring the Leeds figure up to 6'76d. and that for Rotherham up to 7'81d. Finally, brief descriptions are given of the leading systems. The "Cedes-Stoll" system is in somewhat extensive use on the Continent, and is to be employed at Keighley and Aberdare. The current collector is a frame carrying a weighted pendulum running on wheels on the top of the two overhead wires, and turned by a flexible cable with a spring drum on the car to take up the slack. Gearless hub motors are employed. The "R.E.T." system, with two trolley poles and two separate geared motors, one driving each wheel through chains, is in use at Leeds, Bradford, Dundee, and Rotherham, and is being installed at Rotherham. The Bremen system used at Stockport has the negative above the positive wire, with a special collector turned by a flexible cable. A single motor drives through a propeller shaft. The "Filovia" system uses a single pole, on which a four-wheeled trolley is mounted.

The final Paper, by Mr. A. V. Mason (General Manager, South Metropolitan Electric Tramways), dealt with the rules and regulations for tramway employees which have recently been published by the Association.

**Faraday House Journal.**—In addition to the usual extensive account of the most recent doings of "Old Faradians," the Summer Term issue of the Faraday House Journal contains abstracts of some Papers read before various societies, reviews of books, an interesting article on the inductive coupling of oscillatory circuits, by Mr. F. C. Topham; and notes on electric winding plant for collieries are contributed by Mr. G. O. Scampton; while the calculation of transformer regulation on inductive loads is dealt with by Mr. J. Goodman. There is also a short biography of Mr. Haydn T. Harrison.

**The San Francisco Congress in 1915.**—Arrangements are now advancing regarding the International Engineering Congress, which is to be held in 1915 at San Francisco in connection with the Panama Pacific International Exhibition. The Congress is to be conducted under the auspices of the American Society of Civil Engineers, American Institute of Mining Engineers, American Society of Mechanical Engineers, American Institute of Electrical Engineers, and Society of Naval Architects and Marine Engineers, and the necessary committees have been formed. The Papers presented at the Congress will naturally be divided into groups or sections. During the Congress each section will hold independent sessions, which will be presided over by a chairman eminent in the branches of engineering covered by his section. The scope of the Congress has not as yet been definitely determined, but it is hoped to make it widely representative of the best engineering practice throughout the world, and it is intended that the Papers, discussions, and proceedings shall constitute an adequate review of the progress made during the past decade and an authoritative presentation of the latest developments and most approved practices in the various branches of engineering work.

## THE "POINT FIVES" MEETING

(Continued from page 359.)

suggested that membership of the "Point Fives" should be open to all engineers actively engaged in pushing heating and cooking apparatus, especially those engineers charging on the Norwich system. He then instanced his own district, where one of his best customers kept a model lodging-house with beds at 3d. per night. Slot meters were used, and the charge was 5d. per unit, of which 4d. was returned at the end of every month on those units, registered on a separate meter, which had been used for heating or cooking. In addition, a charge of 5s. per quarter for a cooker, 2s. 2d. for a breakfast griller, and 1s. 6d. for a hot plate, was made.

Mr. NAPIER PRENTICE (Chief Electrical Engineer, Felixstowe) spoke on the question of radiant *v.* convected heat for cooking. The former roasted and the latter baked. Cookers should be designed to have both. He had found that the best efficiency was obtained with a cooking temperature of about 220° F. with a preliminary roasting; though the time taken was longer than in a coal oven, yet the losses were only 3 to 4 per cent. against 25 per cent. He had been greatly struck with the automatic and time switches now largely used on American stoves. He thought that it was a mistake to make the hiring charges too low, as had been done by the gas companies, who were now finding out their mistake. He did not think that it was necessary to reduce the price of electricity as low as ½d. per unit.

After some remarks by Mr. N. MILLER (E. & O.A. Co.) and Mr. D. HUNTLY (Dowsing Co.), Mr. H. R. BARGE (Chairman, Poplar Electricity Committee) proposed the health of the "Point Fives," coupled with the name of the Chairman, and Mr. Blackman briefly replied, and defended the Point Fives against some of the criticisms levelled at them during the evening.

The meeting adjourned about 11.40 p.m.

## THE CONTRACTORS' ANNUAL DINNER

**A**BOUT eighty members and friends attended the dinner of the Electrical Contractors' Association under the chairmanship of the President, Mr. W. A. Shaw, at Frascati's Restaurant, on Tuesday evening, when excellent fare both as regards refreshment and speeches was provided.

The toast of the evening, that of the Association itself, was proposed by Mr. M. N. Drucquer, whose forensic eloquence is well known to all who have followed the Association's victories in the law courts. He congratulated them more, however, on their success in the peaceful settlement of disputes than on their fights, and enlarged upon the ability of Mr. Tate, their secretary, both as a negotiator and as an expert witness. The Association seemed always to accomplish successfully what it set out to do. Its membership was rapidly increasing, and already they had bolted and barred the door of 50 Corporations who had attempted to get wiring powers. He referred to the famous Leicester case, and how at Sheffield their craft had been preserved from extinction. It was essential to maintain the present solidarity of their organisation. Safety was to be found as much in unity as in numbers.

Mr. S. H. Webb, the president-elect, in his reply, said that the Association only resorted to law as a last resort when peaceful methods failed, and reminded them that in every case fought under the able leadership of Mr. Drucquer and advice of Mr. Tweedy-Smith had been successful. He now looked to more peaceful times. The Association was now stronger financially and in other ways than it had ever been before. They all wanted to cultivate a better understanding with the station engineers, whom they regretted had lodged a Bill in Parliament that they could not agree to. He complained that municipal balance sheets did not reflect truly the work of the fittings departments, and the competition was not fair. He wished that the engineers would only treat with them so that they all could work amicably together. In conclusion he appealed particularly to London contractors to join the Association and take advantage of combination where individual action had not the ghost of a chance.

At this point an illuminated address was presented to Mr. A. Davidson in recognition of the work he had done in connection with the Sheffield campaign, and Mr. W. R. Rawlings, in making the presentation, said that the settlement of the Sheffield case would prevent many municipalities from attempting the same action. Mr. Davidson replied, paying tribute to the work of Mr. Drucquer and Mr. Tweedy-Smith in the struggle, and declared in a fighting speech that it was his intention to carry the matter further through the Chambers of Commerce, and to insist on an impartial audit of all municipal accounts. Another illuminated address, accompanied by a cheque, was then handed to Mr. Tate by the Chairman, with congratulations on his recent marriage, which were suitably acknowledged.

Mr. E. C. WALLIS, in a clever speech, next proposed the kindred associations, referring to the good work done by the Scottish Contractors' Association, the Ironmongers' Association, and other bodies.

Mr. S. E. EDGCOMBE (Borough Electrical Engineer, Kingston-on-Thames), responded for the I.M.E.A. It was difficult to voice the very divergent views of all the components of his Association, but speaking personally, his own undertaking had had full wiring powers for 13 years, and worked most amicably with the contractors, to whom practically all the work was given by acceptance of the lowest tender. The Electricity Department practically acted as banker to the contractors, and protected them against all possibility of bad debts. He hoped that peaceful means might be found of getting over the present troubles, and emphasised that all were really members of the same profession. He looked forward to good work from the Industrial Committee of the Institution of Electrical Engineers.

Mr. Tweedy-Smith then proposed the health of the chairman, who in his reply referred to the good work done for the Association by Mr. McDermott, Mr. Marryat, the Secretary and the proposer of the toast.

## THE CUMBERLAND PROCESS OF AVOIDING CORROSION

**W**E have received from the Cumberland Syndicate (44 Charing Cross, S.W.) some particulars of the Cumberland electrical patent process for avoiding corrosion, pitting and scale in condenser tubes and boilers, which is in use with considerable success on sea and land in various parts of the world. It has long been realised that deterioration of condensers, boilers and such vessels, &c., is largely due to electro-chemical action, and it has been met to some extent by immersing in the vessel a piece in metallic contact with the casing. The zinc, being electro-positive to the metals of the vessel, takes all the corrosion to itself, so to speak, and all the other metal work forms the negative pole, and a protective liberation of hydrogen takes place over its surface, effectively preventing corrosion. This is, however, only effective when the zinc is new and clean, but not only does it soon eat away, but its surface soon becomes oxidised, and the action ceases, or even may become reversed. The Cumberland process gets over this difficulty by supplying current through one or more immersed anodes from an external source, so that the polarity is certain and the extent of the action regulable. It is no longer necessary to use zinc, and the anodes are pieces of iron shaped according to the particular vessel, and connected to insulated bolts passing through the body of the casing. The current return is, of course, by the vessel itself. Each anode has an adjustable resistance in series with it, and an ammeter can be switched into any circuit. Current is supplied at from 6 to 10 volts by a small motor generator. It is found that the hydrogen forming on the negative surface of the vessel not only protects it from corrosion, but the mechanical action of the hydrogen given off between the metal and the scale loosens and carries away all dirt, scale, or grease adhering to the metal. If the vessel to be protected is already free from scale, the hydrogen being given off prevents any solids settling or adhering to the surface, and also neutralises any corrosive effect of acids, oils or free oxygen contained in the water. The apparatus can also be arranged to form a low-water alarm, as the current will cease to flow if the anodes are no longer immersed. The system is in use in the United States Navy, where it has been very favourably reported on, and by several large steamship companies, as well as in electric generating stations in New York, Brooklyn, Brussels, Llanelli, in the power-house of the City & South London Railway, and elsewhere.

**Siemens' Cinematograph Films.**—It was a pleasure on Monday afternoon to escape for a short time from the heated, dusty atmosphere of the London streets into the private boxes of the Kingsland Imperial Picture Theatre, where, at the invitation of Messrs. Siemens Bros. Dynamo Works, Ltd., Lamp and Fittings Department (Dalston, N.E.), we witnessed, among others, two excellent films connected with this well-known firm, after having greeted Mr. H. A. Pryor and many of his assistants, who so ably carried out the arrangements. The first film depicted the manufacture of "Wotan" and "Tantalum" lamps, as carried out at Dalston (see ELECTRICAL ENGINEERING, March 20th, p. 164), while the second was of humorous intent. The title is "A Lighter Burden," and the story shows the quarrels of a husband and wife, presumably caused by the bad light in the house, the final notice for payment of the quarterly account comes, and when it is paid no money is left, hence many amusing adventures, as only the cinematograph can show. Returning from the city at night, the "hero" falls asleep in the train, and dreams of marvellous feats of strength and beauty performed by the personages in Messrs. Siemens' posters, who come to life. The result of all this is the purchase of a multitude of "Wotan" and "Tantalum" lamps, whereby peace is again effected in the household, and the electric light bill dwindles. This film is more clever, entertaining and enlightening than many of the so-called ordinary humorous films.

## TELEPHONE TRANSMISSION

A PAPER entitled "Practical Application of Telephone Transmission Calculations," by Mr. A. J. Aldridge, was discussed at a meeting of the Institution of Electrical Engineers on May 30th, immediately following the annual general meeting. The author showed how complex were the analytical equations relating to the propagation of telephone currents, and proceeded to develop a graphical construction for the determination of current distribution. To simplify the working, he had designed a special scale, with a pivoted arm and protractor for the rapid measurement of the vectors in his diagrams. The treatment was based throughout on reference to miles of "standard cable," with "allowances" for the terminal impedance any piece of apparatus in the form of the length of such a cable which give the same reduction in efficiency as the apparatus in question. The magnitude of errors introduced by certain causes was investigated, and the application of the method to various practical problems was dealt with. The apparent equivalents of one or two different kinds of line, both unloaded and loaded, were considered, and the question of "reflection losses" was considered. Arising out of this, the author remarked that at the time the National Telephone Co. and the Post Office agreed as to the standard cable, the reflection effect of the terminal apparatus was not sufficiently appreciated. He discussed briefly the pros and cons of other proposed standards, including Dr. Breisig's attenuation constant and length, Major O'Meara's "centibeta" standard, and M. Devaux Charbonel's *al.*, expressed in terms of 5 mm. aerial wire. Finally, he proposed, as a more suitable standard, a 20 lb. cable, with arbitrary but practical constants, and terminals giving the same impedance as the line (therefore giving no reflection), and fed with an E.M.F. of 5 volts. Proceeding, he discussed composite lines, and showed that quite considerable losses may occur at points in a line where there is a change of impedance not detected by the ordinary methods of working out. The latter part of the Paper contained some experimental results. Oscillograms were given, showing that the voice waves usually consisted roughly of slightly-damped series of oscillations of one frequency, and might, generally speaking, be represented by a very low fundamental of about 160 cycles, and a predominating 5th harmonic of 800 cycles. The strength of the fundamental was of the order of 5 per cent. of the principal harmonic. In case of a woman's voice, although the fundamental was higher, the harmonic was lower than in a man's voice. The result of this was that a single testing frequency of 800 was recommended, and experimental tests were mentioned confirming its suitability.

Other conclusions arrived at by the author were that:—The normally accepted equivalents of uniform lines (*i.e.*, the equivalents calculated on the assumption of an infinite line) may be seriously wrong when applied to practice unless the equated length of the line is of the order of 20 or 25 S.M. This improvement with length, however, is only due to the fact that the terminal loss is then less important with regard to the line loss. The equivalents of heavy gauge open wire lines may be improved by the addition of cables at the ends. The relation between the impedances of the various factors, however, must be taken into account in determining the amount. The terminal apparatus plays a most important part in transmission, the sending instrument no less than the receiving. The present system of making telephonic calculations, *viz.*, by adding together the equated lengths of the various sections of a line, is only approximately correct. To obtain accurate results, the various reflection losses must be added. The overall transmission is the same in either direction over a line composed of two or more differing types, though the distribution of losses is not the same.

## DISCUSSION.

Mr. B. S. COHEN (G.P.O.), in opening the discussion, said that it might be possible to overcome the difficulty of settling the best length of section by an adoption of Professor Pupin's equivalent sine formula applied to the general case of any telephone line. It was known that in the case of loaded lines a spacing giving 7,000 coils passed by the wave in one second gave the best results in practice, and in working out such a case graphically, the length of section would be determined by this figure quite irrespective of the error due to the graphical construction. On the question of the equivalent of a 600-lb. open copper-wire line under various terminal conditions, he drew attention to the value of the equivalent for various cases, which showed that in no case would the transmission of the complete circuit be better when cable was added, and although it had been suggested that under certain conditions the addition of terminal cable to an open-wire trunk line might improve the transmission, he knew of no case in which this

actually took place. In connection with the speech tests, it was necessary to take into account the fact that the line leakage in practice might vary with both the frequency and amplitude of the applied speech wave, the impedance of the terminal instrument changed with frequency and current, and the variation in efficiency of telephonic apparatus with the load. The standard proposed by Mr. Aldridge was to have a terminal instrument of the same impedance as that of the line. This amounted to retaining the existing standard, but always making due allowance for the terminal effects, which in the case of unloaded lines had hitherto been considered negligible. The suggestion that a standard terminal instrument might be constructed having the same value as the line impedance involved an instrument with a negative angle, and the only telephonic apparatus of this nature that could be constructed appeared to be a condenser telephone, which in its present state of evolution was not at all suitable for use as a standard. He would also like to emphasise that it was only possible to make standard cable measurement of loaded lines against unloaded lines when there was negligible reflection effect. We were still waiting for a satisfactory multi-frequency wave which would give accurate standard cable measurements for all conditions of line.

Mr. J. G. HILL (G.P.O.) said that in order to predict the quality of speech, attenuation, impedance and distortion must be taken into account in the circuit, and this the author had not done. Distortion was most important. In the case of a high resistance cable, for instance, a very different result was obtained compared with an open line. In the case of an open line with inductance as well as resistance, the formula was very different, and those accustomed to comparing underground circuits found a tremendous difference in the tone and quality of speech, and this accounted for some of the results of Mr. Aldridge. In any long telephone circuits there were periods at different points of the line, and they very often had a combined effect which was tantamount to a loading effect, and the losses were appreciably less than would be expected, seeing there was a loading effect. It had also to be ascertained whether the constants really were constant, and many experimenters besides himself wished to obtain some confirmation of Mr. Aldridge's results before finally accepting them. There were losses at present unaccounted for. It should not be overlooked that the standards adopted by the G.P.O. were not obtained from any calculations, but from arbitrary experiments, and, therefore, should not be compared with calculations.

Mr. J. E. KINGSBURY referred to the frequencies selected in the Paper, and looked forward to some other harmonic being selected as the result of future experiment and analysis.

Mr. F. GILL (Engineer-in-Chief, National Telephone Co.) said that the standard mile was first used in the United States, and was adopted in this country as something already in existence which would form the basis of an international standard, rather than setting up a standard of our own. He agreed with this action as a wise one. At any rate, he would advise that a change should not be made lightly nor until we were certain from the practical point of view. He did not agree with Dr. Breisig's standard because it did not cover both the line and the instrument.

Mr. H. KINGSBURY said that there were a large number of frequencies above and below 800 which could not be ignored; and speech tests carried out recently demonstrated the fact that a frequency of 800 was not the correct one. In fact, no single frequency gave true results, and as time went on, more attention would have to be paid to the range of frequencies if the question of articulation was to receive the attention it deserved.

Mr. ALDRIDGE, in reply, thought Mr. Cohen's idea with regard to the Pupin formula worth going into, although the question was rather complicated in having to allow for lines of different types. His own suggestion was that his standard should be taken as the basis, and the existing standard be used as a working standard from the other one. He agreed with Mr. Hill that the constants varied, but this could not be allowed for in a formula, although he quite agreed that more information was required about the constants for an ordinary line, and how they varied. The Paper was written more with the idea of giving a simple means of calculation than to give any very precise results. The 800 figure taken and objected to by Mr. H. Kingsbury was admittedly not a strict mean. The present standard was the best one for general purposes, but it was necessary to correct for the terminals at the end, which he had done. He agreed that the standard circuit should include the instrument. The single frequency of 800 appeared to give correct results. It might be that other frequencies would be necessary on open lines, and it was quite possible to make tests with two or three frequencies and to combine the results.

**American Hydro-electric Schemes.**—A Bill was recently passed providing for the immediate expenditure of about £135,000 by the New York State on an hydro-electric scheme, using water from the Barge Canal, and supplying eight municipalities for public purposes and for distribution to private consumers. This is intended to be only a beginning, and if successful the system may be extended.

## CATALOGUES, PAMPHLETS, &c., RECEIVED

**FANS.**—We had occasion last week to refer to the very complete line of electric fans manufactured by the General Electric Co. (57 Queen Victoria Street, E.C.) at the special factory at Witton, Birmingham, and the thoroughness of the inspection and testing of the work as it passes through and out of the shops. We have now before us a copy of the latest catalogue of these fans, which seems to cover the whole field of the application of electricity to ventilating work. The "Freezor" fans, as they are called, range from small desk fans, taking no more than 20 watts, to centrifugal and exhaust fans up to 60 ins. in diameter. The Swan patent cooling fan, which we recently described and illustrated, is included, as well as several patterns of punkah. Special attention should be called to the "Liteweight" 12 in. fan, weighing 10 lbs., and taking 25 watts, to the oscillating fans, and the fans with the new "Pitter" multiple blade. A full range of accessories and spare parts is included.

**AMMETERS AND VOLTMETERS.**—Another new list from the General Electric Co. deals with ammeters and voltmeters of the moving coil type, for continuous currents, arranged in pedestal cases so that they can be attached to controllers and switch boxes.

**SWITCHES, &c.**—A list from Siemens Brothers Dynamo Works, Ltd. (Supplies Department, 38 & 39 Upper Thames Street, E.C.), which is supplementary to their ordinary list of installation accessories, contains particulars of several new lines of switches, among which may be mentioned a porcelain-cased watertight switch for damp situations, a door switch, and a flat pattern of tumbler switch. Another list deals with the chain-pull design of switch lamp-holder, which has already been described in our columns.

*Readers desiring copies of catalogues or pamphlets should apply to the firms in question, referring to the notice in "Electrical Engineering."*

**DRIVING CHAINS.**—Hans Renold, Ltd., send us a pamphlet entitled "Driving Chains for Speeding Up," which contains some remarkable results in lowering production costs as a direct result of adopting chain drive in connection with gear-cutting and other machinery. In the case in point a 60 per cent. gain in output was obtained for only 10 per cent. increase in power.

**FANS.**—An exhaustive list of fans for D.C. or A.C. circuits has just been issued by the Electrical Co., Ltd. (122-4 Charing Cross Road, W.C.). The company makes a special feature of a 12-in. swivel and trunnion fan, which it claims to be the best and cheapest on the market. It is finished in matt green with gilt bands and blades, and a three-step regulator is included. The ordinary desk fans and a multitude of designs of ceiling fans as well as shaft and centrifugal ventilators are also listed, and some notes on the use of fans, giving the quantity of air which should be displaced per hour for different buildings, are contained in this publication.

**RUBBER CABLES.**—A sheet from the same firm gives the new prices of 600 megohms S.W.G. rubber cables. Other lists embracing 2,500-megohm cables, flexible cords, steel conduits, and fittings, will also be sent on application.

**MOTORS.**—A leaflet from Krupka & Jacoby, Ltd. (26-36 Chapter Street, Westminster, S.W.), gives prices of A.C. induction motors of 1/10 and 1 h.p. and series commutator motors and D.C. motors for powers between 1/40 and 1/6 h.p.

**FANS.**—The same firm has a new list dealing with its desk, ceiling, and porthole fans. A device is also listed by which an ordinary table fan may be given an oscillating movement, and a special offer of 9-in. D.C. desk fans is being made.

**ARC LAMP SUSPENSION.**—A circular letter from the London Electric Firm (George Street, Croydon) calls attention to the prices of their contact suspension device span-wire lowering gear, which are considerably less than those of equivalent poles.

**ALUMINIUM.**—The British Aluminium Co., Ltd. (109 Queen Victoria Street, E.C.), are issuing a folder for their leaflets. A new sheet illustrates the use of aluminium feeders for electric railways, and a pamphlet deals with the characteristics and advantages of aluminium, and gives some useful information on making bends, joints, &c., while a table has been prepared showing those sections (rod, bar, and strip) which have been found to be most in demand, and are now standardised and quickly obtainable.

**ELECTRIC LIGHT BATHS.**—A new catalogue is to hand from the Dowsing Radiant Heat Co., Ltd. (105 Great Portland Street, W.), of electric light cabinet baths or "Solariums," including patterns recently installed in several large country

houses, portable baths, and special apparatus for local treatment.

**ELECTRICAL APPARATUS FOR MINES.**—A new catalogue from Siemens Brothers and Co., Ltd., describes various electrical appliances for mines. Shaft-signalling apparatus is represented by the Rutherford patent system of luminous signals combined with bells, and an ingenious apparatus for recording bell signals by punching in a paper strip is included in this; the last signal made remains visible by being projected on a screen. Other forms of bell indicator are also included. Another system is by illuminated dial step by step instruments, similar to engine-room telegraphs. A number of forms of gas- and water-tight bells and hooters are dealt with, as well as push buttons, signalling switches, and other accessories, and the latter part of the catalogue treats of mining telephones and exploders. Among the last-mentioned is a particularly compact exploder weighing no more than 1½ lbs.

**RECEIVERS FOR WIRELESS.**—A folder issued by the Sterling Telephone and Electric Co., Ltd. (200 Upper Thames Street, E.C.), mentions the single and double head-gear receiving sets for wireless telegraph operators. The resistance of each receiver is 1,000, 2,000, or 4,000 ohms.

**ELECTRIC HEATERS.**—A variety of designs of heaters with the well-known Schniewindt resistance net elements are illustrated in a new list from the Schniewindt Electric Co. (40 and 41 Stanforth Street, Birmingham). Another pamphlet from the same firm describes a number of varieties of electric hot plates for industrial, domestic, and scientific purposes. Particular attention should be drawn to the asbestos cement hot plates for keeping dishes, &c., hot. Cast-iron boiling plates in a number of sizes are also listed.

**"SCHOLEY'S MAGAZINE."**—A neat little quarterly publication is being issued under this title by Scholey & Co., Ltd. (151 Queen Victoria Street, E.C.), giving technical information as to the extensive lines of electric and engineering material handled by the firm. It is specially addressed to shippers and exporters, who should find it very useful.

## CORRESPONDENCE

### THE ELECTRICAL TRADES BENEVOLENT INSTITUTION.

*To the Editor of ELECTRICAL ENGINEERING.*

SIR,—We are surprised to notice the very poor response to the appeal to subscribe the £1,000 for the Electrical Trades' Benevolent Institution, of which £600 has already been promised, for we quite thought that the few hundreds necessary would have been immediately forthcoming. Possibly, were it made more widely known that donations of £50 would be thankfully accepted to make up the required amount, the difficulty might be overcome. In order to start the ball rolling, we will follow on Mr. Byng's offer to the effect that we will give £50, providing the remaining £400 is made up in amounts of not less than £50 before the time stated at the dinner. As only about a month now remains, may we ask you to make a special appeal on these lines?

We are, sir, yours respectfully,

477-487 Liverpool Road, A. P. LUNDBERG & SONS.  
Islington, N.

June 5th, 1913.

**Electrical Engineering in South America.**—We have received some particulars of some South American electrical enterprises for which Mr. A. O. Kolkhorst has been responsible. Mr. Kolkhorst is coming to England, as announced elsewhere, to practise as a consulting engineer, but was for three years general manager of the Chilean Electric Tramways & Light Co., of Santiago. At the same time he acted as general manager of the Valparaiso Electric Tramways & Light Co. The whole of the electric tramways in Valparaiso, and the lighting and power plants were carried out under his direction and supervision, and he had continuous control of this undertaking from 1903-1912. The supply of electrical energy to Valparaiso is taken from a 6,000 h.p. water power station situated seven miles out of the city, and there is also a 3,300 h.p. steam station in the city. The capital city of Chili, Santiago, draws its supply of electricity from a 20,000 h.p. water power station on the river Maipo. The station is some 14 miles from the city, and the water is taken from the river some 10 miles above the station. There is also a steam power station of 7,000 h.p. in Santiago. The water power plant above-mentioned belongs to the Over Sea Electric Power Co., and was also under Mr. Kolkhorst's management. The capital expenditure on these three undertakings has been about £3,500,000. The companies were very prosperous, and paid good dividends to the shareholders, in spite of the disastrous results of the great earthquake of 1906, and the consequent depreciation of Chilean money, in which all tramway receipts and electric lighting accounts were paid



## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as to accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,343.

There are twelve three-core lead and armoured cables suspended in a culvert. Ten are for three-phase current; two are for direct current. I wish to test by some simple method in the culvert, without cutting the cables, to ascertain which are carrying three-phase current and direct current respectively, which are dead and which are alive, but not delivering current. There are no link boxes. The apparatus used must be such that one man can carry it. How can this be done?—R. S.

(Replies must be received not later than first post, June 26th.)

### ANSWERS TO No. 1,341.

A system of discriminating fault protection has been recently developed in which the difference under fault conditions of the currents flowing in two concentric conductors in parallel, and normally equal, is utilised to trip the switch. It is desired to apply this system to three single concentric cables in parallel originally laid for A.C. single-phase distribution, but now required to be converted to three-phase as feeders. What are the objections to this arrangement, and what is the formula for mutual induction of the cores (1) when currents are equal and in the same direction; (2) when one current is larger than the other, but both in the same direction; (3) when one current is in the opposite direction to the other? What would be the effect of a stray field on each core; for instance, how would the voltage induced in the cores compare if a length were suddenly drawn sharply through a magnetic field?—"KINK."

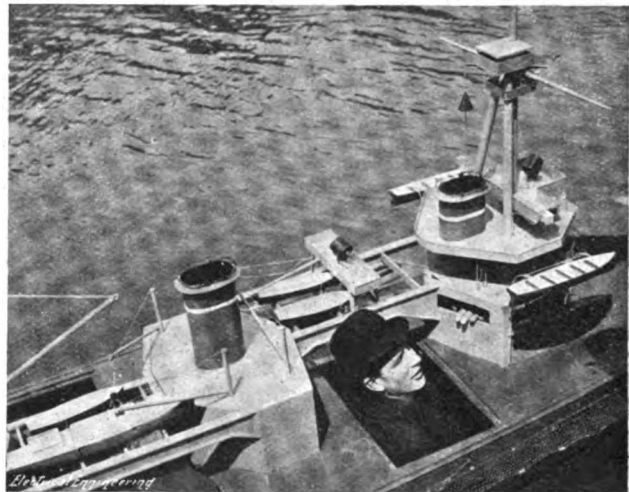
No replies worthy of an award have been received.

L. FOXES suggests, with regard to the replies to Question No. 1,337, published in our issue of June 5th, that in testing the resistance of the armouring of cables by the method described, there is the danger of a break in the armouring being overlooked if the armouring makes good earth on both sides of the break, as, of course, the test gives the parallel resistance of the armouring and the earth shunting it. He also points out that the connection for the insulation test mentioned by "Colliery Electrician" will not include the rotors of the motors, which must be tested independently.

**City and Guilds of London Institute.**—The report of the Council for the year 1912 refers to the second gift of £50,000 by the Goldsmiths' Company towards the extension of the Imperial College (South Kensington), subject to the balance, about £13,000, being added to the endowment fund of the College, and the income being used for higher educational and research work carried on in the new extension, which is known as the Goldsmiths' Company's Extension of the City and Guilds (Engineering) College. The reports show that at this and the Finsbury Technical College the attendances and results have been well maintained. At the latter there is now a third year's course in electrical, mechanical, or civil engineering for those who desire to continue their studies after the two years' certificate course. New apparatus has been added in all departments. At the City and Guilds (Engineering) College there has been marked activity in original research and other special work; particularly was this so in the electrical department, where there were also special courses on electrical machinery, advanced applied electricity, electrical engineering as applied to mining and metallurgy, as well as the railway engineering course.

## THE MODEL WARSHIPS AT EARL'S COURT EXHIBITION

BY this time many of our readers will have witnessed the miniature naval battle which is a feature of the Imperial Services Exhibition at Earl's Court, and it may be of interest to point out that these vessels are worked and controlled electrically. The boats were built and equipped by Bassett-Lowke, Ltd., of Northampton, for those responsible for the display. There are externally scale models  $\frac{1}{2}$ -in. to 1 ft., and vary from 25 ft. in length for the largest battle cruiser to the 12 ft. of the destroyers, and they vary in "tonnage" from 2,740 lb. to 1,560 lb. The correct number and disposition of guns have been fitted, and the larger ones are electrically controlled and trained, and fired by one of the two operators within the vessel. The searchlights and navigation lights are illuminated electrically, and the torpedo nets are automatically operated. The whole fleet consists of four super dreadnoughts, two battle cruisers, two destroyers, and the Royal Yacht. Naturally, the proprietors of the exhibition do not wish full details of the extraordinarily ingenious details of the internal electrical and mechanical devices on the ships to be disclosed, but we may say that the propelling motors are of  $1\frac{1}{2}$  h.p. wound for 50 volts, and are supplied with current from a set of storage batteries carried within the ship, and supplied by the Premier Accumulator Co. The control arrangements consist of an eight-point resistance



PART OF MODEL WARSHIP, SHOWING DECK ARRANGEMENTS.

frame, separate reversing switch, and the usual protection fuses, &c. The batteries are so arranged that the charging leads are brought to a suitable heavy plug situated conveniently on the deck. After each display the ship is simply brought alongside the wharf by the charging boards and suitable leads plugged in. The searchlights are very small, only measuring  $1\frac{1}{2}$  in. diameter, but throw quite a powerful beam, showing up well at a distance of 150 ft. They are supplied at a low voltage, and contain metal filament lamps run at a high efficiency. A parabolic reflector is used in conjunction with suitable lenses to concentrate the beam. All the searchlights on each vessel can be controlled by the afterman, and can be trained, elevated and depressed and switched on and off as desired. It should be mentioned that the fleet was built throughout at Northampton, under personal superintendence of Mr. S. Winteringham, from designs by Mr. E. W. Hobbs, and to the instructions of Capt. R. Raby, Naval expert to the Exhibition.

**Electrical Equipment of the ss. "Imperator."**—The new liner *Imperator*, of the Hamburg-Amerika Line, which has just made her maiden voyage to New York, is one of the largest ships in existence, being 919 ft. in length, with a tonnage of 50,000. Electric power is used to a considerable extent on board, the watertight doors are fitted with electrical as well as hydraulic closing gear, and there are several electric lifts. Searchlights of large size, given as 50,000 c.p., are provided, and the wireless telegraph equipment is said to be the largest on any ship—three operators are on duty night and day. Submarine bell signalling is also provided for, and the gyrostatic compass is used. The main electrical generating plant consists of five 220-kw. turbine-driven, 110-volt machines, and there are upwards of 10,000 lamps on the ship. An emergency generating plant of 110 kw. is provided above the water-line. A completely fitted machine shop is situated in the forward engine-room equipped with electrically-driven lathes, drills, planers, &c.

## "ELECTRICAL ENGINEERING" PATENT RECORD

*(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)*

### Specifications Published June 12th, 1913

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

**3,978/12. Automatic Telephone System.** B. DEGENHARDT. Each subscriber has a contact disc at the exchange which bears two contacts for each subscriber, all the equivalent contacts being in series. The insertion of a contact plug by the calling subscriber releases a lever and causes a current impulse to be delivered to a polarised relay at the exchange, by which the calling subscriber's switch disc is electro-magnetically coupled through a shaft which is common to all the discs. The coupling is maintained only until the calling subscriber's switch disc has been rotated by a step-by-step movement through an angle equivalent to the movement of the lever. Ten figures.

**4,067/12. Telephone Relay System.** S. G. BROWN. Each of the relay terminals is connected to the middle of highly inductive coil situated about the middle of one of the lines connecting two stations. Thus speaking currents operate the relay, and the relay currents on the two parts of the line balance one another, although the receiver is affected. Five figures.

**6,486/12. Wireless Telephony.** W. T. DITCHAM, H. GRINDELL MATTHEWS and GRINDELL MATTHEWS W. T. SYNDICATE. The spark gap electrodes consist of two rods of dissimilar metals with parallel faces and connected to masses of heat-conducting metal. This gap is energised with D.C. through inductive resistances shunted by a condenser, and an inductance which is tightly coupled to an inductance in the antenna circuit through inductances in an intermediate circuit containing the microphone. Notwithstanding the high group frequency of the spark, discharges do not develop into an arc with this connection. Three figures.

**11,559/12. Feeder Protection.** E. G. WATERS. Should one of two parallel cables become faulty it is cut out. To effect this the primaries of two current transformers are connected in the feeder circuits, while the secondaries are connected in opposition through wattmeters or reverse current or power relays operating separate circuit breakers in the respective feeders. In addition two other current transformers with primaries similarly connected and secondaries cross-connected are used, so that normally little choking action is obtained, but on the occurrence of a fault the impedance of the combination is greatly increased, and the power available for cutting out the faulty main is increased. Five figures.

**11,597/12. D.C. Motor Load Equalising.** S. ECKMANN. To reduce current fluctuations due to varying load, some of a series of motors are provided with flywheels. These have an additional series field winding carrying the current supplied to the installation. In addition, automatic regulators vary the motor fields in proportion to the total current, so that the current taken by each motor is caused to decrease when the total current increases and vice versa. Two figures.

**11,714/12. Recording Wireless Messages.** H. MERTON. The telephone receiver of a wireless installation is connected through the medium of a sound intensifier to a phonograph, which may be started and stopped by the messages. Received signals may thus be reproduced when required. Two figures.

**11,957/12. Damping Alternator Oscillations.** SIEMENS-SCHUCKERT. A heavy flywheel is connected to each machine through a spring coupling in which considerable friction is set up by the relative displacements of the parts. Alternatively the frictional resistance due to the movement of a liquid in a restricted part of a vessel rigidly attached to the machine may be used. Two figures.

**12,075/12. Water Heaters and Cookers.** H. S. MARTIN. The substance to be heated is contained in a vessel of quartz or other substance readily permitting the passage of radiant heat. The resistor is arranged on the outside of this vessel, and is in turn protected by a casing not in contact. Insulated handles, or a third wall between which and the second may be an air space, vacuum, or other heat insulator, may be used. Two figures.

**14,091/12. Drying Cables, Conduits, &c.** C. DONDEERS and E. WINTERER. A liquefied gas is allowed to expand in successive stages so that it enters the pressure reducer in a gaseous state and not as a saturated vapour. Carbonic anhydride is suitable. One figure.

**18,908/12. Magazine Arc Lamps.** H. E. ANGOLD. To transfer the feeding catches from one pair of carbons to another in inclined flame lamps where the carbons are fed downwards by shunt coils, energy accumulated by a weight or spring by the descent of the first carbons is expended in bringing the catches back to their starting point. Three figures.

**22,539/12. Switch Indicator.** H. H. BERRY. Iron-clad switches are provided with a reflector controlled by the handle,

so that closing the switch causes it to reflect light, while opening prevents its doing so. Four figures.

**5,872/12. Ordnance Alarm Signals.** KRUPP. For the safety of the gun's crew of guns mounted in turrets, signals are given when danger positions, due to obstruction in the line of fire, arise during traversing, &c. Signal lamps are fed continuously with A.C. through one circuit, and in addition automatically through another with A.C. of a different frequency when the danger arises—whereby flickering results. Four figures.

### Specifications Published To-day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, E.C., at the price of 8d. each, post free. Summaries of some of the more important of these patents will appear in our next issue.

*Names in italics indicate communicators of inventions from abroad.*

**Arc Lamps:** OFFICINE GALILEO [Searchlights] 12,380/12; PASQUALINI [Searchlights] 13,680/12; B.T.-H. Co. [*G.E. Co., U.S.A.*] [Electrodes] 18,220/12; CROMPTON & Co., 237/13.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** LEITNER [Automatic supply system] 16,174/12; CONNER and HEALEY [Flexible cables] 19,807/12.

**Electrometallurgy and Electrochemistry:** HIORTH [Extracting iron and steel] 16,275/12; ELEKTRIZITÄTWERK LONZA [Obtaining alkali metals from their fused halogen compounds] 3,575/13.

**Heating and Cooking:** MATTHEWS [Heating] 12,330/12; VENNER, 12,569/12.

**Ignition:** LANCHESTER [Engine starters] 12,418/12.

**Incandescent Lamps:** HUBERS (*Julius Pintsch A.G.*) [Drawn tungsten filaments] 5,026/12, 5,027/12, and 5,028/12; [Drawn tungsten alloy filaments] 12,752/12; GLADITZ [Ductile tungsten] 12,244/12; [Tungsten wire drawing] 12,469/12.

**Storage Batteries:** WILSON [Charging] 9,735/12.

**Switchgear, Fuses and Fittings:** NAYLOR and NAYLORGRAPH, LTD. [Lamp-holders] 12,381/12; GIBSON [Terminals and connectors] 12,445/12; PICKARD [Lamp fittings] 29,736/12; WEISS [Fuse plug] 3,732/13.

**Telephony and Telegraphy:** CORWIN [Telephone exchanges] 12,547/12; COLONNA [Polarised telegraphic relay] 18,369/12; GIRARDEAU [Aerials] 24,345/12.

**Traction:** WHITLAKES [Railway cab signalling and automatic control] 12,371/12; TARRANT and SYKES [Railway signalling] 13,125/12.

**Miscellaneous:** MUNDEN and MUIR [Announcers] 14,224/12 and 14,225/12; KITSEE [Synchronous phonographs and kinematographs] 14,880/12; C. & G. MÜLLER SPEISEFETTFABRIK [Metallic catalysts] 23,643/12; DALEN [Light signals for life-buoys] 24,564/12; Goss [Alarm clocks] 26,502/12; TROETEL [Door alarms] 1,323/13; CONIDELON SOC. ANON. [Vanadium catalyst] 5,174/13.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Dynamos and Motors:** ZENK [Commutators] 11,886/13.

**Ignition:** KETTERING [Engine starters] 7,543/13.

**Telephony:** AKT. L. M. ERICSSON [Electric control clocks for trunk line switchboards] 11,658/13.

### Opposition entered to Grant of Patent

**8,040/12. Variable Speed Dynamos.** C. A. VANDERVELL and A. H. MIDOLEY. This specification deals with a variable speed constant pressure dynamo, in which there are two brush sets (the second set short-circuited) per pair of poles and unwound polar projections midway between the wound field magnet poles.

### Expired Patents

The following are the more important Patents that have become void through non-payment of renewal fees.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** CALLENDER'S CABLE CO. and J. C. A. WARD [Connecting cables to junction boxes, earth plates, &c.] 5,103/02.

**Dynamos, Motors, and Transformers:** J. S. PECK [Adjustable ratio transformer] 4,357/04; SIEMENS BROS. (*Siemens & Halske*) [Heavy current transformer coils] 4,464/08.

**Electrochemistry:** A. F. and F. A. LINDEMANN [Röntgen ray tube] 4,479/08.

**Telephony and Telegraphy:** A. F. COLLINS [Wireless, using the earth as conductor] 4,691/06; W. FAIRWEATHER (*Brown Hoisting Machinery Co., U.S.A.*), 4,685/07.

**Traction:** H. PIEPER [Electromagnetic engine governor for oil engine-electric set] 4,163/06; W. R. SYKES [Motor operated points: locking and indicating gear] 4,368/08.

**Miscellaneous:** P. SELBACH [Blasting cartridge for use under water] 4,707/07.

# ADAMS IGRANIC

CONTROL GEAR FOR SWING, ROLLING AND BASCULE BRIDGES.

ADAMS  
M<sup>rs</sup> C<sup>o</sup> L<sup>td</sup>  
BEDFORD  
AND  
LONDON

## ELECTRIC TRACTION NOTES

The L.C.C. tramway accounts for the year to March 31st show a gross profit of £739,053. Interest and redemption of loans absorbed no less than £730,687, and after making certain other deductions and additions there is a surplus carried to appropriation account of £497. This position is a very much worse one than in the previous twelve months, and in a lengthy report the Highways Committee calls attention to the difficulties under which the tramways work by reason of so many dead ends and the general want of intercommunication throughout the system. Motor omnibus competition is drawn special attention to, especially in connection with the facilities which are afforded to omnibus services by reason of certain street widenings, a portion of which is often paid out of the tramways accounts. The matter was referred to at Tuesday's meeting of the Council, when it was announced that the Highways Committee was taking steps to make the present routes more remunerative by extension and linking up. The large contribution made by the Tramways toward street improvements and maintenance which were taken advantage of by the motor-buses was called attention to, and an amendment by Sir J. Benn alleging bad management of the tramways was lost.

The House of Commons last week voted £1,000,000 to meet the cost of constructing the Post Office tube railway from the east to the west of London. The railway will consist of a 9-ft. tube, and will contain two tracks, upon which will run trucks electrically controlled from a distance.

In their report for March 31st, 1913, already referred to on page 325 of our last issue, the directors of the British Electric Traction Co. refer to arrangements for introducing motor 'buses in connection with their tramways in other parts of the country than in London; to the provision of capital for the Maritime Coal, Railway, and Power Co., Nova Scotia; the formation of the Rio Grandense Light and Power Syndicate with a capital of £100,000; and the purchase of a concession for lighting, tramways, and power in Pelotas (Brazil), where the generating station is under construction. Before declaring the dividends already referred to, £40,000 has been set aside as reserve for depreciation.

The Stoke-on-Trent Corporation, after a lengthy debate, deferred consideration until May, 1915, of a proposal by the Potteries Electric Traction Co. to extend the lease under which the Tramway Company now works. The Estates Committee, which has had the matter under consideration, recommended that the lease be extended to 1927.

At the meeting of the Kalgoorlie Electric Power and Light Co. it was stated that the cost of repairing the damage done to the Company's overhead lighting and traction mains by the cyclone last year was £2,800. This, of course, does not take into account the loss of revenue during the time the tramways were not running.

The first fifteen months' working by the Corporation Tramways in Coventry, show a net profit of £1,440. The General Manager has reported that large sums will have to be incurred on renewals before the expiration of the period for the repayment of the loan for the purchase of the Company's undertaking, and under the circumstances the balance is to be carried to reserve. The actual amount, however, is only £185, as the balance has been appropriated towards the re-laying of a portion of the track, &c. At the commencement of the year, a deficit of £1,000 was anticipated, and this amount is nevertheless to be taken from the rates to help towards meeting the first instalment of the cost of renewals.

The annual accounts of the Leeds Corporation Tramways show a net profit of £61,374 after meeting all charges. This sum has been transferred to relief of rates.

The Board of Trade has sanctioned the running of trailer cars on the L.C.C. Merton circular route.

## TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

The House of Commons Committee which has been inquiring into the Imperial wireless telegraph scheme has issued a report with regard to the investments of Ministers in Marconi shares. The report has already appeared in full in the daily papers, and there is no need for us to give it in our columns. Briefly, however, it may be said that in drafting the report the Committee followed strictly party lines. The report adopted by the vote of the Liberal members of the Committee, who constitute a majority, states that "Sir Rufus Isaacs acted in perfect faith and with a sincere conviction that his personal interests conflicted in no wise with his public duty," and that he and the other Minister concerned "acted throughout in the sincere belief that there was nothing in their action which would in any way conflict with their duty as Ministers of the Crown." The draft report first prepared by the Chairman, Sir Albert Spicer, suggested that Sir Rufus Isaacs's acquisition of rights in the American Marconi Co. was liable to give rise to misconception, and that he would have been well advised to have had nothing to do with it; but Sir Alfred was apparently the only Liberal member who desired to express even this mild form of censure. The Conservative members of the Committee all voted for a draft report prepared by Lord Robert Cecil, which stated that Sir Rufus Isaacs, Mr. Lloyd George, and Lord Murray acted "with grave impropriety" in their purchase of the American Marconi shares, and that the persistence of rumours and suspicions had been largely due to their reticence as to these transactions, which was "a grave error of judgment."—Yesterday's *Punch*, referring to the criticisms of the report in the Conservative papers, says that one side makes party capital out of Marconi's, and the other side invests party capital in Marconi's.

At the annual meeting of the Marconi Wireless Telegraph Co. of America on Tuesday considerable growth of business was reported, and a profit of over \$200,000 was declared. A 2 per cent. dividend was declared.

Owing to the extreme dryness of the climate at Freemantle, Australia, in the new wireless station which has just opened communication with Sydney, a distance of 200 miles, an insulated counterpoise is used. This consists of about 100 insulated cables radiating from the antenna tower, joined and supported by three concentric circles of wire.

The Newfoundland Government proposes to extend its sea-board telegraph system by some 250 miles during the present season, says the *Electrical Review* and *Western Electrician* (Chicago), and to build three more wireless stations in Labrador, and to establish a telephone system for St. Johns and a number of the outlying places.—Damage estimated at about £2,000 was done by fire to the wireless station at Cape Race on the night of May 5th. The fire was started by a spark from the sending apparatus, and the wooden buildings were destroyed, but the aerial tower was not damaged.

The *Electrical Review* and *Western Electrician* (Chicago) says that after stringent tests it is understood that the improved Poulsen system of wireless telegraphy, as developed by the Federal Telegraph Co. of California, has been adopted for linking up Washington with the stations at Hawaii, Guam, the Philippines, and the Panama Canal zone.

The line between Tangier and Arzila was repaired on the 12th inst. Private telegrams are being sent by this route, but they are subject to delay, and must be accepted at sender's risk.—The routes via Kanbure and Raheng were down and telegrams for Siam were being sent via Madras-Saigon.—On the 14th inst. one line was restored, and the other on the 16th.—The Martinique-Paramaribo cable was restored on the 14th inst., but there is still another section to be put through before the Hayti route to Brazil, &c., is in order. Since the 17th inst. telegrams to Turkey have no longer been subject to delay, and they are accepted without sender's risk.

## FARADAY HOUSE.

ESTABLISHED 1889.

(Proprietors: The SYNDICATE OF ELECTRICAL ENGINEERS, Ltd.)

### LOAN OF INSTRUMENTS

Faraday House tests every kind of Electrical Machinery and Instrument, and all Apparatus and Materials used by the Electrical and Allied Industries.

Scale of fees will be sent on application to the Secretary,

THE ELECTRICAL STANDARDIZING  
AND TESTING INSTITUTION,  
62-70, Southampton Row, London, W.C.

Telep. No.: 9999 Central. Teleg.: "Standardizing, Westcent, London."

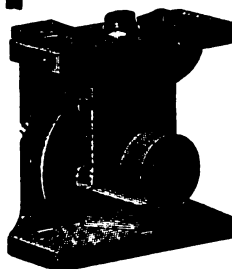
## FARADAY HOUSE.

### Why waste time and money on machining

small intricate pieces when the most complicated  
parts can be cast in a finished state by

"PRANA"

### Die-finished Castings



HOLES, SLOTS, etc., CAST to  
PERFECT SIZE! ABSOLUTE  
ACCURACY GUARANTEED  
FOR ALL REPETITION WORK

Send for illustrated booklet, mentioning  
this paper; or send sample for quotation  
to

**AERATORS, Ltd**  
UPPER EDMONTON  
LONDON, N.

### ELECTRICAL PORCELAIN

OF  
HIGHEST QUALITY

APPLY TO

**JAMES MACINTYRE & CO., LTD.,**  
BURSLEM.

The Micanite & Insulators Co., Ltd.  
WALTHAMSTOW,  
London, E.

FOR **FIBRE**  
SHEETS, RODS  
AND  
TUBES.

ONCE  
USED



ALWAYS  
USED

PRICE: ONE SHILLING PER STICK.

Sole  
Manufacturer— **S. W. CUTTRISS**, Prudential Buildings, LEEDS.

**STEATITE  
INSULATORS**  
SUPPLIED  
FOR ALL KINDS OF  
ELECTRICAL WORK  
**WILLIAM SUGG & CO. LTD.**  
WESTMINSTER.

## As Electrical Engineers & Contractors,

the India Rubber, Gutta Percha and Telegraph Works Co., Ltd. (The SILVERTOWN Company) are among the oldest and foremost in the country, having been the first to manufacture Gramme machines in England.

### — THE SILVERTOWN COMPANY —

have had considerable experience in the manufacture of Dynamos, Motors, Balancers, Boosters, Motor Generators, Rotary Converters, Petrol-electric Plant for Private House, Hotel and Ship Lighting and Power, Switchboards, &c., having executed many important contracts for British and Foreign Governments and Corporations.

# SILVERTOWN

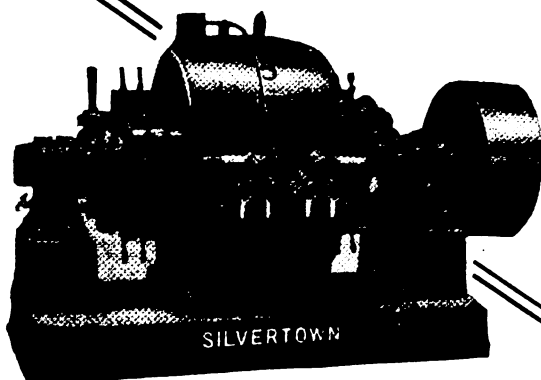
MACHINES HAVE ALWAYS BEEN NOTED FOR  
EFFICIENCY AND A HIGH STANDARD OF  
WORKMANSHIP AND FINISH.

*Estimates on Application.*

**The India Rubber, Gutta Percha  
and Telegraph Works Co., Ltd.**

Head Offices:  
106, CANNON STREET,  
LONDON, E.C.

Works:  
SILVERTOWN,  
LONDON, E.



3000 AMP. PLATING DYNAMO.

WHEN CORRESPONDING WITH ADVERTISERS, PLEASE MENTION "ELECTRICAL ENGINEERING."



## LOCAL NOTES

**Bedworth: Street Lighting.**—The contract for street lighting has been given to the Leicestershire & Warwickshire Electric Supply Co., whose price is reported to be 5s. per lamp cheaper than that of the local gas company.

**Bradford: Electricity Profits.**—There was a net profit of £8,477 on the electricity undertaking last year, from which £7,736 has been transferred to relief of rates.

**Brighton: Electricity Accounts.**—The electricity accounts show a net profit of £1,406 for the year to March 31st, against £8,450 for the previous twelve months. In his report Mr. J. Christie, the Borough Electrical Engineer and Manager, calls attention to the fact that the rates and taxes for the year increased by £1,231, and that an average of 2s. 9½d. per ton more has had to be paid for coal, which is equivalent to an increase of £2,133. During the year substantial developments have been made in connection with the application of electricity to cooking, two fairly large installations having already been fixed, and numerous inquiries for smaller outfits suitable for domestic service are being received. In order to provide an adequate stock of appliances, Mr. Christie strongly recommends that a substantial sum for this purpose be included in their next application to the Local Government Board for further capital for other works. The amount of coal used per unit sold has been still further reduced, and inclusive of all transmission, transformer and distribution losses, is now 4'18 lbs., as against 5'26 lbs. in the previous year. Considerable controversy is going on in Brighton as to allocating all or any portion of the year's profits to relief of rates, but Mr. Christie advises the Committee against doing this.

**Bristol: Electricity Accounts.**—The accounts of the Electric Lighting Department for the year to March 25th show a gross profit of £56,536, and after meeting interest and capital charges, adjustment of income tax, and depreciation of stores, there is a balance of £6,889 to be added to the balance from last account of £4,397. From this has been deducted certain sums in respect of wages of permanent workmen engaged on capital work, new meters, &c., and after transferring £6,000 to general reserve, a balance of £2,411 is carried forward.

**Dudley: Sale of Electricity Undertaking.**—All the difficulties concerning the sale of the electricity undertaking to a private company have now been overcome.

**Eastbourne: Electricity Accounts.**—Mr. J. K. Brydges, the Borough Electrical Engineer, received many congratulations at the last meeting of the Corporation on the successful results of the past year's working of the electricity undertaking. The net profit for the year was £2,495, which is £1,406 more than in the previous twelve months. Of the capital expenditure of £200,000, no less than £101,590 has been repaid.

**Ilford: Electric Lighting Accounts.**—The net profit on the electricity undertaking last year was £1,602, which has been added to the reserve account, which now amounts to £10,520. An extract is quoted in the Electricity Committee's report, from a statement by the Local Government Board auditor, who refers to a proposal by a member of the council who attended at the public audit, that the auditor should express an opinion with regard to the supply of power to the Tramways Department, as it was alleged that the present price is unprofitable. The auditor, however, held the view that it was not his duty to interfere on points of policy, and the general administration of local authorities' trading departments.

**Kingstown: Electric Lighting.**—The New Kingstown Electric Lighting Co. is pushing forward its arrangements for dealing with the electric lighting Order which has been granted by the Board of Trade. The Company's Engineer, Mr. W. Tatlow, has inspected several sites for a power house.

**Leeds: Strike of Municipal Employees.**—Having regard to the somewhat exaggerated statements which have appeared in the local Press relating to the strike of Leeds Municipal employees as it affected the Electric Lighting Department, we are able to state that although the Gas Workers' and General Labourers' Union called upon all its members employed by the Corporation, and the call was fairly generally responded to, it only caused a suspension of cable-laying for a few days. A number of members of the Union engaged inside the generating station also ceased work, but their places were readily filled, and no occasion was given for a moment's anxiety as to the maintenance of the supply.

**Limerick: Legal Action re Electricity Deficit.**—A decision

has been given by the Limerick County Court Judge with regard to the position of the local electric lighting undertaking. The loss on the undertaking up to date has been £15,000, and Mr. Michael O'Brien, a member of the Corporation, appealed against the levying of a rate to meet the deficit upon the undertaking on the ground that under the Corporation's electric lighting order the maximum price was fixed at 8d., but that the price charged was only 5d. per unit. It was pointed out that although there are 7,000 ratepayers in Limerick, only 267 use electric light, and that if the charge for electricity was increased from 5d. to 7d. per unit the undertaking would be a commercial success. Mr. E. B. Thornhill, the Borough Electrical Engineer, expressed the opinion that an increase in the price would tend to a decreased consumption. The Judge decided, however, that the Corporation has outstepped the limits of its provisional order when it levied a 5d. rate to make good the deficit on the electric lighting undertaking. He held that they were not entitled to do this, and he quashed the rate.

**Manchester: Rateable Value System of Charging.**—Under the new rateable value system of charging for electricity which has been adopted by the Electricity Committee (see ELECTRICAL ENGINEERING, June 12th, page 343), occupiers of houses not exceeding £30 rateable value will have to instal and use heating and cooking appliances requiring two kilowatts of maximum demand; houses over £30 and under £50 three kilowatts, and houses over £50 four kilowatts.

**Newport (Mon.): Fire at Electricity Works.**—Considerable damage was done on Friday to one of the older turbo-generators by a fire, which originated in a short circuit in the stator windings of the machine.

**Plymouth: Increase in Price of Coal.**—The Electricity Committee has accepted a tender for the supply of 8,500 tons of coal at 18s. 10½d. per ton. The existing contract price is 14s. 6d. per ton.

**Warrington: Electricity Accounts.**—There was a net profit of £2,944 on the working of the electricity undertaking for last year. The Borough Electrical Engineer states that a traction battery and reversible booster are about to be installed in order to provide for more spare plant. He also calls attention to the fact that generating plant extensions are necessary, and that as soon as the most suitable type of plant is settled upon this should be put in hand as soon as possible.

**West Ham: New Domestic Tariff.**—We regret that in the reference to the new tariffs for lighting and heating in our last issue there was an error in the heating tariff. This should have read: For heating and cooking the annual charge is 10s. per kilowatt for the first two kilowatts and 6s. 8d. for each additional kilowatt. After the first kilowatt the charges are subject to division into tenths, i.e., 1s. and 8d. per 100 watts for apparatus on the 10s. and 6s. 8d. rates respectively.

**Worcester: Electricity Accounts.**—Although the electricity accounts show a deficit of £1,526, they include a sum of £2,167, which has been charged to revenue, although it is largely of a capital nature. When the new machinery recently installed at the Hylton Road Station gets into full operation, it is anticipated that the result at the end of the present year will be very satisfactory.

**Yarmouth: Electricity Profits.**—After meeting capital charges, a sum of £427 has been added to appropriation account from the profits of the electricity undertaking last year. The Electricity Committee has resolved to transfer £744 from this account to the fund for capital expenditure, for which loans are not obtainable, and in addition to allocate £4,000 from the reserve fund to this account.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

Generating Stations, Sub-Stations, Mains, &c.

**Limerick.**—Switchboard, 1,000 ampere-hour battery, motor-driven booster, balancer, &c. Borough Electrical Engineer, July 3rd.

FOR  
STEAM JOINTS  
USE



JOHN HUDSON & CO.'S SUCCESSORS, Mansell St., London, E.

**London: Stepney.**—Two E.H.T. converting plants suitable for 6,000-volt three-phase A.C. to low-tension D.C. (See an advertisement on another page.)

**Southwark.**—Extensions at the Penrose Street power house.

**Woolwich.**—A loan of £3,230 has been sanctioned for the purposes of the electricity undertaking.

**Newcastle-under-Lyme.**—Paper and lead feeder cable, vulcanised bitumen distributor cables. Town Clerk, June 21st.

**Nova Scotia.**—A Steel and Coal Co. will shortly open a new mine in Nova Scotia to be worked electrically. Further particulars from the Board of Trade Intelligence Department.

**Walsall.**—Application is to be made for sanction to borrow £3,000 for prospective expenditure on mains.

**Waterford.**—Mr. Mark Ruddle, Chief Engineer to the Dublin Corporation, has reported favourably upon an electric lighting scheme for this district.

### Wiring

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Aberdeen.**—New theatre. London & Provincial Theatres Co.

**Bradford.**—New music hall.

**Bristol.**—Large warehouses at Bristol Docks.

**Dartmouth.**—New schools.

**Greenock.**—Alterations and additions to post office. H.M. Office of Works, London.

**Leyton.**—Electric lighting of school, Church Road. Architect, W. Jacques, 2 Fen Court, Fenchurch Street, E.C.

**Lichfield.**—New Union Offices. R. J. Barnes, architect.

**Manchester.**—North Manchester secondary school.

**Motherwell.**—New high school.

**Paisley.**—New school.

**Penzance.**—New school.

**Rugby.**—Workhouse. Consulting Engineer, Mr. T. S. Shenton.

**South Shields.**—Electric lighting at Barnes Council School. Borough Electrical Engineer.

**Wimbledon.**—New Town Hall.

### Miscellaneous

**Brighton.**—Overhead equipment for railless traction system. Tramways Engineer, June 23rd.

**London: Woolwich.**—A loan of £1,000 has been sanctioned for the purchase of electrical fittings to be supplied under the Council's free wiring powers.

## TENDERS RECEIVED AND ACCEPTED

**Swindon.**—The tender of the Brush Electrical Engineering Co. for a 500-kw. turbo-generator with condensing plant has been accepted at £5,567.

**Walsall.**—The tender of the British Westinghouse Co. for a 100-kw. rotary-converter has been accepted at £636.

## APPOINTMENTS AND PERSONAL NOTES

The West Ham Corporation invite applications for the position of Tramways Manager at a salary of £550, rising to £700 per annum.

Messrs. F. Gill and W. W. Cook, of the National Telephone Co., who are now practising as consulting engineers, have taken offices at Winchester House, Old Broad Street, where they will have associated with them, amongst others, Messrs. D. B. Fulton, H. Green, S. H. Pook, E. Williams, and J. H. H. Boyd, all of the National Telephone Co.

Mr. R. W. Weekes is taking into partnership Mr. A. O. Kolkhorst, who has had considerable engineering experience in South America, and the firm will practise under the title of Weekes & Kolkhorst, at Maxwell House, Arundel Street, Strand, W.C.

The members of the Metropolitan Association of Electric Tramways Managers are entertaining Mr. H. E. Blain to dinner on Friday, July 4th, at the Municipal and County

Club, Whitehall, on his resignation as Tramways Manager at West Ham, and also as Chairman of the Association.

Mr. C. M. Davis, Commercial Power Engineer in the Bristol Electricity Department, having been appointed to a similar post at Hampstead, Mr. T. R. Stancombe, of York, has been appointed to fill the vacancy at a commencing salary of £160, rising to £200 per annum.

Mr. G. P. Farrer has been appointed Assistant Engineer in the Brighouse undertaking.

Mr. H. S. E. Webster has been appointed Assistant Mains Engineer at Dover.

Plumber joiner required for E.H.T. cables. (See an advertisement on another page.)

Shift engineers with experience in high-tension work are required. (See advertisements this week.)

An improver is required for three-phase power station substation work. (See advertisement on another page.)

A junior engineer is required for three-phase rotary substation and distribution work. (See advertisement on another page.)

## MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. G. Smith and Sons, of 5 Philpot Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night, was £69 to £69 10s. (Last week, £69 5s. to £69 15s.)

**Branch Office.**—British Insulated and Helsby Cables, Ltd. (Prescot), have removed their Manchester branch office to more commodious premises at Orme Buildings, Parsonage. Telephone and telegraphic addresses as before.

**Paraffin and Gas Electric Sets.**—The Electrical Engineering & Equipment Co., Ltd. (109-111 New Oxford Street, W.C.), are taking up the sale of the well-known "Pelapone" oil and gas engines.

**Works Outing.**—The annual outing of the employees of the Siemens "Wotan" and "Tantalum" Lamp Works, Tyssen Street, Dalston, was held on Saturday last, the 14th inst., when a party of over 500 made a journey to Ramsgate. A special train left London Bridge at 7.15 a.m., and after enjoying a day of fine weather returned about 11 p.m.

**Change of Address.**—The Bastian Electric Heating Syndicate, Ltd., are moving their sales office next Saturday from 91 Palmerston House to 185 Wardour Street.

**Change of Address.**—Messrs. Nalder, Brothers & Thompson, Ltd., 34 Queen Street, E.C., will be shortly moving their factory and head office to larger premises at 97A Dalston Lane, N.E. They will retain an office and showroom in Queen Street, and their existing part machine shops at Kingsland Green will be continued as before.

## COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &c.

**Electrical and General Investment.**—A gross profit of £14,797 is announced, of which £5,268 remains after meeting interest and other charges, together with the £2,726 brought forward from last year. £3,072 is to be carried to contingencies fund, and a further dividend of 1s. per ordinary share, and 6d. per deferred share, is recommended, with £2,922 carried forward.

**Aron Electricity Meter.**—A dividend of 7 per cent. for the year is declared.

**Marconi International Marine Communication Co.**—The accounts for the past year show a net profit of £24,400 after deducting £10,700 for depreciation. A 10 per cent. dividend is recommended.



**MARRYAT & PLACE**  
**DYNAMO & MOTOR HOSPITAL,**  
 28, MATTON G<sup>W</sup>  
 LONDON, E.C.

## EIGHTEENTH ANNUAL CONVENTION OF THE INCORPORATED MUNICIPAL ELECTRICAL ASSOCIATION

IN our last issue we published a report of last week's proceedings up to Tuesday night. On Wednesday the meeting was held in camera, to discuss the I.M.E.A. Bill and Electric Cooking, and in the evening the Annual Dinner was held. On Tuesday afternoon visits had been paid to the Deptford and West Ham electricity works, and on Wednesday Lot's Road power house was visited.

### ANNUAL DINNER

The first toast on the list, after the loyal toasts, was that of "The Houses of Parliament," to which Sir William Howell Davies, M.P., who has done so much in connection with the I.M.E.A. Bill, was to have replied. He was, however, unable to get away from the House of Commons, and the toast was omitted.

Mr. W. Duddell, F.R.S., in proposing "The Incorporated Municipal Electrical Association," emphasised the necessity of all electrical engineers to pull together for the common good. One advantage of conventions such as these was that it tended to the development of a broadness of view amongst the members which was of the greatest possible good for the industry generally.

The PRESIDENT, in replying, said that although the Association was a young one, having had an existence of only 18 years, it could claim to have done some good work. The Association also was unique in that although primarily a technical institution, it was composed both of engineers and Chairmen of Committees, a happy combination which he thought had had much to do with its success. The Association had a membership of about 400, composed equally of engineers and chairmen, but although small the membership represented a capital outlay in the hands of municipalities of about 120 millions sterling. Referring to the absence of Sir William Howell Davies, the Member of Parliament for Bristol (South), and the work he had done for the Association in connection with the I.M.E.A. Bill, Mr. Edgcome remarked that he did not know what the Association would have done without Bristol, for, in addition to what had been done by Sir William Howell Davies, the engineer at Bristol was the Association's esteemed, hard-working, and energetic Honorary Secretary, one of their past-presidents, and certainly one of the ablest men among them. Then Alderman Pearson, Chairman of the Bristol Electricity Committee, was Honorary Solicitor to the Association, and all the members were familiar with the work he also had done for the Association. In connection with the I.M.E.A. Bill (ELECTRICAL ENGINEERING, June 12th, p. 343), he said it seemed illogical that some municipalities should have these powers and others should be refused them, but if they showed a united front perhaps they would be able to get the measure passed, although, as they knew, there was opposition to it. There was a great deal of difficulty at present in getting any private Bill passed, but perhaps later on it might be put through as a Government measure if it were really seen that the Bill was wanted by the bulk of the electrical industry. Mr. Cave, the Member for Kingston-on-Thames, had promised his help in the matter, and he urged upon the members of the Association to do all they could to get their own Members of Parliament to assist in the same way. Hitherto the efforts which the Association had made to get the members to interest their Members of Parliament had borne very little fruit. But let them keep putting the matter before their Members of Parliament, and everything should be done to secure a big support outside the House also. A resolution passed at the meeting that morning would also assist them in getting the Bill through.

"The Past Presidents," coupled with the names of Messrs. Wordingham, Rider, and Snell, was next proposed by Mr. R. A. Chattock (Vice-President), and all three in response spoke of the affection which they still had for the Association, and the pride they felt in the important position which it now occupies.

The toast of "Our Guests" was proposed by Mr. H. Richardson (Vice-President), Councillor C. H. Burge, F.I.C. (Mayor of Kingston), and Dr. Ferranti replied.

On Thursday, members proceeded to Kingston by special train, and met in the Empire Theatre, where they were welcomed by the Mayor.

A Paper on "Air Filtration" was then read and discussed.

### AIR FILTRATION, COOLING AND VENTILATION OF ELECTRICAL MACHINERY

By J. CHRISTIE (*Engineer and Manager, Corporation Electricity Department, Brighton.*)

LARGE steam turbo-driven alternators, such as it is common practice to instal in modern power houses, are now supplied by leading manufacturers under the most stringent guarantees as regards steam consumption, coupled with reliability and liberal overload ratings; in fact, within limits, the only condition governing the outputs obtainable from them is the temperature rise which the insulation can safely withstand. Till a few years ago such machines were run with open ends and natural ventilation, but the temperature rise, even on less than full load, was often excessive. By fitting end bells, air ducts and forced ventilation, the makers have with the same carcass been able to double the output with a decreased temperature rise, whilst the selling price per k.w. of rating has been proportionately reduced. All this has proved a great boon to the purchaser, but the advantages thus gained have brought in their train a host of minor though still serious difficulties in the way of filtration and conditioning of the air, which so far have only been dealt with in a rather crude fashion by means of cloth screens.

To cool large units of plants effectively with the surrounding air at normal temperature, some 5 to 7½ cub. ft. of air per min. per kw. of rated output must be forced through the windings of the machine. The general practice is to draw this from outside the building, or, where the conditions are favourable, from the engine-room basement. The circulation is effected either by separate motor-driven fans or by fans fitted to the rotating part of the machine itself. For moderate-sized units of, say, 3,000 to 5,000 kw. at speeds of 1,500 r.p.m., the author favours this latter arrangement, as being cheaper, more efficient and reliable; but for large slower-speed plants and where there are several of these sets working together, he considers that undoubtedly the best lay-out is to provide main inlet and outlet ducts, common to all machines, with branches and dampers to each unit, and to have a combination of fans on the rotors themselves supplemented by separate motor-driven fans for heavy overloads, the air filters being fitted at the ends of the intake duct and preferably in a suitable chamber outside the building.

All air about a power house is heavily charged with dust and fine gritty particles in suspension, and unless it is carefully filtered the windings become coated and the air ducts choked up, and, with the consequent rise in temperature, the efficiency of the machine rapidly falls. A sensitive air gauge is a most useful accessory to fix on the main air duct to the machine.

When no filters are provided, the varnish and insulating fabric on the end windings are in time made porous by the heat and the constant sandblast action; and if a machine in this condition is allowed to cool down in a humid atmosphere, the insulation, due to the absorption of moisture, rapidly falls below a safe figure. This, in the author's opinion, is the real cause of many mysterious "burn-outs." Such failures have generally occurred when a machine has just been run up and put on load after a lengthy rest.

The type of air filter most commonly in use consists of closely woven cloth, tightly stretched on wooden or wicker-work frames, and so arranged as to present a large area to the incoming air, thus keeping the velocity and pressure on the fabric at this point as low as possible. The general practice is to allow 2 sq. ft. of filter medium per cub. ft. of air per min. This is approximately equivalent to 1 sq. ft. of area per kw. of rated output, and in the case of large machines it becomes a most unwieldy surface to handle efficiently. At best, this type of filter can only be regarded as an unsatisfactory makeshift, and it possesses the following disadvantages:

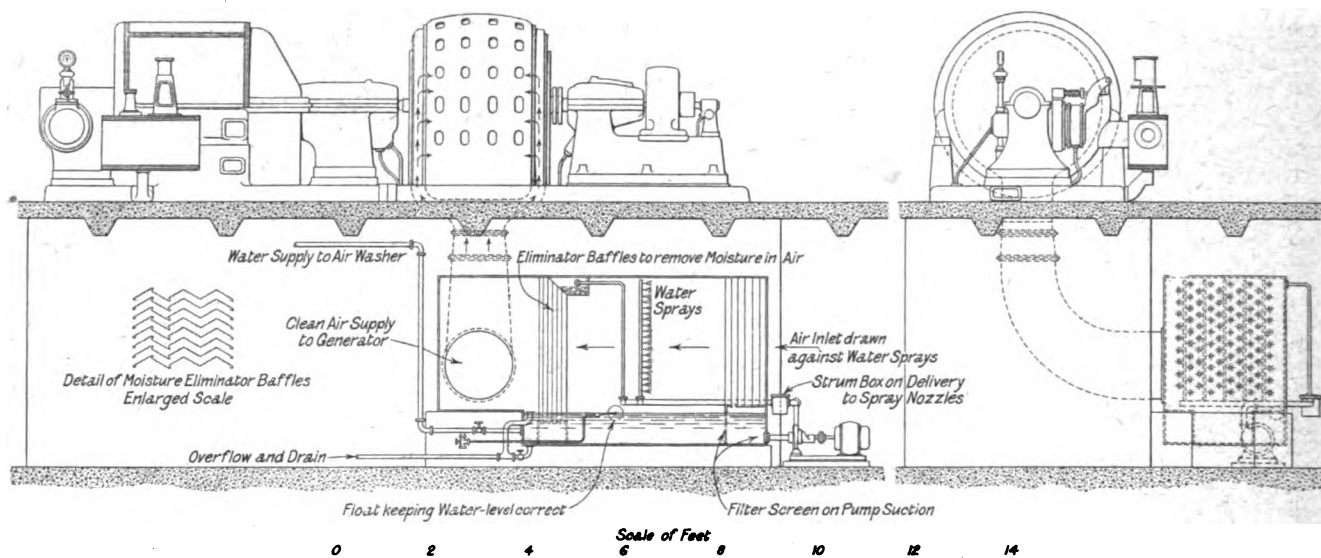
- (1) The large space occupied in proportion to its capacity.
- (2) It requires cleaning at frequent intervals.
- (3) The filter cloths wear out quickly and are expensive to renew. (£75 to £100 per annum for cloth and labour is by no means an outside figure for the efficient maintenance of such a filter on, say, a 3,000 kw. set.)

- (4) The cleaning of the filter is a long and dirty job, and can hardly be accomplished without taking the machine out of service for some considerable time.
- (5) Owing to its combustible nature it is a hazardous fire risk.
- (6) Unless of liberal area it quickly chokes up, and the air pressure rises till the fabric bursts. It is well to note that the air pressure on the intake duct of a machine should not be allowed to exceed one to one and a quarter inches of water, otherwise there is a grave risk of oil vapour being drawn in from the bearings if the oil is run at the excessively high temperature one usually sees on turbine installations, and this has a most harmful effect on the insulation.

As an efficient substitute for a cloth filter, a suggestion was put to the author last year to use a water-spray screen such as is fitted in the "air conditioning chamber" in the Plenum system of ventilating large buildings, and facilities were afforded him for inspecting such an equipment in connection with a large institution in London. On the face of it, at first sight, it strikes one as a rather daring proposition to pass air through water then directly into the internal anatomy of a high-tension alternator, but the author was so satisfied with the experiments which he was enabled to carry out that he had no hesitation in recommending his Council to purchase a suitable apparatus of this type for the last new alternator installed at our Southwick Power-house. It consists (see illustration) of a strong rectangular

at Southwick is often enough), wash out the tank with a hose pipe, fill up and start the pump again. All this can be done in a few minutes and without even taking the machine off load.

- (4) No costly filter cloths to frequently wash and renew.
- (5) The resistance to the air is always constant, and is less than one-third that of a cloth filter, so that the power for driving the main fan is proportionately less, whilst the total energy consumed by the outfit as a whole shows a substantial saving over that required by a cloth filter, after making a full allowance for driving the water circulating pump.
- (6) The air after passing through the filter is not only pure, but is generally several degrees colder than the surrounding air, due to its being reduced to wet-bulb temperature, consequently its cooling effect on the machine, volume for volume of air, is proportionately greater, this difference in temperature being generally most marked in the summer time, just when the extra cooling effect is of the greatest value. In tropical climates or in situations where the surrounding air is at an abnormally high temperature, it is possible, by introducing a small refrigerating plant into the water circulating system, to "super-cool" and control the temperature of the air down to a degree far below the corresponding wet-bulb temperature. Experiments which I have carried out show that it is



GENERAL ARRANGEMENT OF AIR-WASHING AND CONDITIONING PLANT OF No. 5 TURBO-ALTERNATOR.  
BRIGHTON CORPORATION POWER HOUSE, SOUTHWICK.

galvanised sheet iron chamber, one end (the air intake) being open and fitted with louvres. This opening is of such sectional area that the velocity of air at this point when the machine is going full blast is comparatively low. The filter is fixed in the basement adjacent to the machine foundations. Some 2 ft. inside the air inlet a water screen is fitted. This consists of a series of small nozzles pitched 6 ins. apart uniformly over the entire area. Some 6 ft. beyond the screen a moisture eliminator is fixed. (This is a sort of baffle, very similar to that used in an oil separator such as is fitted in the exhaust steam pipe between the low-pressure cylinder of a reciprocating engine and the condenser.) Thence the air passes directly into the alternator.

The base of the chamber forms a fresh-water tank holding some 300 gallons, and is fitted with a ball cock off the town mains to keep the level constant and to make up for any evaporation. A small motor-driven centrifugal pump about 2 h.p. circulates this water at a pressure of 20 to 25 lbs. per sq. in. through the system. The nozzles project this water in the form of a finely atomised spray directly against the incoming air (this space, when the apparatus is working, having the appearance of a dense steamy bank of cloud), and all solid matter in suspension in the air is caught and precipitated in the tank. Any beads of moisture or grit carried through with the air are effectively trapped by the eliminator, and nothing but pure cool humid air is carried into the machine. In some localities during the winter months with this class of filter it will be desirable to fit a small steam coil in the water tank, just sufficient to keep the water from freezing.

The advantages claimed for the water-screen filter are :-

- (1) For equal capacity the space occupied is less, and in the case of larger machines only about half that of a cloth filter.
- (2) No fire risk.
- (3) The apparatus is quickly and easily cleaned, it being only necessary to drain off the water at intervals depending on the amount of dirt in the air (once every two weeks

possible by this means to reduce the temperature of the air to within a few degrees of the temperature of the water through which it is passed.

The first cost of a water-screen filter, of course, varies with the size of the alternator to which it is fixed. In machines of, say, up to 3,000 kw., it is some 60 per cent. greater than a cloth filter, but in the case of larger machines of 5,000 kw. and upwards the advantage as regards price lies with the water-screen type.

In the author's opinion, due to the increased cooling effect obtained, especially during hot weather, an extra 10 to 15 per cent. overload can be carried on any machine so equipped without increasing the temperature rise, and if a super-cooling refrigerator is fitted in the water system, this overload capacity can be still further increased to 25 or 30 per cent.; in fact, I firmly believe that in the near future turbines of ample power to carry extra heavy overloads will always be provided. The attendant will then simply load up the alternators to which they are coupled till their temperature attains a predetermined maximum safe limit, and electrically-controlled thermometers or the switchboard for this purpose will supersede the ampere and watt meters now used. This extra cooling effect is perhaps the chief advantage of this system, especially where large units of plant are concerned, as the additional outputs obtainable for practically the same capital outlay amply justifies its general adoption.

The conditions of service under which the Southwick machine operates is generating three-phase alternating current, 50 periods, at 8,000 volts with 250 volts excitation on the field windings. The equipment was, the author believes, the first to be installed in this country, and has been running since August last entirely satisfactorily. The insulation resistance has been consistently maintained, showing that any moisture carried through with the air is harmlessly evaporated on the warm windings of the machine, and that this type of filter may with safety be used for ventilating extra high-tension machines or air-cooled trans-



# **BALCKE COOLING TOWERS.**

---

# **BALCKE AIR FILTERS.**

**WET AND DRY**

---

# **BALCKE OIL SEPARATORS.**

---

**BALCKE**  
**SPRAY COOLERS — TURBINE PUMPS**  
**EXHAUST VALVES — WATER VALVES**  
**STEAM TRAPS**

**BALCKE & CO., LTD.,**

**BROADWAY COURT,  
BROADWAY, WESTMINSTER, S.W.**

**Telephone:  
1387 Victoria.**

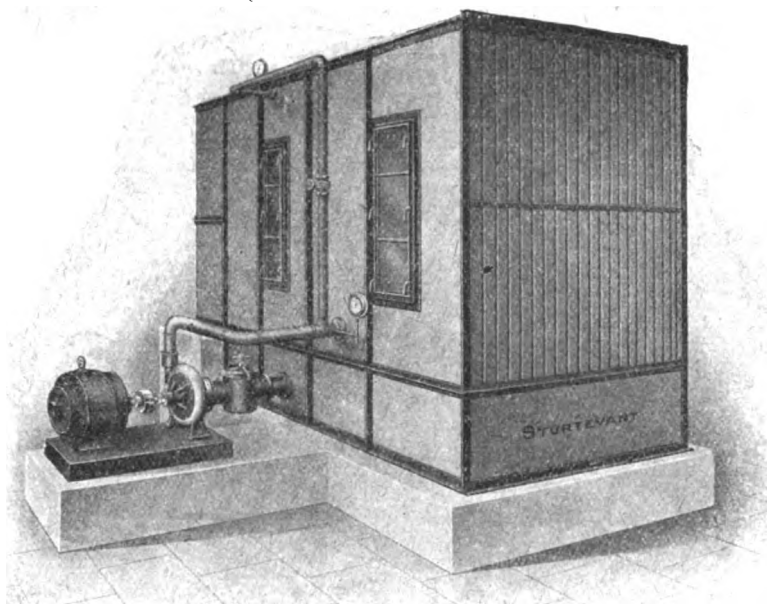
**Works:  
Battersea.**

**Telegrams:  
Gegenstrom, Vic.**

*When corresponding with Advertisers, please mention "Electrical Engineering."*

# STURTEVANT WATER-SPRAY AIR FILTERS

FOR CLEANING and COOLING AIR SUPPLY TO  
ELECTRIC GENERATORS, TRANSFORMERS, etc.



STURTEVANT SYSTEM  
PATENTED.

STURTEVANT ENGINEERING CO., LTD.,  
147, Queen Victoria Street, LONDON.

formers without detriment in any way to their insulation. The additional humidity in the air really has a beneficial effect on the insulation, preventing it from being baked to destruction, as is not uncommon where machines are run at high temperature and heavy overloads with dry, hot, gritty air constantly circulating through their ventilating ducts.

Several engineers who have extensive installations of cooling towers in close proximity to their ordinary cloth air filter intakes have furnished the author with the percentage of humidity in the air as now used. This is often found to be as high as 90 to 100 per cent., so that they are really working almost under the same conditions with their present filters as regards risk, if any, to the insulation due to humidity, but without the cooling and cleansing advantages of the water screen.

With the gigantic units of plant, 10,000 kw. and upwards, now being installed by many of the principal undertakings throughout the country, this system of water-screen filter seems to offer, so far as present knowledge goes, the most satisfactory solution of this somewhat difficult problem of suitably conditioning the air to be used for their effective ventilation.

#### DISCUSSION.

Mr. J. CHRISTIE, before the discussion was formally opened, asked manufacturers who took part in it to give their views on the minimum insulation resistance which they considered safe for alternators of 10,000 volts.

Mr. K. O. HALE (Sturtevant Engineering Co.) said he had been a strong advocate for a long time of the principle of the water-spray system of filtering, but could at first not convince electrical engineers of its advantages. The time arrived, however, when he got Dr. Ferranti to place the first order, and since then Mr. Christie had employed it. He was more than convinced now, after 4 or 5 years' experience with it, that the system must take the place of all cloth filters. The makers of the system guaranteed to put air into the generator entirely free from entrained moisture, and Nature had not given that guarantee in the past.

Mr. D. BENNETT (Balcke and Co.) referred to the Paper as a rather one-sided comparison between the two types of filters. The wet filter had certain advantages over the cloth type of filter, but they were by no means so overwhelming as might appear from the statements made in the paper. It was true that there were no cloths to clean and renew, but the parts in a wet filter which would wear out first would probably be the separating baffles at the air outlet end. They were subject to a current of air which would have a certain amount of moisture in it, and there was undoubted risk of serious pitting after a short time. This might be guarded against by special painting at regular intervals. He would like to know whether any signs of corrosion had been noticed in the filter at Brighton. No figures had been given to substantiate the claim that the resistance to the air was less than one-third that of a cloth filter. The extra overload which it was claimed could be obtained when a wet filter was used appeared on the high side, but no doubt such increased loads could be obtained if a refrigerating plant was employed to cool the air down to a sufficiently low temperature. Such a plant, however, would introduce considerable complications, and must also have an appreciable effect on the first cost and the running cost. Wet filters for large duties—say 5,000 kw. and upwards—would occupy less ground space than dry filters designed for an initial pressure resistance of 1 mm. water gauge, but the dimensions would be very slightly less than those of filters designed for an initial pressure resistance of 3 mm. water gauge. In industrial cities, such as Leeds or Manchester, it had been found necessary to clean dry filters only six or eight times a year, whilst wet filters in similar situations would require to be cleaned once or twice a week; even in such a favourable situation as Brighton it had been found necessary to clean the filter once a fortnight. With reasonable care, cloth filter pockets would last quite two years. The estimate of £75 to £100 for cloth and labour required to maintain such a filter was much too high. A filter for a 3,000-kw. turbo-generator designed for an initial pressure resistance of 1 mm. water gauge would have 60 pockets divided into four sections of 15, or two sections of 30 pockets. With the most modern type of construction the whole of the pockets could be changed and cleaned by two men in about 12 hours at a labour cost of, say, £8 per annum. The work could be done in a much shorter time if a complete set of spare pockets was available. The cost of this would be £33, and as they would last two years, the annual cost would be, say, £16 10s. The total cost of maintaining a 3,000-kw. filter in good condition, therefore, was only £24 10s. It was advisable to shut the machine down for cleaning, but even if only one spare section of pockets was available this time could be very short. The most convenient method of cleaning the pockets was by a vacuum cleaner connected to a condenser or air pump. The fire risk was very little greater than with a wet-type filter, for the timber and cloth could be impregnated to render it flameproof. Mr. Christie must have had an exceedingly cheap filter if the cloth burst whilst in use, or else the plant must have been kept in service until pressure resistance reached a very high figure. The area of cloths as suggested by Mr. Christie was sufficient to ensure that the initial pressure resistance did not exceed about 1 mm. water gauge. In a recent

instance a filter was started up with a pressure resistance of 1 mm., and after running for six weeks night and day, without stopping at all, the resistance rose to only 5 mm., when the first section of pockets was changed. Mr. Christie had said that the maximum pressure should not exceed 1.25 in., and it would be interesting to know what pressure resistance had to be overcome by the air passing through the filter at Brighton. He had at the meeting a small model filter which had been designed to overcome the objections and disadvantages found to exist in earlier designs, and felt sure that this filter in no way merited Mr. Christie's epithet of "crude." The filter was built in sections, having any number up to 30 single pockets per section, and one pocket and frame weighed about 14 lbs. One complete section was controlled, adjusted, or released by operating only four bolts, which were accessible from the outside of the filter casing. Finally, he asked if there was not serious risk in the wet filter of excessive moisture reaching the generator by way of the filter when plant was shut down, which would settle on windings and possibly cause a breakdown when the generator was next started up.

Mr. R. J. KAULA (Willans & Robinson) said that the point to be watched in the use of these air-filters appeared to be the temperature of the air. So long as this, when it left the generator, was well in excess of the temperature entering, the air was quite capable of absorbing any moisture which might be carried past the moisture eliminators; but if the generator was running light, and the heating of the air was very small, there was probably some danger from moisture. He would suggest that it might be advisable, on shutting down, to turn off the sprays so as to pass dry air through the generator and absorb any deposited moisture. Mr. Kaula also pointed out that the danger of a burn-out in one coil of the machine spreading to others was largely augmented by the forced ventilation, and he therefore considered that it was of the utmost importance to provide dampers which could be quickly operated both on the inlet and outlet of the air, so as to shut off the air-current immediately a breakdown occurred.

Mr. S. E. FEDDEN (Chief Electrical Engineer, Sheffield) referred to certain signs of incredulity when he had remarked in that building a few years ago (when he had been one of the first to go in for turbines on a large scale), that his oil costs were 0.004d., whilst the ordinary oil costs were about 0.2d., or something like that. The Paper to-day, however, proved that what he said then was absolutely right. Very little, he continued, was known about the ventilation of alternators, either by fans on the rotors or by independent fans. He had a case of an 8,500-kw. alternator with its own fan, which had to take a load up to 12,000 kw. when used with an external fan. Without the latter it drew a suction of  $\frac{1}{2}$  in., and when the machine was shut down and the motor-driven fan was pumping in air into it, there was an air-pressure of 2 in. Further, when the machine was running with the external fan in use, the suction of  $\frac{1}{2}$  in. was converted into a pressure of  $\frac{1}{2}$  in., so that it seemed as if the external fan had to annul the suction in some way before any useful work could be got out of it. He had the same effect with the balanced draught. On the boilers the makers put a forced draught in, as well as an induced draught, in order to get a balanced draught, and they had absolutely to double the size of the motor on the induced draught before they could get any good effect at all. It was a point worth considering. Mr. Christie said that there must never be more than 14-in. pressure, but surely the greater the pressure in the alternator, the better the cooling effect. The liability to a burn-out after a machine had not been in use for a considerable time existed whether they had the dry filter or the wet filter. He would like to ask manufacturers why they refused absolutely to guarantee their machines if this wet filter was put on. At what voltage did they allow this filter to be put on, and why? It seemed to him that the air from the wet filter, if it was properly regulated, was very little wetter than the air on an ordinary wet foggy day, and the advantages to be derived from it were very great.

Mr. A. H. SEABROOK (Chief Electrical Engineer, Marylebone) said that when he first heard of these filters from Mr. Christie, he asked the contractors for the two 3,000-kw. 6,000-v. alternators of the Oerlikon type, which had been ordered by his Committee, to instal wet filters, but they would not hear of it, and said that, as they had quoted for dry filters, he would have to have them. He asked them, however, to go into the question closely with their designers in Zurich, which they did, and he afterwards took their London man down to Brighton to see the machine running. When they got into the train at Victoria their representative said that there really was no need to go down, because he was quite converted, and had, in fact, ordered eight wet filters and cancelled the order for eight filters of the other type. On the Continent this question of wet filters did not seem to be known at all, and once again the Municipal Electrical Association had been in the forefront.

Mr. F. H. CLOUGH (B.T.H. Co.) said that he had not had much experience with wet filters, but he had seen Mr. Christie's installation. It was working very satisfactorily, and, as far as could be seen, there was no free moisture entering the generator at all. Recently manufacturers had been striving to

prevent dynamos catching fire when a short-circuit occurred, and for that purpose they had introduced mica and asbestos very largely into the insulation. These materials were not so water-resisting as some of the varnishes used previously, and it would be necessary, when wet filters were introduced, to see that an ample amount of varnish was put on all parts, especially just on the outside, and if this were done there should be no doubt that this type of filter would work quite satisfactorily. He certainly thought that they had a great many advantages over cloth filters, and it would be interesting to hear what cloth-users had to say with regard to their experiences. The question was practically as to what insulation resistance should be allowed. A rough working formula was

voltage  
capacity of plant (kw.) + 1,000  
megohms. The insulation resistance was not an entire guide, but he did not think it should drop below this.

Mr. D. FELDMAN (A.E.G. Co.) thought it was not quite fair to call the cloth filter, which had served its purpose very well up to now, a crude method of cleaning air and an unsatisfactory makeshift. There had certainly been very little experience with washing air by means of the spray filter, and he thought manufacturers could be excused for hesitating to adopt the new system hurriedly. Cloth filters were very simple and very easy to clean. Manufacturers could not be asked to accept these spray filters straight away, because they would naturally hesitate to pass the air through water and then send this moisture into the generator, especially when starting up. He could quite understand the utility of the spray filter in cases like Deptford, where it was necessary to clean the air, where the space was limited, and where they had a warm generator, i.e., where the generator and the turbine were not equal as to their full-load capacity. Of course, it was also possible to use a refrigerating plant with a cloth filter. It seemed to him rather complicated to have a number of pipes and a tank which would require painting or regalvanising in the course of time. The man who attended to the turbine would also have to go down several times during the day to see to the motor and starter, whereas with the cloth filter he need not go down at all. The experience of the firm which he represented showed that it was not advisable to have two fans in series, as seemed to be suggested in the paper. The idea seemed to be to increase the volume of air through the machines when the set was running at overload by passing the air from one of the fans on to the other fan on the rotor. In his firm's experience this has not been worth while. A very interesting remark was made in the paper as to the future switchboard with thermometers calibrated in amperes; but it seemed to him that there would be a considerable time lag between the indications of the thermometer and the load on the generator when starting up, as the temperature of the machine would not rise very rapidly. It would take six or seven hours before the temperature was permanent at full load, and a similar time lag would occur when taking the load off.

Mr. J. SHEPHERD (Electrical Engineer, L.C.C. Tramways) said that in connection with certain large extensions for the Greenwich power house of the L.C.C. tramways, it became necessary to consider what to do with the air, whether to use the cloth or the spray system. In common with most engineers, he had not favoured the idea of passing wet air into the generator, and he turned it down at first. But he went to Brighton, and saw the apparatus there was perfectly satisfactory, and it was now his opinion that this was the only way to filter air for generators. With a generator of 1,000 kw. capacity running at 1,500 r.p.m., they had to deal with plant of very small size for its output and occupying only about 1,000 cubic feet, and as this plant would lose anything from 400 to 500 kw. it was obvious that this energy could not be dissipated unless an enormous amount of air was passed through it, and air passing through small passages must obviously be cleaned and cooled. The best way to do this was by passing it through a washing stream of water. The £300 or £400 which the filter might cost did not matter when it was being put upon a plant costing £30,000, especially when it was considered that with very cool air passing through a stream of water there was a gain of 10 to 15 per cent. in the output. His opinion, that the wet filter was the best, was shared by Mr. Fell, his chief, and as a result he was purchasing a plant capable of filtering 100,000 cubic feet of air per min. It was, he believed, the largest plant of this description which has yet been ordered in this country. He had been disappointed at not hearing any data as regards the amount of dirt to be dealt with in these large generators. He had made tests at Greenwich, which was not a dirty station as regards air, although perhaps not so clean as that at Brighton, and had found that the 10,000-kw. machine had to deal, in the normal number of hours in the year, with something like 100 lbs. of fine impalpable dirt, which occupied a space of not less than 10 cubic feet. Obviously, if this were allowed to go into the machine, it would soon choke up the air passages.

Dr. S. Z. DE FERRANTI thought there had been a certain amount of misconception underlying the idea of air washing for cooling generators. It was not a question of wet air. With regard to the nature of the air going through, they might take a lesson from the Taylor-White air compressor which was being installed in some places in the United States,

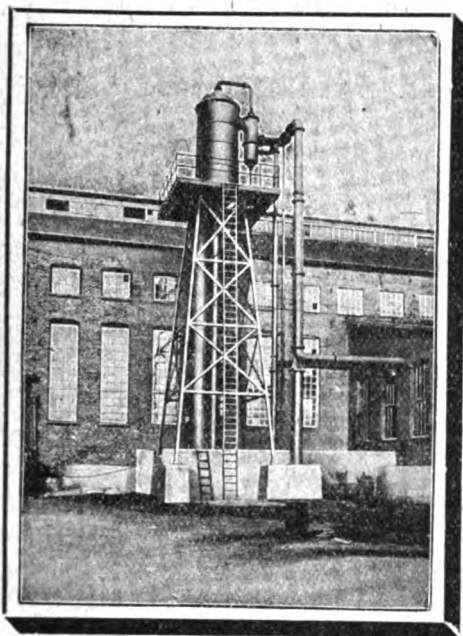
and more largely in Canada. If they had a river with a small fall, they sunk a very deep well adjoining it, and water was allowed to fall down the well and rise again by another shaft to a lower part of the river, below a dam, for example. With proper air entraining nozzles, the water coming down the shaft took air with it, and the air was separated at the bottom shaft, the water passing out to the lower reaches of the river, and compressed air being delivered as the product of this operation. Although it had been compressed in a mass of water, the air was perfectly dry. Air compressed ordinarily by a piston compressor and then used in an engine gave considerable trouble in the way of freezing when its temperature dropped on expansion, but the trouble was not experienced with the air compressed by this water method. The moral was very simple. If they wished to get rid of the infinitesimal small particles of moisture in the air which was called dampness, put that air into intimate contact with a big mass of water, which would hold the small particles of moisture. In the apparatus described by Mr. Christie, the essential feature was the screen, where the air left to go to the alternator. That screen was a form of baffle, and an essential feature of that baffle was to have it continually wetted by a considerable amount of down-flowing water. Once these principles were fully realised, the system ought to be accepted with confidence for ordinary working. Years ago large alternators and electric machines generally were built with a few large cooling spaces between the iron round about the conductors. They were, however, very weighty, and, consequently, too costly. One of the few good things that the lowest tender idea had done was to make designers reduce all the air spaces very much in dimensions, and put a much larger number of them in. Then came the trouble of these spaces silting up to such an extent that they became a danger, as it was never found possible to clean really properly the very hot places. He agreed with everything that had been said against the cloth filter, and he was only interested and surprised to see from the discussion that morning what good arguments could be brought forward to support a bad end. He had had a cloth filter on a 1,500-kw. machine, which took fire and very nearly caused the burning down of the station. It was hard to call them crude and unsatisfactory, because a lot of skill had been exercised in making them workable, but, nevertheless, they were a makeshift sort of contrivance, which could not be expected to endure. Even the first machine of the washer type that had been installed was eminently satisfactory. He had had one of these wet filters on a machine since last September, and it had been no trouble whatever. No cleaning had been necessary, and the thing went along working continuously night and day, generating about 70,000 units a day. There had been cold weather since the machine had been at work, but there had been no freezing; they opened the windows of the air-washing chamber when the weather was warm, and when the weather was very cold they opened the door into the engine-room to admit comparatively warm air. What Mr. Christie had said with regard to increasing the output of the generator was perfectly right.

Mr. C. H. WORDINGHAM (Chief Electrical Engineer to the Admiralty) said it seemed to him that even if the air was fairly moist there was very little danger of it being deposited on the warm machine. He apprehended that they would not turn on the ventilation until the machine was fairly well loaded up and warm. Dealing with Mr. Christie's remark as to the future switchboard containing thermometers and no other instruments, he thought there was a great deal to be said for it, and it did not seem to him to be any drawback that there was a lag between the rise of temperature and the load, so long as the insulating materials on the machine did not attain a temperature at which they became damaged. The chief difficulty was to know how and where to measure the temperature of a machine, so as to get the maximum temperature.

Mr. T. ROLES (Chief Electrical Engineer, Bradford) said that at Bradford he had cloth filters to deal with air going into three 3,000-kw. turbo-alternators, and they go so dirty that on an average they had to be replaced after one month's use at most seasons of the year. During the dry weather the cloths could be removed and the dust taken from them by beating or with a vacuum cleaner, but in the winter months, when the usual air turned through the filter in Bradford had a humidity of something between 90 and 95, the cloths got coated with what could almost be called a slime, and it was practically impossible to do anything but scrap them. One of the speakers in the discussion had stated that cloth filters were simple and easy to clean; he should like him to try some of the Bradford cloths. The same gentleman also said that trouble might be anticipated with the water-filter by reason of the galvanised iron rusting. Galvanised iron was generally used for building purposes to keep out the rain, and it was also well known that if galvanised iron was kept continually wet, there was less rusting effect than if it were alternately wet and dry. Mr. Roles also traversed the suggestion made by the same speaker that there would be trouble in looking after the pump motor. They had circulating pumps driven by motors, and if a pump with motors from  $\frac{1}{2}$  h.p. to 3 h.p. gave all that trouble, he would be very much surprised. As a result of the use of the cloth filters at Bradford—they had now been in use for twelve



# INDEPENDENT CONDENSING PLANTS



FOR  
**TURBINES AND  
RECIPROCATING ENGINES**

TYPES:—**SURFACE AND  
JET** (Barometric Low Level  
and Parallel Current.)

COMBINED WITH

**STEAM, MOTOR, BELT, OR ROPE DRIVEN  
AIR & CIRCULATING WATER PUMPS.**

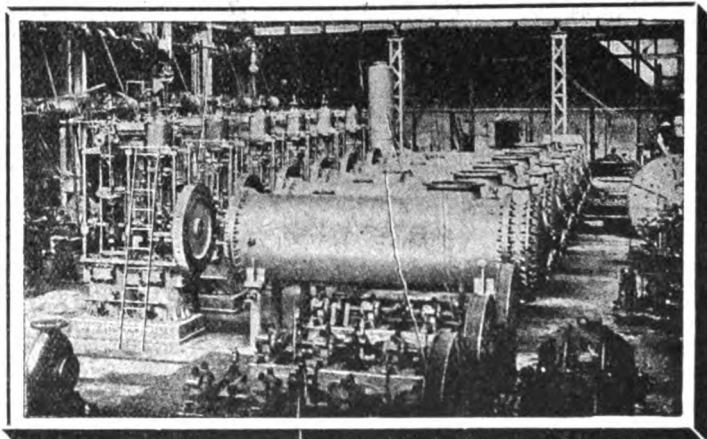
BY ARRANGEMENT WITH A LICENSEE

**WE SUPPLY:—**

**LEBLANG JET CONDENSERS** SIMPLE OR  
MULTIPLE JET TYPES AND **LEBLANG ROTARY AIR PUMPS.**

**HIGHEST VACUUM**  
GUARANTEED WITH  
**MINIMUM POWER.**

ENQUIRIES INVITED.



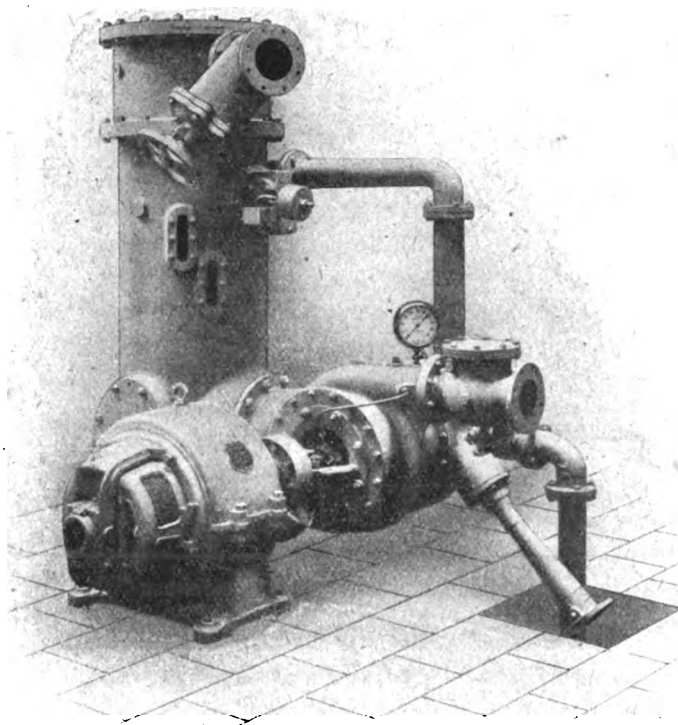
**ISAAC STOREY & SONS, Ltd.** EMPRESS FOUNDRY  
BRANCH OF UNITED BRASSFOUNDERS & ENGINEERS, Ltd. **MANCHESTER**

*When corresponding with Advertisers, please mention "Electrical Engineering."*

# MIRRLEES-LEBLANC

## MULTI-JET CONDENSER

WITH "MIRRLEES-LEBLANC" ROTARY PUMPS FOR AIR AND WATER DISCHARGE



SIMPLICITY

RELIABILITY  
IN ACTION

SMALL  
SPACE  
OCCUPIED

### MANUFACTURERS

THE MIRRLEES WATSON CO., LTD.,  
SCOTLAND STREET, GLASGOW.

WE HAVE CONSTRUCTED—OR HAVE IN PROCESS—  
"MIRRLEES-LEBLANC" CONDENSING PLANTS  
REPRESENTING A STEAM DUTY OF OVER 3 MILLION LBS. PER HOUR.

# JET CONDENSERS

*When corresponding with Advertisers, please mention "Electrical Engineering."*

months, and were the best thing he could get at the time—he was strongly of the opinion that it would pay his Committee to take the £300 to £500 that they cost and to replace them with a water filter. He added that he had discovered, both by putting some cotton-wool in the air duct and by passing his hand over the internal windings of the generator, that even after the air had passed through the cloth filter it was not clean. The cotton-wool was quite choked after two or three days, and his hand was blackened. There was no doubt that the heavy portions of the dirt were taken up by the cloth, but the smaller impalpable dust was forced through the interstices of the cloth and got into the machine.

Alderman FRED SMITH (Chairman, Liverpool Electricity Committee) asked if anyone could furnish him with information as to whether it was a scientific fact that air agitated by a fan was purified in an inhabited, hermetically sealed chamber. He believed that an experiment of this sort had been carried out.

Mr. EDGECOME hoped that Ald. Smith did not suggest that this should be tried on the Council.

Mr. J. CHRISTIE, in replying, said, after an experience of ten months, he would not have any other type of filter in his station. His previous cloth filter had been an endless source of trouble and expense to maintain, and it was also a very serious fire risk in his opinion. With regard to pressure, he was quite satisfied that the resistance to the air due to the spray was practically negligible, whereas with a cloth screen it started at about half an inch after the thing had been closed, and in four or five weeks it was up to  $1\frac{1}{2}$  inches. His suggestion for using a thermometer for gauging the load on the machines he hit upon when he visited Mr. Fedden's station, where there was a switchboard with a great number of push-buttons, by pushing which it was possible to get a record of the temperature of everything in the station from the feed-water to the flue gases, and it seemed to him that an extra push-button would not hurt. On the basis of Mr. Clough's formula for calculating for a minimum resistance, it would work out in his own case to be something like three megohms, but he never got his insulation resistance below 15 to 20 megohms, and it kept quite steady. When he first started the filter it was on an old machine newly wound, and the insulation was rather low. He dried it out, and before putting it on load it came to about 12 megohms. After about ten days this gradually rose to 44 megohms, and it remained at that. He then cleaned it and put it on load with the water spray, and the curve fell from 44 megohms to 18, and had remained within three or four megohms of this ever since. The answer to Alderman Smith's question was in the negative.

The following Paper was then read:

## ELECTRIC AUTOMOBILES

By W. H. L. WATSON and R. J. MITCHELL.

THE authors commenced by calling attention to the unco-ordinate state of the electric vehicle industry in Europe, and said that even in America it was but lately that a professional brotherhood of electric automobile engineers, the Electric Vehicle Association of America, has come to pass.

In America some forty companies are engaged in the manufacture of cars, and there are some 20,000 cars of value exceeding twelve million pounds in use. The funds of the Association are largely subscribed to by electric supply companies. British engineers might do well to follow this lead where roads were better, labour costs about half, and electrical energy far cheaper.

There are more than 130 separate models now on the American market, including industrial vehicles, ranging from 500 to 10,000 lb. capacity, and a few particulars of the weights of chassis and speeds for the different carrying capacities are included in the Paper. American practice inclines to the two- or three-tonner for heavy haulage—using the lighter types of vehicles for services where very cheap ton mileage is of no account. From a comparison of the running costs of different sized cars it is seen that a ton-mile by the light delivery van costs rather more than five times as much as the same duty performed by the five-tonner. Speed is purely a question of battery power and motor rating, and as a compromise it is found most economical to make the commercial electric a moderate speed vehicle able to maintain a uniform speed for a reasonable distance varying from thirty-five to seventy-five miles per single charge. Moderate and uniform speed means decreased wear and tear on all parts of the chassis and tyres, which latter are usually guaranteed an extra 20 per cent. in mileage for use on battery cars. The "electric" scores as a sure hill climber largely because of the property of the series motor in that its torque increases almost proportionally to the fall in speed, giving the necessary "drawbar pull" when it is most wanted. As a pure speed machine the electric is admittedly quite

unlikely to compete successfully with present-day petrol automobiles, but it can accelerate more quickly than many other vehicles. On a test made recently in London, a six-ton battery 'bus showed an acceleration of 4.5 ft. per sec. per sec. on the level—a figure 40 per cent. in excess of the average value applying to London omnibuses.

### TRACTION ACCUMULATORS.

The only two types of storage battery in present-day use are the lead sulphuric acid cell and the nickel iron alkali cell, of which the Edison is the best-known example. The modern lead vehicle battery is a compromise between lightness and durability. The usual plan is to make positive plates a little over  $\frac{1}{8}$ -in. thick and negatives somewhat thinner. The pasted type of plate finds most favour, though in some cases a specially light Planté plate has given good results, in spite of the greater weight. Spacing is arranged to be the minimum that considerations of electrolyte volume permit, whilst the specific gravity of the electrolyte is sometimes as high as 1.3. Separators of perforated sheet ebonite or specially impregnated thin wood sheets are used in preference to celluloid. A sealed-in case is nowadays employed, the top being liquid-tight yet removable. As regards their life, there are some instances where such accumulators have given six or seven thousand miles of running before becoming too much reduced in capacity for further economical service. A company running private cars in London reckons to get three thousand miles' life from positive plates, whilst negatives last sometimes as long as six thousand. The modern lead battery in average cases can store a watt-hour for every cubic inch occupied. This means that 2-h.p. hours can be delivered at the road wheels for each cubic foot of battery weighing on an average from 180 to 200 lb.

### THE EDISON BATTERY.

The central idea of Edison's work appears to have been the elimination of sulphuric acid and the substitution of a mechanically strong material in place of lead. After years of experimenting, an alkaline cadmium-copper oxide cell was patented, but was afterwards superseded by the iron nickel oxide cell of 1908. The qualities which have distinguished this cell derive themselves almost entirely from the fact that it is impossible to dislodge active material from this design of plate.

Briefly, the method of loading the active material consists of filling a small perforated steel tube in a series of thin layers, alternatively of nickel hydrate and metallic nickel in a finely-flaked form. The function of the nickel is to improve the rather poor conductance of nickel hydrate. Each tube is made from a thin strip of steel coiled around in a spiral of 0.25 in. diameter,

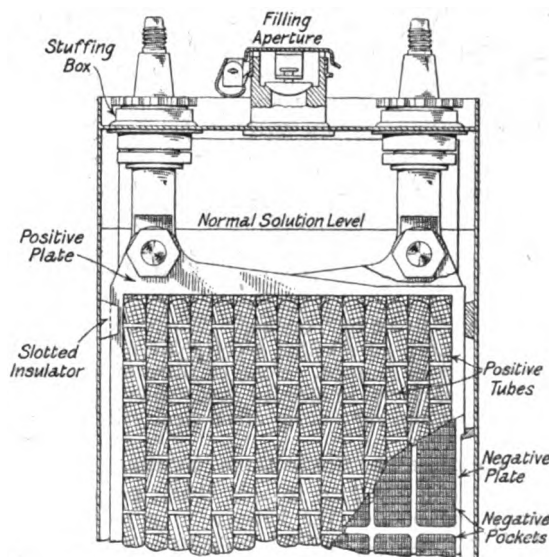


FIG. 1.—DETAILS OF EDISON CELL.

with the edges lapped over to prevent re-opening, and further reinforced by eight steel bands. A complete positive element is composed of two rows, each of 15 loaded tubes, assembled in a stamped frame of nickel steel, the complete unit having a depolarising capacity of some 40 ampere hours. The negative plate is of a form employed originally for both electrodes. Finely divided iron oxide, incorporated with a small proportion of mercury in order to reduce specific resistance, is loaded into rectangular pockets made of very thin nickel steel strip finely perforated. Each pocket is assembled in a light steel retaining

case and subjected to heavy die pressure, which has the three-fold effect: (1) internally consolidating the active substance; (2) superficially corrugating the faces of the pockets, thus making them elastic yet rigid; and (3) swaging over the edges of the pockets so as to associate them effectively and permanently with the steel frame, making it impossible for vibration or shock to impair the conductivity of the assemblage, and therefore its mechanical unity. A welded steel case replaces the more usually employed ebonite box. This latter material is used in fine strips for insulating purposes between adjacent plates, and to prevent metallic contact between the plates and the case. A feature of the electrolyte, a 21 per cent. solution of potassic hydrate, containing also lithium hydrate, lies in its preservative action on steel—hence terminal corrosion is impossible. The general construction is seen from Fig. 1.

Tests have shown remarkable power of withstanding mechanical shock and over-charging, and the cell is particularly well adapted to services where charges can be effected only in an irregular manner, and in this connection the curves in Figs. 2 and 3, reproduced from the Paper, are of interest. Data of the various sizes of cells made,

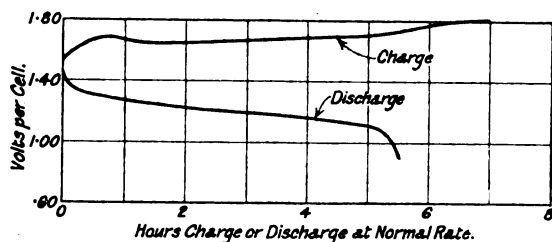


FIG. 2.—NORMAL CHARGE AND DISCHARGE CURVES OF EDISON CELL.

from 150 to 450 ampere-hours, show that the volume characteristic of the cell is 0.85 cub. ft. per k.w.h. of available output, corresponding to an average weight of 75 lb. The battery is now guaranteed by its makers to show an undiminished output at the end of four years' all day service in traction work. In use it slowly appreciates in output, and it is no uncommon experience for a battery rated normally at 150 a.h. to give 180 a.h. in everyday service. Very high rate charging is permissible, and has not any detrimental effects if not carried on to an excessive degree. Thus in emergency it is quite undetrimental to charge at five times normal rate for thirty minutes, although normal rate charging is more efficient than high rate "boosting," it is nevertheless exceedingly convenient under some conditions to be able to

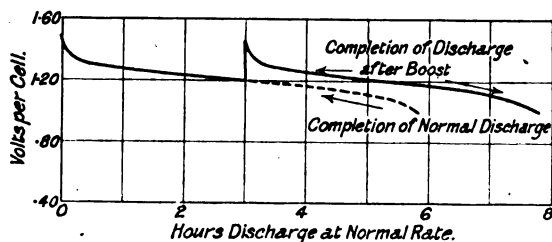


FIG. 3.—CURVES SHOWING DISCHARGE OBTAINABLE BY SUPPLEMENTARY NORMAL CHARGE WITH A SHORT DOUBLE RATE BOOST.

charge by the "boosting" method. There are several other storage cells using an alkaline electrolyte now being tested in various parts of Europe. None of these appear, however, to have been employed in electric automobile service, though doubtless the future may bring other steel cells into prominence.

#### CONTROLLERS, CONTROLLING SYSTEMS, &c.

In the case of the lead battery there are objections to discharging portions of the battery in parallel sometimes instead of in series for control purposes, as this treatment may cause injurious sulphating, and a not uniform behaviour of the cells as a whole. The objection, however, has no weight in the case of nickel-iron cells of the Edison type. From the efficiency standpoint the series-parallel method of control is in advance of the systems using resistances which have displaced it, and future practice might reinstate the system with considerable advantage if mechanical difficulties be overcome. Modern vehicle motor controllers are mostly of the continuous torque drum type, operated by a lever, geared up by meshing with a small spur pinion on the drum shaft. Usually a series of five or six speeds is provided—the highest being that obtainable with full battery voltage

across the motor, together with a field partially shunted by a resistance of the iron-grid type. As a rule the controller handle is operated in a horizontal plane underneath the steering-wheel, a press-button being incorporated on the end of the handle to actuate an electric warning signal. Other refinements include the automatic breaking of the current when putting on the emergency brake, which latter, particularly on commercial vehicles, is interlocked with the controller. Yet another modification employs solenoid contactors of the railway type to operate the controller. Electric breaking does not appear to find favour in American practice. Charging plugs were the occasion of much confusion and waste of time in the earlier days of the American industry. This matter should, in the opinion of the authors, be discussed in England as early as possible by those interested. Much trouble afterwards would be saved by the adoption of a soundly designed plug right from the beginning of the movement. Some notes then follow in the Paper on lighting arrangements for electric cars, and the use of ampere-hour meters for revealing the state of the battery.

#### TRANSMISSION.

The simplest of all transmissions is that employed in the Cedes motor wheel, which has done useful work for ambulance and fire brigade work in London. The motors are of the distributed-field multipolar type. They are completely closed against water and dust. There are several so-called wheel-drives to the credit of American designers. Of these the Walker gear uses a single motor to drive two wheels, the actual drive being transmitted by an epicyclic gear running in oil. In the Commercial Car each wheel has a separate motor transmitting its torque through a double reduction epicyclic gear to an internally cut ring similar to the Walker. In the Couple-Gear motor wheel, each wheel encloses a motor, the shaft of which engages by means of small bevel pinions with two parallel bevel rings, one pinion with one ring, the other with the second ring. An advantage of wheel-drive lies in its being possible to apply front or four-wheel drive. Double chain drive is at present almost universal on commercial vehicles, the first reduction being effected by a silent chain of the inverted tooth type. Final drive is usually by unenclosed roller chain. A tendency for light transmission is shown in the Commercial light rear axle, a totally enclosed worm-driven rear axle and motor in one unit. Among pleasure cars few retain the chain drive, but only one uses worm gear. In some cases the first reduction is by silent chain. One, the Church-Field, employs a planetary gear on the transmission shaft, the low speed being geared down. No two makers' systems are alike, and this applies to Europe as well as America.

#### GENERAL FEATURES.

The impression that electric cars must necessarily be ugly is dispelled by the first Arrol-Johnson-Edison *coupé* designed in collaboration with Mr. J. F. Monnot, which has recently been undergoing trials. Regarding the weights of commercial cars, being essentially moderate speed machines it should be possible to make them slightly lighter than their petrol competitors, particularly in the case of the heavy type of passenger machine. The somewhat heavy design adopted by American manufacturers may be due to the bad roads. It is likely that the roads of the United Kingdom may permit of a lighter design. The most usual position for the battery is amidships and longitudinal. In one or two cases the battery is mounted in two trays, one on each side of the chassis, which can be pulled out sideways on castors, the side lid of the battery-box serving, when hinged down, as a horizontal platform for this purpose. It is not usual to make provision for unshipping the battery in place of a "freshly charged" renewal. Practice favours rather the method of giving a vehicle a battery adequate to deal with an average day's work.

#### ELECTRIC VEHICLE MOTORS.

The series motor is employed in automobile work almost exclusively, its high starting torque constituting a practical advantage that so far has offset the defects of momentarily heavy copper losses and consequently reduced efficiency during acceleration periods. Experiments have been made with compound wound motors, and with regenerative making systems, but there seems little likelihood of such systems finding favour with the lighter types of vehicle, although for heavier work the possibilities are more hopeful. There is considerable variation in the methods adopted by American manufacturers for rating their motors. The authors suggest that a rational method of rating vehicle motors would be to define normal rating as that b.h.p. output required on a hard



level rolled dry road with vehicle full loaded—this figure being taken as an average for, say, a mile journey each way, after the car had done an hour's work fully loaded on an undulating road. The index of overload capacity should then be expressed as a percentage measure of the current value allowable for thirty minutes as compared with normal current. On an average the best practice inclines to motor speeds of 800 to 1,000 r.p.m. The desirability of enclosing a vehicle motor makes the temperature difficulty greater, and it is suggested that some attempts at internal ventilation might be practicable in spite of dust troubles. The usual construction of these machines favours a carcass of cast-steel, generally of the four-pole type. Considering the extra cost of making the field carcass from laminations would be hardly more than 15 per cent., and that a reduction in weight of 25 per cent. is claimed for this method of construction, there appears to be an opening for improvement in such a direction. From characteristic curves it can be seen that a motor taking 50 amperes at 80 volts can be operated over a range of from 2 h.p. to 11 h.p. without the efficiency falling off below 80 per cent. A steep torque-current curve is also obtained. In the "J.L." machine a radical departure in design is made. In place of solid salient poles the field frame is built up from laminated multi-polar stampings somewhat like an armature turned inside out. The field windings are of strip form and are connected in a continuous series forming a closed circuit like an armature winding. A saving in weight of 80 per cent. is stated to be possible, as compared with the results attained using average construction.

#### THE C.M.B. AND THOMAS SYSTEMS.

The main object of the system developed by Messrs Macfarlane & Burge, as applied to battery traction, is to employ electrical means of limiting the maximum discharge of the battery to some predetermined rate. The system in which the now well-known C.M.B. converter is employed to supply a variable voltage to the driving motor was fully described in Messrs. Macfarlane & Burge's recent Paper before the Institution of Electrical Engineers (see *ELECTRICAL ENGINEERING*, Feb. 29th, 1912, p. 101). The control is entirely by small rheostats in the excitation circuits, and regenerative making is obtainable. In traffic work as much as 17 per cent. of the energy can be restored to the battery by this means, and very low consumption of current has been recorded.

As is well known, the Thomas Transmission system was originally evolved with the idea of making available an infinitely variable speed torque gear change, and as such is used in conjunction with petrol engines on road and rail vehicles (see *ELECTRICAL ENGINEERING*, May 4th, 1911, p. 236, and Nov. 7th, 1912, p. 627). In this system an epicyclic gear always in mesh is used in conjunction with two electric machines, and the power is transmitted partly mechanically and partly electrically in proportions depending on the excitation. In the modification for battery-driven cars, a shunt motor would displace the engine, and would be started up light, and regulation and control of the speed of the car effected by the Thomas gear only. The component machines would be coupled up as shown in Fig. 4. The total addition

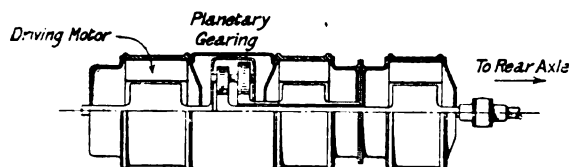


FIG. 4.—THOMAS TRANSMISSION AS APPLIED TO BATTERY VEHICLES.

to the weight of the mechanical equipment would be approximately equal to the weight of a single motor required in the direct case, and the extra cost approximately equal to the cost of such a motor. The extra weight of the equipment is stated to be balanced by the saving possible in battery weight.

#### A FRONT DRIVE SYSTEM.

The "F.R.A.M." front-driven traction was specially mentioned on account of its ingenuity, and a  $3\frac{1}{2}$ -ton vehicle was described. In this the whole of the mechanism is mounted on a truck which is pivoted vertically so that the two wheels may turn nearly at right angles to their normal direction. Steering is effected entirely by electrical means—namely, by accelerating one motor above the speed of the other, thus causing the whole vehicle to turn towards the faster wheel. Breaking is by regenerative control. The back part of the

vehicle is easily interchangeable; thus, for municipal purposes the same tractor can readily be converted into a water-cart, dust-cart, or waggon. The vehicle can be turned almost in its own length. The usual battery equipment is a lead-type 80-volt, 40-cell accumulator weighing about 18 cwt., and giving an output of 240 ampere-hours. On some recent tests in London a distance of thirty-one miles was accomplished on one charge, including stopping hundreds of times and restarting. Current consumption is about 1 unit output per mile. These machines are used considerably in Paris for municipal purposes. They can be had with either lead or Edison batteries.

#### THE PLEASURE AUTOMOBILE.

While the authors considered that the greatest results in the future would be achieved by the commercial vehicle, they had a few words to say regarding the private passenger car, and that there was a class of user who would welcome the "reliable, noiseless, clean, stateliness" of the electric automobile. In America they were much appreciated by ladies, and the lady owner-driver was common. Arrangements have been made for the manufacture of twelve hundred pleasure car electrics—all propelled by the Edison battery—in the works of Messrs. Arrol-Johnstone at Paisley. In the opinion of the authors there is a very wide field indeed for the pleasure electric, on account of reliability, simplicity, silence, and absence of odours, absence of "stand-by" losses, comfort and cheapness of operation.

#### RUNNING COSTS.

It appears from tests by the Massachusetts Institute of Technology that under American conditions the electric is from 15 per cent. to 25 per cent. cheaper to run than the petrol truck—this in spite of the fact that American users pay 8d. per gallon for fuel against our 1s. 9d.—and that in the U.S.A. electricity is hardly ever supplied at less than 2d. per unit, whilst it often costs 3d. The Paper concluded with a number of tables of running costs of commercial vehicles with lead batteries in America, varying from 882 d. per mile for a 700 lb. van to 23'65d. per mile for a 10,000 lb. lorry. The authors were of opinion, however, that a vehicle of the last-mentioned size with an Edison battery could be run in England at 13'82d. per mile if charging current were available at 0'5d. per unit.

#### DISCUSSION.

Mr. A. H. SEABROOK (Chief Electrical Engineer, Marylebone) said that it seemed that the user must decide whether to pay a good price for the battery and a small annual maintenance charge, or a small price for the battery and a high annual maintenance charge. This was the main difference which everyone who was going to use these vehicles would have to consider as between the lead and the Edison types of battery. For some reason which he was unable to explain, we were absolutely behind every civilised country on the question of self-contained electrically-propelled vehicles. It was not because of roads: ours were as good, and better, than those of other countries, and the price of current compared well with any other country in the world. He was inclined to think that it had something to do with the attitude of the British battery makers, who either condemned electrical vehicles altogether or damned them with faint praise. Electrically-propelled vehicles should appeal to municipalities particularly more than to the private user. Mr. Christie, of Brighton, had been making interesting experiments, and there was a possibility of sweeping the whole of the horse traction out of the municipal service there. Some useful tests had been made recently in his own district with the F.R.A.M. vehicle, referred to in the Paper. This was the only electric vehicle of which he had had actual experience as to cost. It was a French machine, and it had been put at the service of the Public Health Service Department of Marylebone for some months, and it had been running for seven or eight days for various purposes. They loaded it up to  $1\frac{1}{2}$  tons, and ran it out on what they called a slopping round and a dust-collection round, and also street-sweeping round. The dust collection, of course, involved stopping about 1,400 times a day. For the sweeping it had to hold a makeshift arrangement of a couple of horse-drawn brooms. These were very difficult conditions, the starting and stopping, and the weight and pull of the brooms. But in spite of that, throughout the whole tests, the units put into the machine were less than one unit per mile run, and the efficiency of the battery, motors, and gear was approximately 65 per cent. With regard to tariffs, there was no necessity, as there was in the case of electric cooking, to make a very low rate. He asked members of the Association who were considering what to charge to take into consideration the price they could get. It would be quite ridiculous to offer an all-round competitive price of  $\frac{1}{2}$ d. per unit for electric vehicles, because in his opinion the value of the service was about one penny for very large commercial purposes. A firm running 50 cars, of course, would come in under special con-

tract; but he did not believe that even the Authors would say that an all-round usual price of one penny to 1½d. per unit would have any effect as regards restricting the use of these vehicles. There was still an urgent necessity for encouraging the use of electricity for all purposes. His own district was largely a lighting district, and his lighting revenue was a class of business he had to keep a very close watch upon. For instance, during the last twelve months the introduction of the new 16-c.p. metal filament lamp had dropped his revenue considerably more than £7,000, so that he was keenly on the lookout for all other uses of electricity.

Mr. W. W. LACKIE (Chief Electrical Engineer, Glasgow) said that in November last year the Glasgow Corporation ordered an electrically-propelled commercial vehicle, which was delivered in February of this year. It was sent to Glasgow by rail, and the man who was sent to the station to get it, and who had never seen the vehicle before, drove it away without any trouble whatever. It cost £650, weighed 33 cwt. empty, and carried a load of one ton. With one charge it ran from 37 to 40 miles, and had done this regularly for four months, during which period it had run from 550 to 600 miles at a cost per mile of 0.6d. This compared with 1.2d. for a similar petrol car at a time when petrol was very much cheaper than it was to-day, so that there was no occasion to sell electricity under 1d. per unit for charging at the present price of petrol. He was warned that this electric car would not climb hills, but it had been up hills in Glasgow that no horsed vehicle would think of going up. They previously had horse vans, which cost £14 each per month to run, but the cost of running this electric car and allowing 20 per cent. depreciation was £19 per month; but it should be pointed out that this car was doing the work of two vans, so that the Corporation was well in pocket over it. Another strong point about the vehicle was that it could be used on Sundays at night for special jobs for which the horse vans could not be got out. The charging of the battery could be done at other times than peak-load times. The cost of working the vehicle at 1d. per unit worked out to £26 per annum, which was equivalent to three domestic consumers.

Mr. J. CHRISTIE (Chief Electrical Engineer, Brighton), like Mr. Seabrook, was losing revenue due to the introduction of metal filament lamps, in spite of adding on new business at a greater rate than before. He had got all the motors that were to be obtained, and, therefore, must look for side lines such as cooking and other methods of applying and using electricity. In Brighton there was a fleet of 16 or 18 motor-omnibuses driven by batteries, owned by a local omnibus company, but the routes were soon to be completed for trolley omnibuses. He had given consideration to the question of adapting the electric buses for municipal purposes, and hoped that he would be able to retain a large portion of the revenue at present derived from the 'bus company. With regard to the rate for charging, he thought 1d. was quite low enough. The Brighton 'bus company had been paying this in the past, and he had no complaints. It behoved supply engineers to try and develop this class of business, inasmuch as the vehicles could be charged at times when the generating plant might be almost idle. In this way they could afford to supply at a very low rate, and the supply of current in this way would all tend to reduce works costs and to improve the load factor of the station. He had inspected some municipal electric vehicles used in Paris, and understood that the authorities were so satisfied that they were placing an order for several hundred vehicles, and in a short time the whole of the work of the city could be carried out by self-contained electrically-propelled vehicles. In that case current was being bought from a company at a substantial higher price than obtained in England under ordinary conditions.

Baillie SMITH (Convener, Glasgow Electricity Committee) suggested that the right way to introduce electric motor traction was for the Electricity Department to use vehicles themselves, and to get the results of tests which would enable them to recommend it to other Committees of their Corporations. In Glasgow the Electricity Committee had adopted the vehicle, and the first Committee which the electric vehicles were to be recommended to was the Health Committee, for their motor-ambulances connected with infectious hospitals.

Mr. F. AXTON (Chief Electrical Engineer, Ipswich) expressed the opinion that the electric battery vehicle business from a central-station point of view was going to be just as important. He suggested the formation of a special Committee to go into the question in co-operation with the manufacturers. There were many points which ought to be settled at an early stage: for instance, the uniformity of the charging voltage, the question of the standardisation of the charging connections, and the rates. They should beware of relying too much on experience from America, as had been done in the case of tramways. It was worth while discussing as to how we should start. Should supply-station engineers start by inaugurating a garage or some place where cars could go to be charged? He had spoken to some of his automobile friends on this matter, and from what he could gather they would not move very quickly in this matter. They did not understand the electric vehicle, and were afraid of anything electrical, and considered that they had quite enough trouble as it was with the electric circuits on the petrol vehicle. It would probably be necessary to establish charging stations

in each town, and perhaps go a little further and at the first outset do any repairs which might be necessary. He admitted this was a big question, but it was one which his suggested Committee might go into. He would like to hear some witnesses' views as to how to start. In regard to the details of design, he was inclined to doubt the wisdom of chain drive for commercial vehicles. The manager of the Bradford tramway system, Mr. Spencer, who also ran trolley omnibuses, told him that the 'buses which he had and which were provided with chain drive were going to be scrapped for the reason that the chain drive had proved a failure. In the new 'buses there would be two motors, one on each side, each driving one of the wheels independently through a worm gear, and he would like to hear whether Mr. Watson did not think in the light of what he had said that the worm drive was probably the better method.

Mr. J. W. BEAUCHAMP (Chief Electrical Engineer, West Ham) could not say that they had sold any vans in West Ham, but they had had a large number of inquiries, and he believed they would get some business before long. The use of these vans should first be pushed for shifting heavy loads at low speeds. The future of the thing was really in the hands of municipalities, all of whom had much of this work. By utilising the vans in this way, they could prove the economy of them. The experience of the Commonwealth Edison Company in America seemed to prove the advantage of the use of such vans by an electric supply department. By utilising them and superseding the ordinary methods, for instance, of sending out jointers, &c., in big towns, it would be possible to save the cost of such a van several times over. With regard to a tariff, he believed that ½d. a unit was a very good one, and would bring in a revenue of about £25 a year, and as the vans could be charged off peak with very little arrangements indeed, the average load factor of charging these vans would be 40 or 50 per cent. The question of providing charging stations and things of that kind was one in connection with which they could begin almost immediately to compile a list of places where such facilities could be provided.

Mr. R. A. CHATTOCK (Chief Electrical Engineer, Birmingham) anticipated a very big business from this class of supply. The only way in which electric supply departments could assist was by regulating their rates to accommodate this class of supply. A penny per unit had been mentioned that morning as being a fair figure. This was the ordinary charge for power in most towns, and that rate could undoubtedly be charged all day long, but he assumed on the top of that rate for current the cost of the garage and the handling of the charging would have to be added, amounting, perhaps, to another ½d. per unit. He was of opinion, however, that it would pay to charge a less rate than a penny if they could restrict the hours of charging to night or to times in the day when the demand was slight. He did not favour municipalities undertaking garaging and repairing of these automobiles. This was hardly within their province, and from inquiries which he had made in Birmingham he was convinced that the ordinary garage proprietors were fully prepared to undertake this side of the business.

Mr. SYKES (Glasgow) thought that it would be quite time to regulate the price for current when the electric vehicle industry had got formally established.

Mr. L. B. HOGARTH (Chief Electrical Engineer, Morecambe) said that the matter interested him, as his Corporation was considering the question of the electrification of the Morecambe tramways, and wished to avoid adopting the overhead system. As probably several of them knew, they had in Morecambe petrol tramcars running on a route about a mile long, but if anybody suffered from liver complaint a ride on these cars occasionally would either kill or cure it. From the figures that had been obtained from the Edison Storage Battery Company, he thought that there was a great future for battery system if they could only extend their guarantee for a period of three or four years. The advantage of the electric battery vehicle was that, by allowing an overlay of about ten minutes, the vehicles could all be charged up in the daytime ready for running during the evening, thus necessitating no interference with the peak load at all.

Mr. F. W. CRAWTER (Chloride Electrical Storage Co.) said he believed he was the first driver of an electric automobile in this country, in 1888. He believed the first electric vehicle which ran in London was one improvised by Professor Ayrton in 1885. Then came Mr. Radcliffe Ward's 'bus in 1886, and then the Immisch Company in 1888, 1889, 1890, made various vehicles for export. It was no good people working alone in this matter, and both the battery people and the supply-station people must work together. Therefore he welcomed heartily the efforts of the authors to popularise the electric vehicle. He did not think the pleasure vehicle would be developed in this country to the same extent as in America, because there were large towns situated large distances apart, and the electric pleasure vehicle was used simply as a town vehicle. In London, if a person had an electric vehicle to take him to his office five or six days a week, on the other day he might want to go to Wales. For commercial vehicles it was quite a different proposition. There was an enormous field, particularly in shifting heavy weights, for the electric vehicle. The Authors gave the

average life of a lead battery as being 3,000 miles. This, however, was about one-third lower than it ought to be.

Mr. F. S. GROGAN (British Electric Transformer Co.) said that the question must be divided into two items—namely, the pleasure vehicle and the commercial vehicle. The question of the tariff would be decided on the commercial side as between the engineer in the district and the commercial firm who were running the vehicles, as such arrangements could be made as would get the least charging prices during the night. With the pleasure vehicle it was a different matter. A man might come into the town in order to get electricity at any time of the day or night, and they could not do that for a penny or anything like it. He supported the suggestion that a committee should be formed to work on co-operative lines so that they would be able to loan batteries ready charged from charging stations all over the country, and a pleasure vehicle could pay for a charged battery that would run him into another town where he could return it to the charging station there and take another.

The PRESIDENT said this question had occupied his attention some 10 or 12 years ago, and he felt that if anything was to be done at all it would have to be done like the clearing house for railways. Standardised batteries would have to be adopted, and the larger cars could have to have a larger number, and each central station would have a certain number of these batteries in their works, a small town a few, and the larger towns a larger number, so that the owners of cars would, when arriving at a town, go to a central station, where there would be facilities for taking out their battery and putting in a fresh one immediately. He concluded with some amusing remarks on the rates charged for electric launch charging on the Thames.

Mr. WATSON, in reply, welcomed the formation of a committee such as had been suggested. Without the supply-station engineers, the vehicle-makers could do nothing.

AFTER the meeting members inspected the examples of electric vehicles which had been brought to Kingston as a practical illustration of Messrs. Watson and Mitchell's Paper, and included the now famous Arrol-Johnston-Edison car, which successfully accomplished the journey from Dumfries to London mentioned in our columns recently. Some members also paid a visit to the Kingston electricity works, where interest was shown in the horizontal Diesel engine sets. A lunch at Nuthalls, an enjoyable trip up the river in steam launches, a short inspection of the grounds at Hampton Court (admission to the Palace was not allowed, although Mr. Edgcome had offered to guarantee that the ladies would not carry hammers), and a supper at Nuthalls concluded the day's proceedings.

## ANNUAL GENERAL MEETING

The annual general meeting was held in the building of the Institution of Electrical Engineers on Friday.

### A Birmingham Meeting and President in 1914.

Mr. R. A. Chattock, Senior Vice-President (Chief Electrical Engineer, Birmingham) was unanimously elected President for 1913-14, and he invited the Association to Birmingham for next year's meeting, an invitation which was accepted unanimously.

### Election of Vice-Presidents and Council.

Mr. H. Richardson, Junior Vice-President (Chief Electrical Engineer, Dundee), was elected Senior Vice-President, and Mr. A. C. Cramb (Chief Electrical Engineer, Croydon), Junior Vice-President. There were no other nominations.

### Election of Members of Council.

According to the Articles of Association, four Engineer Members of Council retired, viz., F. Ayton (Ipswich), A. C. Cramb (Croydon), F. M. Long (Norwich), and T. Roles (Bradford).

The nominations for the resultant vacancies were: W. Wyld (Hampstead), S. E. Fedden (Sheffield), H. R. Burnett (Barrow-in-Furness), A. H. Shaw (Ilford), E. E. Hoadley (Maidstone), T. Roles (Bradford), H. W. Bowden (Poplar), C. S. Davidson (Barnes), W. C. Pickvance (Wrexham), F. Ayton (Ipswich), and A. S. Barnard (Walsall).

The following were elected: S. E. Fedden (Sheffield), T. Roles (Bradford), F. Ayton (Ipswich), W. Wyld (Hampstead).

Three Chairman Members retired from the Council under the rules, viz., Alderman Crowther (Sheffield), Alderman Sinclair (Swansea), Bailie Willock (Glasgow).

The nominations for the resultant vacancies were: Alderman Littler (West Ham), Alderman Sinclair (Swansea), Bailie Willock (Glasgow), Councillor Ellaway (Birmingham), Alderman Barge (Poplar), Alderman Crowther (Sheffield).

The following were elected: Councillor Ellaway, Bailie Willock, and Alderman Sinclair.

The honorary officials were re-elected as follows:—Hon. Solicitor, Alderman Pearson (Bristol); Hon. Treasurer, J. E.



R. A. CHATTOCK.  
(President of the I.M.E.A.)

Edgcome (Kingston); Hon. Secretary, H. Faraday Proctor (Bristol).

## COUNCIL'S REPORT

THE following are the main points in the Council's Report, which was taken as read:—

**Sub-Committees.**—The Standing Committees during the year have been as follows:—

**PARLIAMENTARY.**—C. E. C. Shawfield, R. A. Chattock, H. Richardson, Alderman Pearson, H. Faraday Proctor, J. E. Edgcome, A. C. Cramb, Alderman J. P. Smith, Councillor Crowther.

**FINANCE AND GENERAL PURPOSES.**—C. E. C. Shawfield (Chairman), R. A. Chattock, H. Richardson, Alderman Pearson, H. Faraday Proctor, J. E. Edgcome, A. C. Cramb, W. W. Lackie, C. Furness, F. M. Long, J. Christie, S. J. Watson, Alderman Sinclair, T. Roles.

**EDITING.**—C. E. C. Shawfield, G. Wilkinson, H. Richardson, F. M. Long (Chairman), S. J. Watson, S. L. Pearce.

**Information Bureau.**—There is not sufficient evidence that such a bureau would be adequately supported or be of any very material benefit to the members, and the Council consider that the present system of filing information with the Secretary would meet all reasonable requirements if members made a point of forwarding information likely to be of general use. The Council is frequently called upon by members for advice on points arising in their business, and during the past year they have been able to express their views on various matters such as liability for accidental damage, the action of gas companies in seeking powers to supply electricity, and on various other subjects.

**Supplementary Paper.**—A Paper by Mr. A. M. Reid, Chief Accountant, Dundee Corporation, on "Reliability of the Total Costs per Unit Sold," will be published in the *Proceedings*.

**Travelling Studentship.**—There were again no entries for this. The Council feel that the Associates lose much of educational value by neglecting this opportunity of extending their experience and knowledge.

**Testing of Materials.**—In the last annual report (ELECTRICAL ENGINEERING, Vol. VIII., p. 373) attention was drawn to the apparent lack of reasonable facilities for the testing and certification of materials used in the electrical industry, and to the steps taken by the Council to approach the National Physical Laboratory and the I.E.E. with a view to their co-operation. After further consideration the Council felt that the matter was one which could be dealt with more effectively by the I.E.E., if they would consent to do so, and it was accordingly

left to them to continue their investigations (see also *ELECTRICAL ENGINEERING*, Vol. VIII., p. 703).

**Electric Supply Publicity Committee.**—The Council were approached by the Committee with a view to getting some of the larger municipalities to support a scheme financially for an extension of the Committee's proposals on a large scale. The difficulty was and is that many local authorities are at present debarred from spending money on publicity, and until the I.M.E.A. Bill is passed, the electrical industry will continue to be hampered and to be unable to compete with other industries in regard to developing its resources.

**Rating of Metal Filament Lamps.**—The Council has, through their representatives on the Lamp Standards Committee, been kept in close touch with developments, and some time ago expressed the view that metal filament lamps should be marked with both candle-power and wattage. Eventually, however, it became clear that there was a growing disposition on the part of makers and central-station engineers in favour of rating in watts in place of candle-power, and after further inquiry the Council had reason to modify their previous view and to express themselves in favour of rating in watts.

**Supply of Electrical Energy Conditions.**—These conditions needed revision and amendment. They have been withdrawn from publication, and a Sub-Committee has been appointed to report upon the matter.

**Electric Lighting Bill.**—The Bill promoted by the Association was down for second reading in the House of Commons on June 10th, 1912, but was not reached. Although no progress has been made in Parliament this session, a very great deal has been accomplished in reconciling the interests of all who will be affected by the measure, and there is every reason to hope that in the next session of Parliament it will be made evident that the one object of the Bill is to increase the output and diminish the cost of electricity, and to promote the general welfare of the electrical industry for the benefit of the community generally, in which efforts every section of the electrical industry is concerned.

**Sheffield Corporation Bill.**—The Council, at the request of the Sheffield Corporation, circulated the members of the Association last December asking them to endeavour to get their respective Parliamentary representatives to support Clause 83 of that Bill, referring to the supply of electric fittings by the Corporation.

**Conditions of Contract.**—The Council have under consideration the standardisation of conditions of contract with a view to agreeing upon a document which will be acceptable as a basis for such conditions between the purchaser and the contractor. A joint meeting of representatives of the British Electrical and Allied Manufacturers Association and the Association has been held, and the negotiations are still proceeding. In the meantime the Council has notified the members that the proposed conditions have not yet been agreed so far as the Association is concerned.

**Meter Loans.**—The Council were asked by the B.E.A.M.A. to approach the Local Government Board with a view of getting the term extended to ten or fifteen years. The Council, however, felt that it would not be wise to ask for more than five years, as in their opinion the purchasing of cheap meters is not due to the short loan repayment periods granted by the Local Government Board, but to the too common practice of municipalities accepting the lowest tender irrespective of other considerations.

**Publication of Tenders.**—The question of the publication of prices of municipal tenders in the technical journals has been considered at the suggestion of the B.E.A.M.A., and they invited the members not to publish lists of tenders. The members with one or two exceptions agreed with the action of the Council.

**Exhibitions.**—The question of the organising of exhibitions and demonstrations has also received preliminary consideration by the Associations jointly.

**Census of Production.**—At the invitation of the Board of Trade, the Council considered the proposed census of production form and made certain suggestions for modification. These recommendations were subsequently substantially adopted by the Board of Trade.

**Joint Conventions.**—At the wish of the Institution of Electrical Engineers the feeling of the I.M.E.A. Council regarding closer relationship between the two bodies and the holding of Annual Joint Conferences in place of the I.M.E.A. Annual Conventions was ascertained. The majority were averse from the proposal in principle, though several saw no objection to an occasional joint conference. The opinion was expressed that the interests of the two bodies were entirely different and distinctly opposed in some instances, and the Council therefore did not consider it to be feasible to hold joint Conventions.

**Constitution of the Council.**—Certain changes have been decided upon, and these were passed at a special general meeting which followed the ordinary business meeting. Briefly, the alterations made consist in the adoption of the method of electing Council recently adopted by the I.E.E., in the increase of the engineer members of Council from 8 to 9, the Councillor members remaining at 6 as before, and the adoption of a new

rule by which an "honorary" member of Council shall also be eligible, who must be a member of the Electricity Committee of the President for the year.

**Information Bureau.**—A member asked whether it was the intention of the Council to drop the proposal for an information bureau altogether. Only the other day he had an inquiry form with 16 questions to answer, which, if he had conscientiously endeavoured to do, would have taken him all the morning. The Honorary Secretary said that the only difficulty in connection with this matter was that of expense. It would mean having a paid technical officer for the purpose; he thought they would have to wait until they got the I.M.E.A. Bill through, when perhaps municipalities might be in a position to subscribe on some different basis than a mere annual subscription of a guinea.

**Election of Honorary Member.**—A vote of thanks was passed to Mr. C. E. C. Shawfield for the services he had rendered the Association; he was elected Honorary Member.

A discussion upon other matters followed, which the Press were requested not to report, and the Council's Report and Balance Sheet were then adopted.

### Other Business.

Mr. C. Turnbull (Tynemouth) hoped that there should be another discussion *in camera* next year, and suggested heating and cooking, which had been curtailed this year on account of the discussion on the I.M.E.A. Bill.

Mr. S. E. Fedden asked if it was proposed to have another exhibition of electrical cooking apparatus at the next Convention, as there should be a number of improvements during the year.

Mr. H. R. Burnett asked the Council to consider seriously the question of the salaries paid to central-station engineers and their assistants, which were in some cases an absolute disgrace to the Association. The Association was in a unique position with regard to this matter, inasmuch as they had Chairmen Members.

The President said that all these three matters would be considered by the Council as favourably as possible. There had, he added, been some misunderstanding in certain quarters as to why such a subject as heating and cooking should be discussed *in camera*. It apparently was thought that the Association had met to discuss the question as to whether or not it was possible to cook electrically, and in these circumstances perhaps it was advisable to explain that it was not for this reason, but because there were many points the members wished to discuss without hurting the feelings of manufacturers.

### Committee re Electric Vehicles.

Mr. F. Ayton moved "That a committee be appointed by the Council to consider and adopt such measures as may be found desirable to further the use of the electric battery vehicle; that such committee be empowered to co-opt representatives of other institutions, company-owned electric supply undertakings, manufacturers, and others directly interested in this matter."

Mr. A. H. Seabrook seconded the resolution, which was also supported by Mr. W. A. Vignoles and Mr. G. Wilkinson, and was carried unanimously.

At this point the meeting was declared private, and the Press withdrew.

**Prime Movers for Electric Power.**—Mr. R. W. Weekes was misunderstood by our Reporter on one point in the course of his remarks reported on page 355 of our last issue. In the example mentioned in line 24, it is stated that 6 per cent. of the total heat in the steam was lost, but what Mr. Weekes intended to imply was that 6 per cent. only was abstracted by the engine from the steam on its way from the boiler to the heating system.

**Electrical Fatality.**—An inquest was concluded last week into the death of F. Hardell, who was fatally burnt on May 1st at the Blaydon substation of the Newcastle-on-Tyne Electric Supply Co. It appears that the deceased was making some tests at the back of a switchboard on some transformers which he had connected up against instructions, and accidentally caused a short circuit by touching a piece of metal on to a terminal.

**American Hydro-electric Schemes.**—The Bill favoured by the New York Conservation Commission, which provided for the State ownership and management of water-power schemes for the generation and distribution of electrical energy in New York State on similar lines to the scheme in operation at Ontario, was recently vetoed by the Governor of New York. According to the *Electrical World* (New York), a commission is to be appointed to consider this project, and also the Long Sault, Niagara, and Genesee water-powers, and to report and submit appropriate Bills for the consideration of the next Legislature.



## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,344.

In what way can the forces on transformer coils due to short circuit be determined in three-phase core type and single-phase shell type transformers with sandwich windings?—J. W.

(Replies must be received not later than first post July 3rd.)

### ANSWERS TO No. 1,342.

What is the greatest error commonly met with when using single-phase dynamometer-type indicating wattmeters on power-factors down to 0.3 with frequencies varying from 15 to 100 cycles per second? The instruments consist of a single moving coil for the pressure circuit, and two fixed coils for the current circuit, no iron being used.—"Vivo."

The first award (10s.) is given to "OHM" for the reply given in slightly abridged form below:—

The errors in dynamometer-type indicating wattmeters, resulting from power factor and frequency variations, are due to two fundamental causes:—(1) The very small phase displacement between the current through the potential circuit, and the voltage to which this circuit is connected. (2) The very small phase displacement between the flux produced by the series windings and the series current. This may result from masses of metal used in the construction of the instrument, and which intercept the series flux. If iron is employed for the purpose of augmenting and concentrating the magnetic field, there will be a slight phase displacement due to hysteresis.

If no iron is used in the instruments, and it has been designed with a view to eliminating eddy currents, we need only concern ourselves with the probable error in the instrument reading due to cause (1). The armature circuit must necessarily be slightly inductive, so that the armature current will lag by a very small angle behind the voltage. The error that results therefrom is inherent, and cannot be entirely eliminated. It can, however, be reduced to a minimum by very careful design, and in most commercial instruments it does not reach a serious figure except under abnormal conditions.

If the self-induction of the armature coil =  $L$ , the total resistance of the armature circuit =  $R$  and the frequency =  $f$ . Then  $\tan \phi = \frac{2\pi fL}{R}$ , where  $\phi$  = phase displacement between armature current and voltage. For all practical purposes it can be assumed that the armature current is directly proportional to  $E$  (the voltage), as the error resulting from the variation in the armature current consequent upon a frequency change is negligible.

If  $C$  = series current, and  $\theta$  = phase displacement between  $C$  and  $V$ , the wattmeter will read  $\frac{\cos(\theta - \phi)}{\cos \theta}$  times what it should do. That is, the error in the reading expressed as a percentage will be

$$\frac{\cos(\theta - \phi) - \cos \theta}{\cos \theta} \times 100.$$

On an inductive circuit the wattmeter will read more than it should do, whilst on a circuit giving a "leading" current the reading will be on the low side.

This equation also shows that as  $\phi$  increases the error will increase, and *vice versa*. Equation (1) shows that for a given frequency  $\phi$  will decrease as  $R$  is increased. This means that the error with a low-voltage instrument will be much greater than in the case of a high-voltage instrument, as it is usual practice to employ the same armature for all voltages, and simply vary the non-inductive resistance in series with it to give the same armature current. Furthermore,  $\phi$  will increase as the frequency is raised, so that, other things remaining the same, the error will be greatest in 100 cycles.

Taking the worst possible case of a low-voltage (say 100 volts) instrument working on a frequency of 100 at 0.3 power factor, and putting the self-induction at an average figure of 0.0085 henries, and assuming  $R=3,000$  ohms, the error works out to only 0.5 per cent. This error will vanish on a frequency of 15, whilst on 100 cycles it will be negligible if the power factor closely approaches unity. Furthermore, in the case of a high-voltage instrument (say one designed for 500 volts), the error would be of no practical importance, even on 100 cycles, when the power factor is 0.3. "Vivo" will find that instrument manufacturers will be willing to guarantee the accuracy of "first-grade" instruments on all frequencies and power factors likely to be met with in practice as follows:—1 per cent. between middle point and full-scale reading; 2 per cent. at 25 per cent. of full-scale reading; 5 per cent. at 10 per cent. of full-scale reading. This guarantee is in accordance with that specified by the Engineering Standards Committee for "First Grade" Instruments.

The second award (5s.) is made to "AGATE" for a reply given in abstract below:—

The principal errors met with in single-phase dynamometer type indicating wattmeters are due to: Self-inductance of pressure circuit, capacity of pressure circuit, mutual inductance between current and pressure circuits, eddy currents, and imperfect elasticity of spring or suspension; but, with the exception of the first, all these errors are negligibly small in a good instrument. Indeed, in such an instrument, at all normal frequencies, power factors, and voltages, the error due to the self-inductance of the pressure circuit is also negligibly small, for in the design of the instrument, the pressure circuit is arranged in such a way that the reactance is small in comparison with the ohmic resistance, consequently the current in the thin wire circuit is practically in phase with the pressure. At ordinary frequencies, under certain conditions, particularly low power factor or low circuit voltage, the error due to the self-inductance of the pressure circuit may assume serious proportions.

"Agate" works out his correction factors as  $1 - \tan \theta \tan \phi$ , where  $\phi$  = the angle of lag of the main circuit and  $\tan \theta$  = the ratio reactance to the resistance of the pressure circuit.

In the case of a wattmeter where  $L=0.01$  henry,  $r=1,000$  ohms, and the frequency = 15 cycles, the correcting factor for  $\cos \phi = 0.3$  is worked out as 0.99700, which is an equivalent percentage error of 0.3 per cent. With a frequency of 100 cycles per second, and the same power factor, the correcting factor is 0.98000, or a percentage error of 2 per cent. This instrument is intended for use on 30-volt circuits. On a circuit of a power factor of 0.9 the correcting factors are 0.99954 and 0.99696 at 15 cycles and 100 cycles respectively; the corresponding percentage errors being 0.04 per cent. and 0.3 per cent. respectively.

The same instrument is used on 300-volt circuits by increasing the resistance of the pressure circuit to 10,000 ohms. Taking the case of the load of  $\cos \phi = 0.3$ , and frequency 15 cycles, the correcting factor is 0.9997, and at 100 cycles 0.9980, the corresponding percentage errors being 0.03 per cent. and 0.2 per cent. The foregoing examples suffice to show that on low voltage circuits of low power factor (such as would be used for the determination of iron losses by the Epstein method) that a knowledge of the instrument constants is of prime importance. Their determination is somewhat difficult, but, as a rule, manufacturers supply the information with their instrument.

### ANSWERS TO CORRESPONDENTS

O. HULIN.—We should advise you to write to the Secretary of the Institution of Electrical Engineers, Victoria Embankment, W.C., for particulars of the examinations.

**Memorial to Lord Kelvin.**—A bronze statue of the late Lord Kelvin, 10 ft. high, which is the work of Mr. A. Bruce-Joy, was unveiled by Sir Joseph Larmor, F.R.S., on Thursday last at Belfast.

### A RED-HOT HOT-PLATE

WE recently had the pleasure of inspecting some of the latest products of the works of Belling & Co. (Enfield). Of greatest interest at the present time, in view of the recommendations of the "Point Fives" in this connection (ELECTRICAL ENGINEERING, June 5th, p. 321), is a 1.5 kw. red-hot hot-plate. From the illustration, Fig. 1, it may be seen that the hot-plate consists of a cast-iron top and a spun-steel well, between which are housed the heating element and heat insulation, preventing heat escaping downwards. The actual heating element consists of a porcelain former, unglazed on the top, but glazed underneath. A number of peg-like projections are distributed uniformly over the upper surface as shown, and the resistor in the form of a small spiral of nichrome wire is suitably held in place by the pegs. The resistor is divided into two sections, so wound that in no case is the pressure between adjacent turns more than

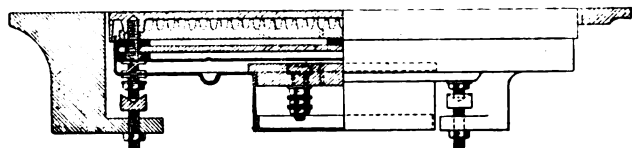


FIG. 1.—THE BELLING HOT-PLATE.

a few volts. The heat is equally distributed, and, moreover, a too intense central heat is avoided, thus overcoming expansion troubles. Three heats may be obtained. When the resistor is in position it is covered by a special fireproof cement pressed well in. Whilst it is drying current is passed intermittently through the wire, so that a small space round all parts of it is formed to provide for expansion when in actual use. On the cement is a further layer of a fine heat-conducting, non-caking powder which, owing to the construction of the hot-plate, sustains a continual uniform pressure. The leads are brought to the terminal well in flexible metallic tube, and by means of the removable bottom cover the hot-plate may be entirely disconnected in five minutes. The whole plate rests on three locked adjusting screws, so as to get correct top level. It should be noticed that, owing to the construction, no water can drip on to the element or into the terminal box.

These hot-plates may be obtained singly mounted on a suitable stand, and they are used in the Belling domestic cooker, which is provided with side heat in the oven, the

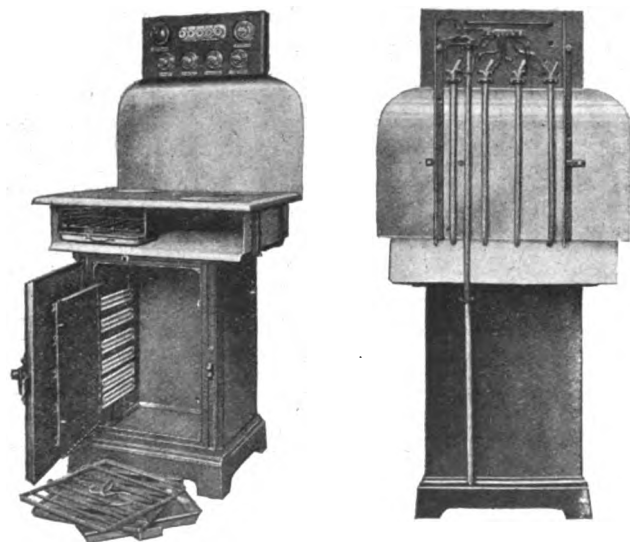


FIG. 2.—FRONT AND BACK VIEWS OF THE BELLING DOMESTIC COOKER.

elements of which are easily get-at-able, and yet out of harm's way. It may be mentioned that the oven gives excellent results, and the whole design appears to make for simplicity, ease of operation, cleanliness, and durability, as may be seen by the illustrations in Fig 2, which shows both front and back views. By using improved fire-bars and winding the resistor first into a helix, it is now possible to supply single bars for pressures up to 500 volts, and the new terminal clip (ELECTRICAL ENGINEERING, June 12th, p. 331) gives a

large cooling surface to the wire, which is effectively prevented from coming in contact with the fixing screw. Thus the danger of breaking the wire when connecting up is eliminated.

Among the other specialities may be mentioned a radiant-heat grill and many handsome "electric fires," which are to be on the market this season. Messrs. Belling & Co. are about to move into larger works at Edmonton.

### BOARD OF TRADE REGULATIONS FOR THE ACCURACY OF METERS

IN pursuance of the provisions of Section 11 of the Electric Lighting Act, 1909, and of the provisions substituted by that section for Section 50 of the schedule to the Electric Lighting (Clauses) Act, 1899, and for the corresponding provisions contained in or incorporated with any special act or provisional order relating to the supply of electricity, the Board of Trade have made regulations allowing the following limits of error for electricity meters, the construction and pattern of which have already been or may hereafter be approved by them, and belong to the classes of meters capable of ascertaining the value of the supply on continuous current or on single phase alternating current circuits.

Meters in which the maximum current for full load (a) does not exceed three amperes—the error at any point from one-tenth load to full load must not exceed  $3\frac{1}{2}$  per cent. plus or minus; (b) exceeds three amperes, but does not exceed 50 amperes—the error at any point from one-tenth load to full load must not exceed  $2\frac{1}{2}$  per cent. plus or minus; (c) exceeds 50 amperes—the error at any point from one-twentieth load to one-tenth load must not exceed 2 per cent. plus; and at any point from one-tenth load to full load must not exceed  $2\frac{1}{2}$  per cent. plus or minus.

### THE GLASGOW ELECTRICAL EXHIBITION

ARRANGEMENTS are proceeding apace for the Electrical and Engineering Exhibition, which is to be held in Glasgow from October 28rd to November 15th, at the Zoo Buildings, New City Road. The success of the exhibition is already assured by the large proportion of space let to leading firms, and the fact that the British Electrical and Allied Manufacturers Association has agreed to give their support. Among the exhibitors who have already taken space are the following: the Glasgow Corporation, British Insulated & Helsby Cables, the Electrical Co., Siemens Bros., Anderson & Munro, Verity's, Edison & Swan, M. K. Cooper & Co., Electric Control, Ltd., British Electric Plant Co., British Thomson-Houston Co., Fraser & Borthwick, W. T. Henley's, Bonham Scott & Co., Brown, Boveri & Co., Callender's Cable & Construction Co., Electric Appliances, Ltd., Scottish Vacuum Cleaner Co., Magic Appliances, General Electric Co., British Westinghouse Co., R. Waygood & Co., Kelvin & James White, British Heaters Co., Carrier Co., Simplex Conduits, J. Keith & Blackman, Yates Bros., J. Dugdill, Edward & Sons. A special feature will be cinematograph demonstrations of the uses of electricity.

### CATALOGUES, PAMPHLETS, &c., RECEIVED

**BATTERY FANS.**—A neat little four-bladed ceiling battery fan for use in motor-cars, boats, yacht-cabins, motor-buses, &c., is described in a new leaflet from the General Electric Co. (67 Queen Victoria Street, E.C.).

**GAS ENGINES.**—A pamphlet from Crossley Brothers, Ltd. (Openshaw, Manchester), describes their exhibit at the forthcoming Royal Agricultural Show at Bristol, where they will be showing a new design of gas and suction gas plant.

*Readers desiring copies of catalogues or pamphlets should apply to the firms in question, referring to the notice in "Electrical Engineering."*

**FIBRE, EBONITE, BELTING, &c.**—A list from Arthur Cort & Co. (303½ Camberwell Road) deals with vulcanised fibre, ebonite, vulcanite, Chatterton's compound, gutta-percha, and other materials, as well as balata, gutta-percha, and cotton belting.

# ADAMS IGRANIC

CONTROL GEAR FOR PRINTING MACHINERY.

ADAMS  
M<sup>C</sup>C<sup>O</sup>L<sup>T</sup>  
BEDFORD  
AND  
LONDON

## TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

The appeals and cross-appeals resulting from the arbitration proceedings before the Railway and Canal Commissioners, who had to determine the price the Government should pay the National Telephone Co. for its undertaking, have been settled out of court. It will be remembered that, after the award by the Railway and Canal Commissioners, the Post Office appealed to the Court of Appeal on the point that nothing at all ought to have been allowed for the "cost of raising capital, &c." The Telephone Co. then entered cross-appeals practically alleging that much of the award was bad. When the appeals came before the Appeal Court, which Court thought it had the right to hear the appeals, the Telephone Co. argued that under the constitution of the Court of the Railway and Canal Commission there was no jurisdiction to appeal, but if there was, the Telephone Co. would cross-appeal on several points. This point was taken to the House of Lords, who took the view that there was an appeal from the Court of the Railway and Canal Commission to the Court of Appeal, and a preliminary objection taken by the Attorney-General that no appeal lay from the Court of Appeal to the House of Lords was overruled. As a result of this, the appeal was to have been continued in the Court of Appeal before the Master of the Rolls and Lords Justices Kennedy and Swinfen Eady on Monday, but before the case was called the leading counsel held a private consultation with the judges. As a result of this it was announced that an agreement had been come to, which would be announced on Tuesday next, as certain formalities had to be complied with.

Owing to the breakdown of a cable in the south-eastern district, telegraphic communication between London and Woolwich was interrupted last Thursday night, and messages were sent round through Eltham. A gang of men from headquarters were at work all night effecting the necessary repairs.

At the meeting of the Marconi International Marine Communication Co. the Chairman announced that the profit had increased by nearly £10,000 over that of the previous year. A 10 per cent. dividend was declared.

In view of the fact that on and after July 1st time signals will be transmitted daily at 10 a.m. and 12 midnight from the great Eiffel Tower Wireless Station (in direct connection with Paris Observatory), and from the German Norddeich station at 12 noon and 10 p.m., the Synchronome Co. (32 and 34 Clerkenwell Road) have brought out a complete wireless receiving set designed for watch and clock makers. The necessary instruments are combined on a neat board occupying little space, and the whole outfit is appropriately called a "Horophone." No technical knowledge in the use of the apparatus is required, and, thanks to its simplicity, it can be sold at a low price. Mr. Hope-Jones, of the Synchronome Co., points out that the watch and clock trade in France were making extensive use of the wireless time signals, and sees no reason why the same should not be done here. Some particulars of the signals from the Eiffel Tower were given in *ELECTRICAL ENGINEERING*, May 20th, p. 306.

We have received from the Italian Ministry of Posts and Telegraphs a copy of a well-printed and illustrated volume partly in French and partly in Italian, forming a complete record of the International Congress on practical telegraphy, held at Turin during the Exhibition in 1911. Numerous portraits of the participants and views of the actual meetings are given, with a full account of the proceedings, which included prize competitions in sending and receiving. Other sections are devoted to the Volta commemorations, including fêtes held at Milan, a postal congress in Rome, and an interesting article commemorates the jubilee of the Italian postal and telegraphic services.

On the 17th inst. the Tangier-Arzila line gave out again, and telegrams for the French zone cannot now be accepted, urgent messages being sent by wireless, and these can only be accepted conditionally.—The Campagnie Française des

Cables Télégraphiques successfully repaired the Paramaribo-Cayenne cable on the 19th inst., and the recently repaired section between Martinique and Paramaribo once more requires attention, having failed on the same day.—Telegrams for French and Dutch Guiana, as well as for other places via Hayti, are stopped, and messages must be sent via Salinas.

## ELECTRIC TRACTION NOTES

Direct-current battery storage has been adopted for the Wiesenthal single-phase line of the Baden State railways. According to *Elektrische Kraftbetriebe und Bahnen*, the railway pays a fixed sum to a local supply company for energy up to a maximum demand of 1,040 kw., with an increased rate for the units taken over this limit; and the battery storage has been adopted to reduce the maximum demand. The current is supplied three-phase 50 cycles to the sub-station at Basle, which contains two three-phase single-phase motor-generators, each with a direct-current machine direct-coupled. The single-phase generators supply the railway feeders at 15,000 volts 15 cycles, and the direct-current machines act as generators, charging the battery at periods of low railway load, and at times of heavy demand, as when one or more trains are starting, act as motors, taking energy from the battery and helping to drive the single-phase generators. The battery has a capacity of 2,200 ampere-hours at 750 volts, and can deliver 4,800 amperes for a short time. The sets are controlled by direct-coupled Danielson double-commutator machines, which also provide automatic compounding of the single-phase generators. It is stated in the Swiss papers that some of the German locomotives made for this railway have not come up to expectations in their tests, and that the aid of a steam locomotive had to be requisitioned to enable them to start with full load. Alterations are being put in hand, but in the meantime an order for two new locomotives has been given to the Swiss firm of Brown, Boveri & Co.

Lectures on electric traction are being given at Euston and provincial centres of the London & North Western Railway to members of the staff by Mr. F. A. Cortez Leigh, Chief Electrical Engineer to the railway, in view of the approaching conversion to electric traction of the Company's suburban lines.

A considerable length of guard-wire which had come into contact with the trolley-wire in Harrow Road, near Paddington Green, fused and fell into the roadway one evening last week. No one was injured.

The Railless Traction Bill of the Mexborough and Swinton Tramways has passed through the Select Committee. The much-discussed clause as to road maintenance has been settled so that the Company shall bear one-third of the cost of certain road widenings, and contribute a fixed sum of 3d. per car mile to road maintenance.

The London County Council are unwilling to accept the clause inserted by the Select Committee in the L.C.C. Tramways and Improvements Bill, giving the London United Tramways Co. running-through powers over certain of their lines, and at Tuesday's meeting passed a resolution that steps be taken to secure its deletion.

The Board of Trade report of Col. Druitt on an accident on the Lancashire & Yorkshire Railway at Sandhills, Liverpool, on May 1st, when a steam train ran into the rear of an electric train. It appears that the vacuum brake of the electric train was defective, and the driver was unable to pull up at a signal which was against him, and entered a section immediately in front of an express, which dashed into the rear of his train. The lack of power of the brake was due partly to a hot bearing on a vacuum pump which entailed changing over to another pump at the rear of the train, which is less effective, and partly to the sticking of the plunger of an electrically-actuated valve, so that the connection between the train pipe and pump was not fully open.

## "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

### Specifications Published June 19th, 1913

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

Names in italics indicate communicators of inventions from abroad.

5,026/12, 5,027/12, and 5,028/12. **Ductile Tungsten Filaments.** J. HUBERS (*Julius Pintsch A.-G.*). The first specification describes a process in which a compound of tungsten is mixed with between 1 per cent. and 5 per cent. of an oxide or an equivalent proportion of a compound of thorium or other rare earth metal, an alkaline earth metal or magnesium or zirconium, or a mixture. The mass is squirted and reduced in hydrogen, so as to avoid the formation of crystalline particles. The metals are finally alloyed together. Alternatively, colloidal tungsten may be used. In the second specification processes are covered for compressing the preliminary ductile filament, obtained as above described, by passing it through drawstones or rollers and subjecting it to drawing or rolling. According to the third specification, a thick wire or rod is formed from the paste, as in specification 5,026/12, and is drawn or rolled.

12,752/12. **Ductile Tungsten Filaments.** M. M. HUBERS, executrix of the late J. HUBERS (*Julius Pintsch A.-G.*). The carbonisation and decarbonisation of the filaments, produced as above in a reducing atmosphere, is effected with filaments of long aggregate length, and is carried out in one step. The filaments are cut to length after ductile filaments are obtained.

12,244/12 and 12,469/12. **Drawn Tungsten Filaments.** C. GLADITZ. In the first specification a construction of press moulds, which permits of pressing the bar in such a way as to avoid the possibility of cracking, is described. The tungsten powder used is of a fluffy character, and the press mould simultaneously and instantaneously releases the compressed bar in all three directions, so that it can expand unrestrictedly. Two figures. The second specification deals with a method of preparing the end of the wire so that it can easily be inserted into the draw-plate, for drawing into filaments, without twisting taking place. A long tapering of the wire at the end is effected by treatment in an electrolytic bath containing a strongly oxidising electrolyte. The end to be treated is stretched and hangs vertically in the electrolyte, and is connected up as the cathode, and is gradually withdrawn upwards. Four figures.

16,174/12. **Automatic Supply System.** H. LEITNER. An internal-combustion engine is arranged to drive a dynamo in conjunction with which is a storage battery whose principal function is to supply the dynamo as a motor when it is required to start up the engine. A regulator of the type covered by patents Nos. 21,145/04, 25,784/04, and 6,690/06, is used. At the end at which the travelling arm has put all the resistance in the main circuit, a trigger is provided. This, when closed, completes a circuit from the battery through the solenoid of an automatic motor starter. The ignition circuit is interconnected with the motor starter, so that the release of the solenoid will both disconnect the dynamo and stop the engine.

24,345/12. **Aerials for Wireless.** E. GIRARDEAU. The aerial described is for use with high-frequency generators. The conducting wire consists of two parts: first, the wave-radiating part, which is vertical, and secondly, a horizontal part, which merely serves for increasing the wave-length. This part is constructed as a flat, horizontal spiral. The former lies between the latter and the earth. Three figures.

231/13. **Enclosed Flame Arc Lamps.** CROMPTON & Co. and C. CROMPTON. Up-cast and down-cast circulating tubes are provided. The former are heat-insulated and provided with heating coils connected in series with the arc. Two figures.

### Specifications Published To-day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, E.C., at the price of 8d. each, post free. Summaries of some of the more important of these patents will appear in our next issue.

**Arc Lamps:** BOARDMAN, 29,160/12.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** FRENKEL [Insulated coils] 12,530/12; THOMPSON (*Ateliers de Constructions Electriques de Charleroi*) [Starting a synchronous and asynchronous machine connected in cascade] 5,481/13.

**Dynamos, Motors, and Transformers:** MCLEAN [Field magnet] 17,391/12; SIEMENS DYNAMO WORKS and HOWARD [Cooling] 18,087/12.

**Heating:** COLLINS and COLLINS [Cable connectors for irons] 20,776/12; MAYER [Heaters] 29,569/12.

**Ignition:** BOSCH [Short-circuiting gear] 27,403/12.

**Incandescent Lamps:** TOPHAM [Apparatus for feeding powdered, granular, or like material] 15,547/12.

**Instruments and Meters:** B.T.-H. Co. and YOUNG, 14,378/12.

**Switchgear, Fuses, and Fittings:** EDWARDS [Conduit continuity devices] 16,318/12; MARKS (*Clinton Wire Cloth Co.*) [Circuit-breakers for welding machines] 18,109/12.

**Telephony and Telegraphy:** MALCOLM [Concrete antenna towers] 10,542/12; GELL [Automatic switching for telegraphy] 12,847/12; AITKEN [Telephone exchanges] 12,973/12; [Telephone switching] 12,974/12; [Switchboards] 12,975/12; HEURTLEY [Telegraphy] 13,155/12.

**Traction:** ELEKTROMOTOREN-WERKE HERMANN GRADENWITZ [Transporters] 12,833/12.

**Miscellaneous:** DUSSAUD [Projection apparatus] 5,424/12; CHAPMAN (*Chapman*) [Signalling] 13,208/12; B.T.-H. Co. (*G.E.Co., U.S.A.*) [Cranes] 18,746/12.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Heating:** WEINTRAUB [Refractory materials] 20,348/12.

**Meters:** CIE. INTERNATIONALE D'ELECTRICITE, 11,825/13.

**Telephony:** SIEMENS & HALSKE, 12,060/13; [Circuit arrangements] 12,061/13; [Inductance coils] 12,565/13.

**Miscellaneous:** FEDERICO [Transmitting synchronous movements by rotating magnetic fields] 12,638/12.

### Opposition entered to Grant of Patents

9,673/12. **Direction "Tell-tales."** J. C. CLARKE and CHAD-BURNS (SHIP) TELEG. CO. This specification deals with an electrical tell-tale adapted for use with the propeller shafts of steamships. It operates in conjunction with the propeller shafts and the order telegraph through a differential gear, and a pointer is moved over a scale by electromagnets. Eight figures.

2,471/13. **A.C. Phase Transformation.** F. SPINELLI. To effect the static transformation of three-phase current into single-phase current with three times the frequency by connecting the secondaries of three single-phase transformers with highly saturated cores in series and feeding with the three-phase current. Alternatively a four-core transformer may be used.

### Expiring and Expired Patents

The following Patents expire during the current week, after a life of fourteen years:—

13,509 of June 29th, 1899. **Controlling Electric Cranes.** J. G. W. ALDRIDGE. The motor is connected to the crane barrel through a clutch which is operated in conjunction with the motor controller by the control lever. A separate brake acting on the barrel controls descending loads, as on the return motion of the control lever the barrel is entirely disconnected.

13,561 of June 30th, 1899. **Storage Battery Traction.** M. J. BARREAU. To maintain constant the effective work of the motor at different speeds, an induction coil divided into sections is arranged to be connected in various ways (the sections in series, parallel, or series parallel) between the battery, which is divided into as many parts as the induction coils, and the motor. By this means the field current may be kept constant, and the speed will vary as the applied pressure. The motor is shunt wound.

13,646 of July 1st, 1899. **Traction and Crane Motor.** T. D. HOLLICK. To start, stop, or reverse effectively and economically the armature is mounted on a shaft revolving on fixed bearings, while the field magnets can revolve freely concentrically with the shaft, on which are toothed wheels gearing with toothed wheels on the field magnet through wheels connected with the pulley shaft, which is concentric with the armature shaft. The motions of the pulley shaft are controlled by retarding either the armature or field magnet.

The following are the more important Patents that have become void through non-payment of renewal fees.

**Arc Lamps:** JOHNSON & PHILLIPS [Globe] 5,029/08.

**Distributing Systems, &c.:** M. EYQUEM [Constant pressure variable speed dynamo] 4,503/05.

**Dynamos, Motors, and Transformers:** C. H. PRÖTT [Adjustable speed polyphase motors] 4,950/08.

**Electrometallurgy:** SOC. DES PROCÉDÉS GIN POUR LA MÉTALLURGIE ELECTRIQUE [Open channel induction furnace] 1,080/07.

**Incandescent Lamps:** H. KUZEL [Colloidal filament manufacture] 5,129/06; J. W. GREENWOOD [Cycle lamps] 5,078/08.

**Switchgear, Fuses, and Fittings:** B.T.-H. Co. (*E. W. Rice, U.S.A.*) [Motor-operated remote-controlled H. P. switchgear] 4,248/00; R. P. JACKSON [Double break switch with rolling contact] 4,000/07; A. H. CURTIS, A. H. MACKLEY, and ADAMS MFG. CO. [Locking and indicating push-button switch for lifts] 4,696/08; CROMPTON & Co. and C. CROMPTON [Two-arm motor-starter and controller] 4,799/08.

**Traction:** G. HARRISON (*Elec. Rly. Improvement Co., U.S.A.*) [Electrically-welded rail bonds] 5,016/08 and 5,017/08.

**Miscellaneous:** E. W. ENGELS [Fire and acid proof materials containing carborundum] 4,166/00; L. CHALAS, E. RÉQUILLART, and C. CONTAL [Electro-magnetic horn] 4,951/06.



## LOCAL NOTES

**Aldershot: Electricity Accounts.**—A working net profit of £508 is reported, with £31 deposit interest and £264 brought forward; £477 is to be transferred to reserve and the remainder carried forward.

**Batley: Electricity Accounts.**—Last year's deficit of £37 has been turned into a net surplus of 19s. 4d. The gross profit was £3,271, nearly all of which was absorbed by capital charges.

**Bedford: Diesel Engine Prices.**—The inquiry held in April on the application for a loan of £11,590 for plant extensions was reopened on Wednesday of last week, when evidence was taken regarding the reasons for certain differences in the prices in the tenders for Diesel engines, and an arrangement that had been made between four of the five firms who had been asked to tender. A long report of the inquiry appeared in the *Bedfordshire Times and Independent* of June 20th.

**Bexhill: Electricity Accounts.**—A profit for the year of £1,086 has been made, and after deducting £421 for public lamps and meters there remained a balance of £421. During the coming year a new switchboard is to be erected at a cost of £500.

**Blackpool: Electricity Accounts.**—With a total income of £40,333 and expenditure of £20,928, there remained, after meeting capital charges, a surplus of £6,226, of which £2,426 has been transferred to reserve and £3,800 to the general district fund. The capital account now stands at £218,007; 4,725,049 units were generated during the year, with a maximum load of 3,179 kw. and a plant capacity of 6,550 kw.

**Clones (Ireland): Electricity Supply.**—Messrs. Henry Jenkinson & Co., accountants, 29 Rosemary Street, Belfast, are promoting a company whose object it will be to introduce electric light into the town of Clones. Mr. Charles Ferguson, Electrical Engineer, Fermanagh Street, Clones, has consented to act as managing director.

**Colchester: Electricity Accounts.**—The year's working has resulted in a gross profit of £7,268, which, after meeting capital charges, leaves a final surplus of £591 (against £122 for last year). There has been an increase in the works costs due to rise in price of fuel, but other items have decreased; 1,555,425 units were sold, which is an increase of 58,000 over the previous year.

**Hereford: Electricity Accounts.**—The gross profit for the year of £3,035 has been insufficient to meet the capital charges, and a deficit of £448 has resulted. The undertaking has suffered severely from decreased demand due to metal filament lamps.

**Kettlewell: Electricity Supply.**—At this little village in the Upper Wharfe Valley, Yorkshire, a water-power plant was opened recently, which is said to be the smallest public supply station at work. It was established by a local company at a cost of £625, and has a capacity of 400 lamps. Overhead distribution is used, and the mains are attached in most cases to the chimneys of the houses.

**London: Stepney.**—Notwithstanding the increased cost of coal, the net profit of £11,507 is only £1,250 less than the figure for the previous year. Of the balance of £13,760, including the amount brought forward from last year, £1,125 is to go towards capital expenditure, £2,711 is to be written off capital expenditure, £8,442 carried to reserve, and £1,482 carried forward. The works costs have been reduced to 0.594d. per unit, which is claimed to be the lowest in the County of London.

**Stoke Newington.**—A clause is to be added to the conditions of the tariff providing for a minimum charge of 13s. 4d. per quarter in the case of a consumer failing to take a supply to that amount in any quarter.

**Lynn: Electricity Accounts.**—The net profit, after allowing for capital charges, works out at £876. Of this £246 will be devoted to paying off capital expenditure for last year on meters, mains, &c., and the remainder in part payment for extensions now proceeding. The total units generated were 44,438.

**Newport: Electricity Accounts.**—The year's working has resulted in considerable increase in revenue with only slight increase in expenditure, but there is still a loss on the undertaking of £1,093 on the supply department, and £2,326 on the tramways.

**Skegness: Electricity Supply.**—Crompton & Co. have given notice of their intention to apply for a provisional order for the supply to the district.

**Tempo (Ireland): Electricity Supply.**—The inhabitants of

Tempo have decided to have a plant for electric lighting purposes installed. A company has been formed and the necessary capital subscribed. It has been decided to accept the tender of Mr. J. S. Loughlin, Bundoran, for the installation of the plant, which will be proceeded with immediately.

**West Ham: Electric Automobiles.**—We have received a copy of the excellent booklet with which the Corporation electricity department are circularising manufacturers and others in their district. The advantages of the vehicles propelled by the Edison battery are well put, and we understand that a large number of promising inquiries have already been received. The department have two Edison vans of their own in daily use.

**West Wickham: Electricity Supply.**—A Select Committee of the House of Lords has decided that unless the West Kent Electric Power Co. exercise their powers and give a supply to West Wickham within six months the supply may be given by Beckenham. The West Kent Co. have had difficulties with the Bromley Corporation through whose district the cables would have to run.

**Weymouth: Electricity Accounts.**—The gross profit of £4,538, after meeting capital charges, leaves a net balance of £881.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

## Generating Stations, Sub-Stations, Mains, &amp;c.

**Bexhill.**—A Local Government Board inquiry has been held for a proposed loan of £1,900 for substation site and mains.

**Chester.**—A Local Government Board inquiry was held last week into an application for a loan of £11,550 for a battery with building, boosters, switchgear, &c.

**Costa Rica.**—Tenders are invited for the erection and working of a hydro-electric plant to supply power to the City of Limon and neighbourhood. The plant required comprises two Pelton turbines of 414 h.p., two 400 kw. generators, and six transformers. Particulars from Commercial Intelligence Branch, Board of Trade.

**Kettering.**—A Local Government Board inquiry was held recently into an application for a loan of £1,600 for feeder cables. There was no opposition.

**Londonderry.**—A Local Government Board inquiry was held on June 14th regarding an application for a loan of £13,000 for cable extensions rendered necessary by the re-opening of the shipyard which is taking all its power from the Corporation.

**Loughborough.**—The Council has approved the expenditure of £11,000 for works extensions and £3,000 for mains. Application is to be made to the Local Government Board for sanction to a loan.

**Whitworth.**—An application to the Local Government Board is to be made by the Council for permission to borrow £10,065 for an electric lighting plant.

## Wiring

The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.

**Bridport.**—Isolation Hospital.

**Bury.**—Conversion to electric lighting at Gigg Mills for Bury Papermaking Co.

**Crewe.**—Co-operative Store. Architect, Mr. G. E. Bolshaw, Southport.

**Eccles.**—Tenders are invited for electric light installation at the Green Lane Council School, Patricroft.

**King's Langley.**—County Council School. U. A. Smith, County Surveyor, Hatfield.

**London.**—Reconstruction of Tivoli Theatre, Strand.

**Hampstead.**—New fire station.

## THE RECORD ELECTRICAL Co., Ltd.

LONDON OFFICE:  
CAXTON HOUSE,  
WESTMINSTER, S.W.

Telephone:  
3067 Victoria.  
Telegrams & Cabigrams:  
"Infusion,"  
London.

MEASURING  
INSTRUMENTS.  
RECORD'S PATENT.

WORKS:  
BROADHEATH,  
MANCHESTER.

Telephone:  
164 Altrincham.  
Telegrams & Cabigrams:  
"Infusion,"  
Altrincham.

Write for Prices & Particulars.

**Manchester.**—New secondary school at Harpurhey.  
**Pembroke.**—New police station. H. H. Thomas, County Surveyor, Haverfordwest.  
**Rotherham.**—New Y.M.C.A. building.  
**Scarborough.**—Tenders are invited for an electric lighting installation at the Workhouse and Infirmary by July 12th. Particulars from Tennant & Barra, Consulting Engineers, Cathedral Buildings, Dean Street, Newcastle-on-Tyne.  
**Sheffield.**—Extensions to Union Hospital.

### Miscellaneous

**Australia.**—The principal of a Sydney firm, visiting London, wishes to get into touch with United Kingdom manufacturers of all classes of electrical goods and machinery. Particulars from Information Department, London Chamber of Commerce, Oxford Court, Cannon Street, E.C.

Tenders are invited by Sept. 16th for telephone exchange switchboards for Melbourne, and by Aug. 13th for telephone parts and switchboards for Adelaide. Particulars from High Commissioner, 72 Victoria Street, S.W.

**Denmark.**—A Danish firm wishes to secure the representation of United Kingdom manufacturers of armatures and other electrical machinery. Apply to the Danish Consulate-General, and 9 Byward Street, Great Tower Street, E.C.

**London:** Tenders are invited by H.M. Office of Works for a year's supply of incandescent lamps. (See an advertisement.)

**Hackney.**—The electricity department has received permission of the Council to purchase a high-pressure cable-testing set at a cost not exceeding £150.

**Norway.**—Tenders are invited by the Norwegian State Telegraph Dept. for 400,000 metres of double wire. Particulars from Commercial Intelligence Branch, Board of Trade.

### TENDERS RECEIVED AND ACCEPTED

**London: St. Pancras.**—The tenders of E. F. Moy, Ltd., for testing panels (£98), and the Electrical Power Storage Co. for cells (£86), have been accepted.

Siemens Bros. Dynamo Works, Ltd. (Incandescent Lamp and Fittings Dept., Tyssen Street, Dalston), advise us that they have obtained the following contracts:—12 months' supply of Tantalum traction-type lamps to Rochdale Corporation Tramways and Royal Mail Steam Packet Co; drawn-wire and carbon lamps to G.N. Ry. Co., and carbon lamps to the War Office.

Among recent orders for Osram lamps from the General Electric Co. are those for installations on the s.s. *City of Paris*, running between Liverpool and Calcutta, and the Brighton Palace Pier.

### MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. G. Smith & Son inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night, was £67 15s. to £68 5s. (Last week, £69 to £69 10s.)

**Australian Prize Van.**—A prize has been awarded to the British General Electric Co. for a delivery vehicle at the Annual Show of the Royal Agricultural Society of New South Wales at Sydney.

**New Telephone Number.**—Osram Lamp Works, Ltd., inform us that on and after Saturday next their telephone numbers will be Hammersmith 1500 and 1501.

**Private Fire Brigade Championship.**—This competition was held at the Guildhall on Saturday last, the 21st June, and as a result the Robertson Lamp Section Brigade took second place and won the bronze medals; the Osram Lamp Section Brigade obtained the fourth place. There were twenty-three brigades competing.

**Change of Address.**—The British Home and Office Telephone Co. (15 and 17 City Road, E.C.) have moved to 125 High Holborn, W.C.

The General Cable Manufacturing Co. have now removed to larger and more convenient premises at 15 Garlick Hill,

London, E.C. (Tel.: City, 3408). Large stocks of V.I.R. cables are kept at the new stores, and immediate deliveries can be effected.

**Agency.**—The Arc Lamp-Lowering Gear Co., of Darlington, have appointed as their sole agents for London Messrs. Neale & Freund, Ltd., who will keep samples at their offices at 31 Budge Row, Cannon Street, London, E.C.

**Companies Struck off Register.**—The names of the following have been struck off the register of joint stock companies:—Carnarvonshire Electric Traction Syndicate; Empire Electric Light & Power Co.; and the Improved Electric Supplies, Ltd.

**Liquidations.**—The Johnson Secret Wireless Telegraph and Telephone Testing Syndicate is to be wound up voluntarily. A meeting of creditors will be held to-morrow at 40 King Street, E.C., at 2.30.

**Bankruptcies.**—A third and final dividend of 1½d. in the £1 is to be paid in the bankruptcy of J. G. Cunningham and H. P. Addison, lately trading as Laing Wharton and Cunningham, electrical engineers, 7 Great Newport Street, London.

### APPOINTMENTS AND PERSONAL NOTES

Mr. G. W. Humphreys, Chief Engineer to the L.C.C., has been nominated to replace Sir Maurice Fitzmaurice as a representative of the Council on the Engineering Standards Committee.

Mr. T. R. Stancombe, of York, has been appointed Commercial Power Engineer at Bristol.

Captain T. C. Fitz-Hugh, the Chief Commissioner in the Far East, recently appointed by the British Engineers' Association, left London for Peking, via Siberia, last Saturday, accompanied by his secretary, Mr. L. B. Stevens.

### COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &c.

**Aron Electricity Meter.**—The report announces a net profit of £36,652 to be added to £4,455 brought forward from the previous year. After paying the preference dividends at the rate of 6 per cent. per annum, a 7 per cent. dividend is recommended on the ordinary shares, with £15,000 transferred to reserve, and £5,864 carried forward. The past year's trading in electricity meters and taximeters has again been most satisfactory, the sales having exceeded those of any previous year. The company's factories have been fully employed, and the necessary extensions to cope with the increased business are being carried out.

**Edison and Swan United Electric Light Co.**—At an extraordinary meeting of first debenture holders last Wednesday, Mr. Ellice Clarke presiding, to consider a scheme for the consolidation of the first and second debenture stocks into one stock bearing interest at 4½ per cent. per annum, on a show of hands the scheme was passed by 9 votes to 8. A poll was, however, demanded. At a meeting of second debenture holders held subsequently, the scheme was adopted with one dissentient. The result of the poll was declared on Friday to be against the scheme, as it fell short by 1,417 votes of the necessary three-fourths majority. The scheme therefore cannot proceed.

**Crompton and Co.**—According to the *Financial Times*, the directors have drawn up a scheme of reconstruction involving the exchange of the existing 85,000 ordinary £3 shares into a fresh issue (share for share) with a denomination of £1 per share, while, in addition, there will be created 136,000 non-cumulative seven per cent. participating £1 preference shares, credited as 12s. 6d. paid. These will be offered to the existing proprietors at the rate of eight new preference shares for every five shares now held. The existing £100,000 of debentures will be paid off, but the new company will be at liberty to make a further amount of £100,000 of five per cent. bonds.

**R. Waygood and Co.**—A profit is reported of £25,288, making £31,541 with the inclusion of the amount brought forward. A further dividend, making 7 per cent. for the year, is recommended, with £1,500 put to reserve and £6,691 carried forward.

**J. G. White & Co.**—The report gives the net profit on the year's trading as £88,797, out of which £10,000 is allocated to special dividend equalisation reserve, and £20,000 added to general reserve. A dividend of 12 per cent. is recommended on both classes of shares, and in addition an extra dividend of 10s. per share on the ordinary shares.

# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 340 [Vol. IX., No. 27]

*All rights reserved.*

THURSDAY, JULY 3, 1913.

[PRICE ONE PENNY.

*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARMOLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES and TECHNICAL COLLEGE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

*Other Advertisement Rates on Application.*

#### Latest Time for Receiving

Letters for Insertion, Tuesday first post.

Small Advertisements and Official Announcements, Wednesday first post.

Displayed Advertisements, Tuesday first post.

Corrections in Standing Advertisements, Monday first post.

All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 308-306, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Circling, Fleet, London."

Telephone No.: 5509 Holborn

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

THE new buildings at the National Physical Laboratory were opened by Mr. A. J. Balfour on Thursday last. (Page 390.)

THE Annual Report of the Chief Inspector of Factories includes the report of Mr. G. S. Ram, the Electrical Inspector, who reports the same number of electrical accidents in generating stations as last year, and draws attention particularly to the question of switchboard fires. The district inspectors report an increase in lead-poisoning in accumulator factories, and a special report appears on the lighting of foundries. (Page 391.)

AN interesting Paper on Aluminium Cables was read by Mr. Welbourn before the Institution of Mining Engineers last month. Mr. Welbourn makes little of the difficulty of wiring and jointing aluminium cables, and is of opinion that the whole question is one of the relative cost of aluminium and copper. Comparisons of cost were made, to show at what market values of the two metals aluminium cables might come in for consideration with advantage. Incidentally, also, the question of lead-covered v. vulcanised bitumen cables was discussed. (Page 393.)

THE objections to the Home Office draft general regulations made under the Coal Mines Act were considered by Lord Mersey at a reference which has just terminated. It will now be compulsory to fix signal indicators in the winding engine house. (Page 395.)

THE Patents of particular interest to mining electrical engineers and electrometallurgists published during the

preceding month include one by J. H. Hoadley, for producing gas underground in mines and conveying it to the surface, and two relating to electric furnaces for the production of tin from its ores, and for the direct production of iron and steel respectively. (Page 395.)

A METHOD of differentiating between alternating and continuous-current mains and ascertaining if they are live and if they are carrying current, are discussed in our Questions and Answers columns. (Page 397.)

THE Specifications published by the Patent Office last week included one for a storage-battery portable jib crane, by the B.T.-H. Co.; one dealing with the cooling of dynamos and motors, by Siemens Bros. Dynamo Works and J. Howard, and a method of detecting the presence of icebergs or other bodies in the neighbourhood of ships at sea, by Adam Hilger, Ltd., and L. Bellingham. The method requires the use of thermopiles or bolometers. Opposition has been entered to the grant of several patents, including one by C. H. Fischer for drawing tungsten filaments. (Page 398.)

THE Oxford Corporation are recommended to accept a proposal for the adoption of petrol-electric tramcars. Colonel Sir H. A. Yorke has retired from the post of Chief Inspecting Officer of Railways for the Board of Trade. The single-phase electric railway through the Loetschberg Tunnel was inaugurated last week. (Page 399.)

THE appeals against the result of the arbitration between the Post Office and the National Telephone Company have been withdrawn, and a compromise has been arranged. Although the terms were not announced in Court, we are able to state that the sum realised by the National Telephone Company will enable the deferred shares to be paid off in full, and it is estimated that there will then be a further surplus of considerably over £100,000 for distribution. (Page 399.)

THE Aberdeen Borough Electrical Engineer has been awarded £250 damages in a libel action.—An interesting charge of "stealing" electricity has been heard at Weston-super-Mare.—The L.C.C. is not satisfied with the offers it has received for the purchase of the Musgrave steam engines at Greenwich.—Last year's profits from the Brighton Electricity undertaking have been transferred to relief of rates, despite the advice of the Borough Electrical Engineer.—There was a profit of £8,477 upon the Bradford Electricity undertaking for last year, £6,248 at Sunderland, and £7,725 at Hull. The Stalybridge Joint undertaking showed a loss of £9,124. (Page 399.)

TWO 5,000-kw. turbo-generators and two cooling towers are required at Birmingham, mains at Leeds, incandescent lamps by the L.C.C., generating plant at Roscrea and Mile End, motor-generator at Sunderland, and sub-station plant at Hackney. Extensions

are contemplated as follows:—Ipswich, £33,500; Keighley, £6,800; Hebden Bridge, £3,250. (Page 399.)

THE scheme for the reconstruction of Messrs. Crompton & Co. has been successfully carried through. Very satisfactory reports have been issued by Waygood & Co. and the Aron Meter Co. (Page 400.)

**Osram Lamp Patents.**—Before Mr. Justice Warrington in the Chancery Division of the High Courts on Tuesday, judgment was given with costs in default of defence against Messrs. David Smith and Co. for infringement of the Osram Lamp Patents.

**The "B. & K." Restaurant.**—This restaurant, in which the cooking is all carried out electrically, is now in thorough working order, and a wide variety of appetising dishes can always be obtained. Luncheons, teas, and dinners are served at the usual hours, as well as coffee, chocolate, &c., during the forenoon. The restaurant is situated at 254 to 260 Earl's Court Road, S.W., and is the property of the Brompton and Kensington Electricity Supply Co., Ltd. It was fully described in *ELECTRICAL ENGINEERING*, May 8th, p. 255.

**Action for Wrongful Dismissal.**—An action for wrongful dismissal brought by Major Glyn (Managing Director of Holophane, Ltd.) against the company has just been heard by Mr. Justice Bailhache and a special jury in the King's Bench Division. The jury, after deliberating for less than a minute on the evidence, which had lasted three days, found a verdict for Major Glyn for £400 damages, as being the equivalent of six months' notice. While Major Glyn was managing the Holophane business, they felt the competition of similar fittings made in Germany and sold under the name "Dilux." This business was bought up by the Holophane Company, and the fittings sold under the name of "Holophane." This resulted in Major Glyn's dismissal, which, as stated above, the jury found was not justified. Evidence by Professor S. P. Thompson, Mr. Haydn Harrison, Mr. C. C. Paterson, and others showed that the "Dilux" glass was slightly heavier, that the absorption of light was slightly less, but that the distribution was not quite so good as the "Holophane."

**Electrical Trades' Benevolent Institution.**—A letter from Mr. Justus Eck, Chairman of the Committee of this Institution, reaches us as we go to Press. Mr. Eck writes:—"On my return from Australasia I was much gratified to hear of Mr. G. Byng's splendid offer, namely, to give £100 to the funds of the Electrical Trades' Benevolent Institution if £1,000 could be raised in individual amounts of not less than £50 each, before July 16th, 1913. In view of the large number of wealthy persons connected with and benefiting by the electrical industry, however, I am surprised to find that over two months have gone by and the donations are still short of the amount by £250. The calls on the Institution for grants for temporary relief are increasing steadily, although the Committee has fortunately been able to keep the sum of the grants down to a low figure by their success in obtaining employment for most of the persons assisted, and no qualified person who has applied for assistance has failed to receive it."

**British Association.**—The preliminary programme for the British Association meeting at Birmingham, from September 10th-17th next, has now been issued. Among the papers arranged for Section G (Engineering) are "Some Effects of Atmospheric Conditions on Wireless Signals," by Prof. E. W. Marchant, and "The Nature of the Electromagnetic Waves employed in Radio-telegraphy, and the Mode of their Propagation," by Prof. G. W. O. Howe. Prof. Gisbert Kapp's Presidential Address, it may also be assumed, will contain some matters of electrical interest; whilst there is also to be a demonstration of electric cooking appliances. The annual report of the Committee on Gaseous Explosions will also be presented. In Section A (Mathematics and Physics) the following will be presented:—Presidential Address, by Dr. H. F. Baker; "Nature of X-Rays," by Prof. Barkla; Discussion on Radiation; "Lightning and Protection from It," by Sir J. Larmor; "A New Method of Starting a Mercury Vapour Lamp" and "A New Method of Sealing Electrical Conductors through Glass," by Mr. J. S. Anderson; "A Direct Method of Measuring Magnetic Susceptibility and Instruments for this Purpose," by Mr. W. H. F. Murdoch. There will also be a paper by Prof. E. Rutherford. In Section B (Chemistry) there will be a discussion on the Future of British Fuel, and a paper on the effect of impurities in commercial copper, by Mr. F. Johnson. In Section F (Economic Science and Statistics) there will be a discussion on Canals and Inland Waterways.

### The London Electrical Engineers.

(To-Day) THURSDAY, JULY 3RD.—C. Company. FRIDAY, JULY 4TH.—D. Company. Infantry Drill, 7 to 9 p.m. Technical Instruction for all members of the Sixth Rate and for all Candidates for Higher Rating, 7 to 9 p.m.

SAURDAY, JULY 5TH.—Royal Review.

MONDAY, JULY 7TH till FRIDAY, JULY 11TH. Headquarters open 10 a.m. till 4 p.m.

SAURDAY, JULY 12TH. Headquarters open 10 a.m. till noon.

## THE NATIONAL PHYSICAL LABORATORY

A LARGE gathering assembled at the National Physical Laboratory on Thursday last on the occasion of the opening of the new buildings of the Laboratory by the Rt. Hon. A. J. Balfour, F.R.S. The ceremony was held in the new building, in which will be constructed a large air channel and other apparatus for aeronautical research, and the chair was taken by Sir Archibald Geikie, P.R.S. (Chairman of the General Board of the Laboratory). A number of distinguished men were on the platform.

Sir A. Geikie in his introductory remarks referred to the growth of the laboratory and the pressing need that had existed for such buildings as the fine new administrative block now completed. Dr. R. T. Glazebrook added a few words apologising for the incomplete state of some of the new buildings, and regretting that they could not be shown fully equipped owing to insufficiency of funds. Lord Rayleigh referred further to the financial situation, saying that the Treasury had only seen fit to supply half of the £30,000 necessary for the new buildings, and if it had not been for a gift from the late Sir William White, the great liberality of the late Sir Julius Wernher and Lady Wernher, and a grant of £5,000 from the Commissioners of the 1851 Exhibition, the scheme could not have been carried out. They were still in want of adequate equipment. Some people had regretted that a larger proportion of the work of the laboratory could not have been devoted to pure science, apart from its applications, but unfortunately this was also a matter of funds, and perhaps the future would put them in a more fortunate position in this respect.

Mr. Balfour, in rising to declare the new buildings open, dealt with the general question of the *raison d'être* of the laboratory. It had often been asked why its work could not be left to private enterprise, and if of vital interest to the manufacturers, left to the industries themselves; and whether the work of standardisation and testing was really so important as to justify the spending of vast sums of public money. With regard to the latter question, measurement was the life-blood of physical science, although many things, such as life itself, could not be measured, and lay at the root of all its applications to practice. Such means of measurement as were provided at the National Physical Laboratory were not only desirable, but if neglected would inevitably cause this country to fall behind. In answer to his first question, it was of great advantage, both to the manufacturer and to the purchaser, to have an independent authority to appeal to, and it was an economy of resources to have a central place to which all manufacturers could come on an equal footing. He shared Lord Rayleigh's regret that a larger proportion of the labours of the laboratory could not have been devoted to abstract scientific investigation. It was to the labours of men working for purely scientific ends that mankind would be most indebted in the future. He hoped that this truth would sink into the public mind and be reflected in a different attitude on the part of those responsible for public expenditure.

Colonel Seely, in proposing a vote of thanks to Mr. Balfour, said that if life could not be measured by science, it could be saved by science. The investigations of the laboratory into the problems of aeronautics had already elucidated concrete facts that had undoubtedly saved the lives of many brave men. He concluded with a well-deserved eulogy of Mr. Balfour's abilities, which elicited a modest reply. The proceedings concluded with a vote of thanks to the Chairman.

The visitors then proceeded to an inspection of the new buildings, which include a central block with ample accommodation for administrative offices, library and lecture room, a north wing for dealing with the reception and despatch of instruments and materials sent in for test, and a south wing for the optics laboratories, to which some of the work formerly carried out at Kew is being transferred. The buildings form the completion of a scheme initiated in 1909 at an estimated cost of £30,000, to which the Treasury contributed £15,000. In 1910 the late Sir Julius Wernher gave £10,000 for the metallurgy building, and some additional cost in its erection was defrayed by Lady Wernher. The building fund was completed by a grant of £5,000 by the Commissioners of the 1851 Exhibition, and £4,000 has been given by the Drapers' Company to found a library in memory of Sir William White. Further funds are still needed to provide equipment. The various other departments were inspected by parties of visitors, and while tea was partaken of on the lawn the interest was added to by the passage of an aeroplane over the grounds.



The Annual Report of the National Physical Laboratory records a large amount of work accomplished in its various departments during 1912, as well as work in co-operation with other bodies.

With regard to the work of electrical interest, Mr. F. E. Smith, in the Physics Department, has nearly completed the measurements necessary to determine the absolute value of the resistance of the international ohm, and his report indicates the high order of accuracy which may be expected. Fourteen new mercury-resistance standards have been constructed; of these five were for the Japanese Government. The value of the international ohm, as found from the old tubes, agrees with that obtained from the new tubes just set up within 1 part in 100,000. The Laboratory standards of resistance have been again compared with those of the Bureau of Standards, the Reichsanstalt, and the Laboratoire Central d'Electricité. The maximum difference is 11 parts in 1,000,000; the Laboratory and the Reichsanstalt agree within 1 part in 1,000,000. The value found at the Bureau of Standards was 1 part in 100,000 greater. During the year, Mr. Campbell communicated to the Royal Society an interesting account of a determination of the ohm by two novel methods, using alternating-current and resistances of considerable value.

A large amount of general testing has been done, including 2,852 tests, and investigation has been prosecuted into power factors of condensers and change of capacity with frequency, wave-meter testing and magnetic testing apparatus. A good deal of new apparatus has also been set up. In the photometric division, the most important researches have been the determination of the candle power of a set of twenty-four tungsten lamps running at 1.5 watts per candle, an investiga-

tion for the Board of Trade into the visibility of ships' lights, and a large number of tests for the Engineering Standards Committee on metallic filament lamps. These are intended to form the basis of a specification by the Committee. Mr. Paterson has become Secretary of a sub-committee appointed to formulate proposals for the reconstitution of the International Photometric Commission, which will, it is hoped, be able to extend its valuable work in connection with problems of photometry and illumination. Another series of investigations for the same Committee has been on the heating of lamp sockets, while much information has been obtained for the Admiralty on the dielectric properties of ebonite and mica. Mr. Melsom has carried out some valuable investigations for the Institution of Electrical Engineers into the heating of flexible cords and cables, while Mr. Rayner read a Paper before the Institution, summarising his work on high-voltage tests and dielectric loss in insulating materials. In the thermometry division, the research work during the latter part of the year has suffered on account of Dr. Harker's regrettable illness. Earlier in the year an important Paper dealing with the discharge of electricity from matter at a high temperature was presented to the Royal Society by Dr. Harker and Dr. Kaye.

Among the work proposed for the current year may be mentioned the investigation on the magnetic testing of rods and strips, including magnet-steel tests, and incidentally the more accurate determination of the areas of search coils; while in connection with the Research Committee of the Institution of Electrical Engineers, some experiments on the steel most suitable for magnets may be undertaken.

## ELECTRICITY IN FACTORIES AND WORKSHOPS

THE Annual Report of the Chief Inspector of Factories and Workshops for 1912, which has just been issued, contains both in the sectional reports and that of Mr. G. S. Ram, the Electrical Inspector, many references to electrical working.

### ELECTRICAL ACCIDENTS.

Mr. Ram's report records 334 non-electrical (including 11 fatalities) and 58 electrical accidents (four of them fatal) at public supply stations, and 37 non-electrical and 16 electrical non-fatal accidents at other stations. The non-electrical accidents are more by 25 per cent. than in the previous year, but the electrical accidents, both fatal and non-fatal, are the same in number. The large proportion (27) due to working at live switchboards, &c., provokes the remark that risks are often taken unnecessarily by engineers and attendants familiar with the dangers. This is fully borne out by the details of the three fatal cases under this heading. The other fatal electrical accident was due to a man walking in the dark into a cable which was under test in the yard of a substation.

The electrical accidents reported at factories other than electrical stations were 283 in number, of which 15 were fatal, and are classified as follows: Arcing of switches, 23; arcing of fuses, 8; shock or burns from fuses when replacing fuse-wires, 27; portable apparatus, connectors and flexible wires, 61; unprotected conductors, switches, terminals, fuses, &c., 27 (one fatal); working on or near live conductors: skilled persons, 32; unskilled persons, 33 (five fatal); miscellaneous accidents in electrical manufacturing and repair works—mostly in testing operations, 32; adjusting brushes and cleaning commutators, and flashing at commutators, 9; miscellaneous, 31 (nine fatal).

Ten of the cases of arcing of switches were due to switching on motors with the starting resistance cut out. Of the accidents due to the use of portable apparatus, half the total were due to damaged flexible conductors. In one case the fusing of the flexible to a portable lamp set fire to petrol in a garage. Nineteen accidents due to improperly constructed connectors, and eight to improperly constructed hand lamps would have been avoided by following Mr. Ram's recommendations in previous reports. The fatal case due to unprotected conductors occurred to a lad in touching live parts (460 volts D.C.) of a controller, the cover of which had been left off. Most of the accidents due to skilled persons working on line conductors could, in Mr. Ram's opinion, have been avoided, as the work need not have been done whilst the conductors were live. The five fatal accidents under this heading occurred to "unskilled" persons. Two were to labourers working on overhead cranes, two to men painting transmission line poles when they thought the line was dead, and one to an assistant commencing work before

receiving instructions. The accidents in testing departments were less than usual. Among the nine miscellaneous fatalities; one was due to the very usual cause of a man receiving a shock from foot to foot while walking over electrically-charged ground. Five occurred in connection with cranes, one was caused by disused wires which were still live, and in another case a man working near an electric lift under erection did not know the gear was live. One accident was due to breakage of an overhead wire during a gale.

Three switchboard fires are reported in public supply stations. Mr. Ram recapitulates the circumstances, and remarks that in all three cases it was the covering of the cables that burned and spread the fire, and although some of the cables were in so-called "fireproof" composition tubes, these appear to have been of little, if any, use in checking the spread of the fire. That where the cables are in a covered trench or under a ceiling or roof, they are most readily attacked, he continues, has been further clearly demonstrated in the case of a fourth station fire which has occurred since the period covered by this report. In this last case the cables were in a subway some six or seven feet in height, and were laid on insulators on racks on each side of the gangway. All the cables within about two feet of the roof of the subway had their insulation completely burned off, but those nearer the ground were practically undamaged. In many of the older stations the cables and wires behind the switchboards and in cable trenches and subways are hopelessly mixed up, so that should a fire be started at any point it would be impossible to prevent it from rapidly spreading and involving the whole. It is a common practice in electrical stations for the cables to be taken from trenches or subways up the wall of the building to the switchboard gallery, the floor of the gallery being cut away, leaving a permanent opening some 12 inches wide all along for the cables to pass through. Two of these fires show the danger of this opening in the floor by allowing the fire to pass upwards and involving the switchboards in the gallery or room above. So long as cables with inflammable insulation are used in electrical stations, it is obvious that some safer system of isolating and protecting them is necessary if the possibility of such disasters is to be prevented. There are no doubt difficulties in many stations on account of the large number of cables which have to be accommodated, but it might be practicable in many cases to separate the cables in channels of brick or stoneware in such a way as would prevent the spreading of a fire from cable to cable. The small wires for instruments, regulating resistances, &c., are often a source of danger, being poorly insulated and looped about anyhow at the backs of the switchboards. It is generally recognised that inflammable woodwork, particularly soft wood, should not enter into the construction of switch-

boards, yet I recently found a new high-tension three-phase switchboard in a public supply generating station practically enclosed in woodwork; the bus-bars were just below a match-board ceiling, and the whole passage-way at the back of the open-fronted cells was enclosed by deal boarding. Whilst there has been a very great advance in the design of high-tension switchboards during the last few years, the same attention has not been given to the design of direct-current medium-pressure boards. These switchboards are commonly arranged so that it is impossible to do any work upon them without danger of making a short circuit. Many of the short circuits due to men working on the live conductors have been between one conductor and the earthed framework. There is nothing impracticable in protecting the framework by slate or other suitable material and protecting bolt heads on the front of the panels in such a way as to overcome this danger, or in putting more divisions between adjacent conductors of opposite polarity, and the extra cost involved would be well repaid by the increased security against accident and breakdown. Again, in comparatively few stations are insulated spanners or special tools provided for use on live switchboards. There are still many examples of switches and switch fuses not arranged "so that the hand cannot inadvertently touch live metal."

Of the above 18 fatalities directly due to electric shock, five were on high-pressure or extra-high pressure alternating-current systems. Ten were on medium-pressure alternating systems; six of these were shock to earth on three-phase systems of which the pressure between phases was 440 volts or less, and as the neutral point was earthed in probably each case, the pressure received would not exceed 250 volts in any instance. One was from a 200-volt single-phase system. Of the two on direct-current systems, one was on a 460-volt three-wire system, but not having the middle wire earthed, and the other on a 220 volt two-wire system.

In only nine cases is it clear that any attempt was made to resuscitate the victim by means of artificial respiration. Mr. Ram emphasises the importance of not only applying artificial respiration in every case, but continuing it a sufficiently long time, and quotes medical opinion to the effect that "practically every case can be revived, and most of these will make a complete recovery if first-aid is promptly forthcoming and properly applied."

#### LEAD POISONING IN ACCUMULATOR FACTORIES.

The reports of the sectional inspectors of the different localities, as well as that of the medical inspector, bring out the regrettable fact that there has been an increase in the proportion of lead-poisoning cases in accumulator factories, due principally to the inhaling of dust and fumes. This is particularly the case in the South-Eastern District, where, in East London alone, there were 13 cases as against a total of 19 for the whole of the previous six years. The more complete provision of exhaust ventilation is being pressed for as a remedy.

#### LIGHTING.

Conditions of illumination are dealt with to an increased extent by factory inspectors, and a special report is given this year on the artificial lighting of iron foundries by Mr. D. R. Wilson. The dull colour of the floor and surroundings, and the frequent presence of dust and smoke, render a high degree of illumination necessary, and shadows are particularly undesirable. The method recommended is by powerful units fixed as high as possible above the floor, and spaced comparatively close together. Observations of the illumination in a number of actual cases are tabulated. The investigation appears to show that the illumination received on a horizontal plane one foot above the floor level does not fall below 0.5 foot-candle in well-lighted iron foundries, 0.3-0.4 in fairly well-lighted, 0.2-0.3 in moderately, 0.1-0.2 in poorly, and is below 0.1 in badly-lighted foundries. It would seem, therefore, that the lighting cannot be deemed to be adequate unless the illumination received on a horizontal plane one foot above the floor level is not less than one-third of a foot-candle over any part in which work is being carried on or over which any person is liable to pass.

Several of the sectional inspectors refer to illumination, and Mr. Skinner (Bristol) in particular is encouraging the avoidance of glare by frosted lamps and suitable shades. In some cases, such as Leicester, the successful introduction of mercury vapour lamps is reported, and from Londonderry the inspector writes:—"In one large factory 70 16-c.p. metal filament lamps were replaced by four mercury vapour lamps placed under the ceiling. Although, owing to the light being more concentrated with these lamps, the candle-power required to give the necessary illumination is greater, it has

been found that the light is much softer on the eyes of the workers and that headache is in consequence less frequent amongst the girls than it used to be.

#### MISCELLANEOUS.

The report of the principal lady inspector calls attention to the conditions in incandescent lamp factories. In some of the sealing-in and exhausting departments, where a large amount of gas is continually burnt, unduly high temperatures were found. The effect of certain operations on the eyesight of the workers has also been inquired into, but complaints of eye-strain, though sometimes met with, were not common. Glasses of smoked or blue glass are sometimes provided and worn for the testing work. In the manufacture of arc lamps, the occurrence of electrical ophthalmia among the men was met with, but there seems no evidence of anything resembling this among those exposed to the weaker light of incandescent lamps, nor of any gradually progressive injury to the sight. The Diesel engine explosion at Bray is referred to in the special report on dangerous trades, and, after discussing some other similar cases, it is remarked that the danger of explosion is considerably accentuated if compressed oxygen is used for the purpose of starting any type of internal combustion engines.

### OSRAM LAMPS ON THE JUNGFRAU RAILWAY

SOME time ago we chronicled the fact that electric light had been installed on the Jungfrau Mountain Railway in Switzerland, and in view of this we think that the accompanying illustration may prove of considerable interest to our readers. The highest railway station in the world, situated 3475 metres above the sea level, on the Jungfrau electric mountain railway, is lighted by means of Osram drawn wire lamps.

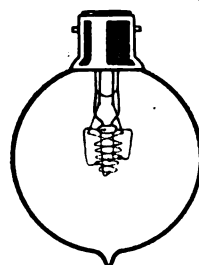


THE JUNGFRAU RAILWAY.

The station having been satisfactorily lighted, the next step was the application of these lamps to the illumination of the trains. The above illustration shows one of the trains with its three-phase rack locomotive. The nature of the work is a fine illustration of the way in which Osram lamps are able to withstand the jolts and jars.

### MAZDA AUTOMOBILE LAMPS

A FOLDER dealing with various types and sizes of Mazda drawn wire automobile lamps has been issued recently by the British Thomson-Houston Co. (77 Upper Thames Street, E.C.). These lamps are not merely standard lamps made in



MAZDA HEADLAMP.

small sizes, but have been specially designed for the peculiar conditions of motor-car service. They are tremendously strong, and are not affected in any way by jolting or vibration, and they are between three and four times as efficient as carbon filament lamps. The lamps include headlight lamps, side and rearlight lamps, and tubular and festoon lamps for interior lighting. In each class the filaments have been constructed with the object of giving the most suitable distribution of light for the particular purpose. The headlight lamp, for example, has a very small helical coil filament approaching as nearly as possible the theoretical point source, so that when used in a parabolic reflector all the light is thrown forward in a parallel beam. They are supplied in voltages from 4 to 12, and in candle-powers from 6 to 50. Side and rearlight lamps are made in voltages from 2 to 12, and in candle-powers from 1 to 12, while the tubular and festoon lamps range from 2 to 12 volts and from 1 to 8 candle-power.

*Important Notice.*

---

# METAL FILAMENT LAMPS.

---

**THE OSRAM LAMP WORKS, Ltd.,**  
hereby inform the Trade and the Public that

## A WRIT HAS BEEN SERVED

by them FOR INFRINGEMENT OF THEIR  
METAL FILAMENT LAMP PATENTS, on  
the suppliers of

## THE "SERENA" LAMP

—THE LONDON & PROVINCIAL ELECTRIC LAMP Co.,  
24-26, Mitre Street, Aldgate, E.C.

*Manufactured by*  
**SERENA METAAL GLOEILAMPEN FABRIEK**  
**NIJMEGEN, HOLLAND,**

and AN INTERIM INJUNCTION will be  
applied for.

---

**ANY DEALERS IN OR USERS OF SUCH LAMPS**  
**WILL BE SIMILARLY PROCEEDED AGAINST.**





Copper (electrolytic wire bars), £69 5s. per ton of 2,240 lbs.; aluminium (electrolytic wire bars), £90 10s. per ton of 2,240 lbs.

This price of copper is about 5 per cent. higher than the average price for the last 15 years, during which period it has fluctuated between £54 and £122 per ton. On the other hand, aluminium has fallen from about £200 per ton to the above figure, after making a somewhat artificial drop to £60.

The author then gave tables comparing the costs of aluminium and copper cables, all designed to comply with the Engineering Standards Committee's Specification of March, 1910.

For 0.1 sq. in. 3-core medium pressure copper cables, and the equivalent aluminium cables (1.66 sq. in.) he found that the aluminium cables is the cheaper in plain lead-sheathed cables whenever aluminium wire bars are less than £22 per ton above the price of copper bars; in single-wire armoured cables whenever aluminium wire bars are less than £10 per ton above the price of copper bars; and in double-wire armoured cables, only when aluminium wire bars are lower in price than copper bars. In all cases, however, the percentage saving is small.

It is for low- and medium-pressure D.-C. cables that the chief economy is shown when using aluminium. A comparison made by Mr. Welbourn between a 0.30 sq. in. copper single conductor paper-insulated lead-sheathed cable and the equivalent 0.50 sq. in. aluminium cable, both being built to comply with the Home Office Rules, shows that, for a plain lead-sheathed cable, there is a saving of 8 per cent. when aluminium bars are £22 per ton greater than copper, and that this saving will actually become 17½ per cent. if at any time aluminium is £10 per ton cheaper than copper. With single-wire armoured cables the saving is 4½ per cent. when aluminium is £10 per ton above the price of copper, but with double-wire armoured cable of this size, the saving which can be effected by aluminium, even when it is £10 per ton cheaper than copper, would only be 4½ per cent. Comparisons of bitumen-insulated D.-C. cables give very similar results. The author also pointed out that with larger sizes of unarmoured D.-C. cables the saving by using aluminium is greater, and stated also that unarmoured concentric and triple concentric aluminium cables for pressures up to 650 volts usually show a considerable saving over the equivalent copper cables.

The remainder of the Paper dealt with Overhead Lines and Jointing, and we hope to publish this portion, together with the discussion, in our next issue.

## ELECTRIC MINING AND METALLURGICAL PATENTS OF JUNE

### Mining.

THE only patent specification of particular interest to mining electrical engineers published during the past month is No. 14,494/12 by J. H. Hoadley (President of the Consolidated Coal and Iron Co., U.S.A.). The specification covers a method of mining coal which consists in comminuting the coal as it is removed from the seam by continuously moving fluids, introducing it into a producer, and then conveying the gas out of the mine through pipes.

### Metallurgical.

In specification No. 11,643/12, by W. E. Gibbs (Birkenhead), is described a process for extracting tin from its ores and slags by the electrolysis of the fused mass (which is heated in a reverberating furnace). The cathode consists of a layer of molten tin and is connected by a channel with a smaller vessel containing the liquid tin. After the tin has been extracted a similar process is carried on with separate cathodes, for the extraction of any tungsten, titanium, and molybdenum present. Specification No. 16,275/12 by A. Hiorth (Norway) deals with the direct production of iron and steel from the ore. Purified gases rich in carbon monoxide and nitrogen compounds are forced with air or oxygen into the upper part of the charge of a shaft furnace, and also through an electric arc furnace into a hearth furnace directly connected with and taking up the molten mass from the shaft furnace. The charge consists of ore with or without a slight addition of carbonaceous material. The gas from the top of the shaft furnace may be supplied to a gas producer for obtaining the necessary gases. They may be preheated by being passed through a jacket surrounding the shaft furnace.

## GENERAL REGULATIONS UNDER THE COAL MINES ACT

LORD MERSEY, sitting as referee, has had the draft general regulations made by the Home Office under the Coal Mines Act, 1911, and the objections to them, before him from June 17th to 27th. Few points of special interest to mining electrical engineers were raised as the electrical regulations have already been settled (ELECTRICAL ENGINEERING, February 6th, p. 74). The objections lodged to the General Regulations were also announced in ELECTRICAL ENGINEERING for May 1st, p. 244.

When regulation No. 68, under the heading "Use of Electric Lamps [Section 32]" came up for discussion, Sir T. Ratcliffe Ellis, who represented the Mining Association and the Colliery Managers' Association, asked that the words "other than Locked Safety Lamps" might be inserted in the heading, as this was what was intended. This was allowed. The regulation itself as drafted did not allow electric lamps within 300 yards of the coal face. Amendments were proposed by Sir T. Ratcliffe Ellis to give permission to use incandescent electric lamps in any part of a mine where the percentage of inflammable gas in the general body of the air in that place did not exceed 1½. In support of this it was pointed out that especially on haulage roads (where the greater number of accidents occur) it is very necessary to have a good light. Witnesses, including Mr. W. C. Blackett (President, North of England Institute of Mining and Mechanical Engineers) said that these enclosed lamps were safer than safety lamps. Mr. Blackett also said that there was less likelihood of an explosion resulting from the fracture of an incandescent electric lamp in an explosive mixture than a safety lamp. Mr. Redmayne (H.M. Chief Inspector of Mines) argued that in most cases it was dangerous to take these lamps nearer the coal face than 300 yards because falls of roof were more frequent, and because blowers or temporary blowers of gas would not allow time for the current to be switched off. He suggested that electric safety lamps could be used. A safety lamp giving 7 c.p. had, he said, recently been submitted to the Home Office for tests. In few cases were the main haulage roads carried so near the face. Evidence was given of the existence of such cases and also of pumps and other electrical machinery within that distance which were lighted by electric lamps.

Mr. Smillie (President of the Miners' Federation) admitted that the men had an "honest fear of electricity" for any purpose underground. They did not like electric safety lamps because there was no means of detecting the presence of inflammable gas. Eventually Lord Mersey said he must allow the regulation as drafted, leaving those cases which he was sure existed where it would be right to permit the use of electric lamps close to the face to be dealt with by special rules. He hoped he was right in the attitude he took up, but did not feel sure about it.

Other important regulations were those relating to the proposed substitution of a uniform code of signals for signalling for both winding and haulage. Regulation 82, relating to winding, was finally amended, and it was made necessary for the installation in every case of "an appliance which shall automatically indicate the signal to the winding engineman until the signal is complied with." This regulation does not come into force till July 1st, 1914. It was not made necessary for an indicator to be installed for haulage, but evidence was given by several mine managers that they used electric signalling systems in which each signal rang the bell at the sending station as well as at every other station in the circuit, so that all stations knew what signals were being given. It was argued that with this system it was not necessary to repeat the signals as required by the new regulations, as if one bell rang it followed that all the others did. The regulation relating to repeating all signals received was, however, passed. Regulation 91, relating to the installation of telephones, was also amended on the application of Sir T. Ratcliffe-Ellis, and it now reads thus:—"Where in any mine not being a small mine the distance of the main haulage from the shaft exceeds 1,000 yards, efficient means of telephonic communication shall be provided and maintained between the end of the main haulage and the pit bottom, and thence to the surface. This regulation shall not apply to mines of stratified ironstone in the Cleveland district or to mines in any other district, as respects which the Secretary of State is satisfied that similar conditions prevail."

## ELECTRICITY IN MINING

THIS is the title of a handsome volume, with nearly two hundred illustrations, which has been compiled by Siemens Brothers Dynamo Works, Ltd., and is published by C. Griffin & Co. at the price of 10s. 6d. net. The first of its twenty chapters deals generally with the object and scope of electrical mining installations, and this is followed by selected descriptions of large distribution systems in various parts of the world, including the Cambrian Colliery group and the extensive system of the Powell Duffryn Steam Coal Co. in South Wales, the interlinked power companies of the north-east coast, and some large German systems. After a few words on choice of pressure and system, the plant is

studied more in detail, and reciprocating engines, steam turbines, gas engines, Diesel engines, and water-driven generating plant are treated successively with a wealth of illustration of actual examples. A few illustrations indicate the different types of switchgear that may be employed in generating stations, including a particularly neat compromise between the desk board and the pillar for remote control. The subject of transmission is then completed by details of typical examples of transformers, cables, and overhead lines. After thus indicating how electric power is supplied to collieries, its uses at the pit are studied in more detail. Some forty pages, containing as many illustrations, give us an excellent idea of modern practice in electric winding engines, both as driven by three-phase induction or series commutator motors, and by the Ward-Leonard continuous-current system. Not the least interesting part is that devoted to the load equalisation, and the battery system, with Pirani type of booster, is described, as well as the world-famed Siemens-Ilgner flywheel system. Examples of such installations are taken from Germany, Austria, Holland, France, and South Wales, including some remarkable plants where the actual winder is mounted on the headgear right over the shaft. Electric pumping plant is also treated by the aid of numerous examples, embracing reciprocating and centrifugal apparatus, the latter including vertical shaft direct-coupled sets for sinking work. The conditions to be met by fan motors and air compressors are then discussed, and among the examples the interesting Rand turbo-compressor station at Robinson Deep is illustrated. Other classes of apparatus dealt with are underground haulages and hoists, and such auxiliary in-by machines as portable air compressors, pumping sets and fans. The field of usefulness of the electric locomotive, both underground and on the surface, is then discussed, and among the examples illustrated is the traction system of the Harton Coal Co. A few examples of electrically-driven coal washeries, briquette factories, &c., are next illustrated, and a few words are added on machinery specially designed for transport in foreign lands. The next chapter puts forward the claims of the electric rock-drill, of which the Siemens firms were among the pioneers, and then we come to the all-important subject of switchgears for use below ground, and flame-proof motors and apparatus generally. Finally, electric signalling systems for mines and shot-firing apparatus are dealt with, and we lay down the book with our ideas widened as to the vast store of experience which the Siemens companies have to draw upon, the completeness of the study their engineers have given to the subject, and the success which is attending their efforts.

**Electric Locomotives at Collieries.**—The Harton Coal Co. are further extending their electrically-worked railways between their collieries in the South Shields district, and have ordered a new eight-wheeled, 140-ton locomotive from the A.E.G. Electric Co. This locomotive will be 35 ft. in length, and will be carried upon two four-wheeled bogies equipped with four motors of 70 h.p. each. It will be worked by direct current at 500 to 550 volts, supplied by an overhead line. The bogie-wheel base will be 5 ft. 4 in., and the centres of bogies will be placed 18 ft. apart. The locomotive will have a speed of eight miles an hour, and a tractive effort of 12,200 lb.

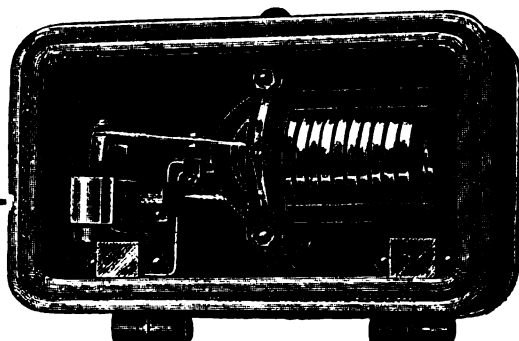
**Production of Electrical Steel.**—There are at the present time 14 plants in the United States equipped with electric furnaces, while five other contracts have been let, says *The Iron Age* (New York). From 1909 till 1911 the following countries show considerable continuous increases in the production of electric steel: Germany and Luxemburg, Austria-Hungary, France, and Sweden; but the United States shows a falling off in the output for 1910 to 1911 of over 44 per cent. In America the practice is generally to take the steel to the electric furnaces in a molten condition from Bessemer converters or open-hearth furnaces. On the Continent, and to some extent also in this country, cold metal is usually charged into the furnaces and melted by electricity. In Italy there were four electric furnaces in operation in 1911, two in 1910, and five in 1909. In Sweden the numbers were 13, 12, and 11 for the three years, and in Germany 15 in 1911 and 13 in 1910, while in France the number in operation in 1910 was 21, compared with 12 in 1909 and seven in 1908. In 1911 almost half the world's output of 128,510 tons was supplied by Germany, while Sweden accounted for 2,034 tons only.



# FOR BRITISH MANUFACTURED PAPER INSULATED CABLES

## THE UNION CABLE CO., LD

DAGENHAM DOCK,  
ESSEX.



## Automatic Battery Cutcuts.

RECORD'S PATENT.

### CHIEF POINTS ARE:—

Differential Action.

Only Two Terminals to Connect.

No Permanent Shunt Coil.

Magnet can never depolarise.

Handsome Case.

### Competitive Prices.

30 Amps.	50 Volts	-	£3	5	0
50	" 50 "	-	£3	12	0

Liberal Discount to the Trade.

Further Prices and Particulars, see List C 1.

## THE RECORD ELECTRICAL COMPANY, LTD.

London Office, 'Phone, Works, 'Phone,  
Caxton House, 3057, E.R.C. Broadheath, 164  
Westminster, S.W. Victoria, Manchester, Altrincham.

Agents for South Wales:—Hunter & Swan, Gordon Chambers, Cardiff.

Agents for Ireland:—Hurst Electric Manufacturing Co., Belfast.

Agents for Scotland:—C. E. Hart, Standard Buildings, Glasgow.

Agents for Midlands:—Messrs. Wansbrough, Skelsey & Gunther, Exchange Buildings, Birmingham.

# ADAMS IGRANIC

ELECTRIC CONTROL GEAR FOR LIFTS, CRANES AND HOISTS.

ADAMS  
M<sup>FG</sup> C<sup>Y</sup> L<sup>D</sup>  
BEDFORD  
AND  
LONDON

## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,345.

"HARMONIC" has made up a wireless telegraph installation, and he finds that if he simply taps a few feet of flex on one side of any lamp in his electric lighting installation, he can receive signals from a number of wireless stations, and some of these are exceedingly clear. He does this when the lamp is actually alight, and he also finds that he still gets signals when the main fuses are out, but in this case he believes belonging to one station only. How is this explained?

(Replies must be received not later than first post, July 10th.)

### ANSWERS TO No. 1,343.

There are twelve three-core lead and armoured cables suspended in a culvert. Ten are for three-phase current; two are for direct current. I wish to test by some simple method in the culvert, without cutting the cables, to ascertain which are carrying three-phase current and direct current respectively, which are dead and which are alive, but not delivering current. There are no link boxes. The apparatus used must be such that one man can carry it. How can this be done?—R. S.

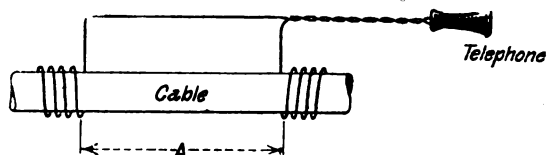
The conditions of the question make the problem rather a difficult one, and it is questionable whether there is any way to obtain the information with any degree of certainty in the manner required by the questioner. Few replies have therefore been received. An award of 10s. has been made to J. F. ROMER, who writes as below. Too much reliance, however, should not be placed upon the test, as methods relying upon want of balance in three-phase circuits, and slight inductive effects, are often liable to give misleading results.

When a lead-covered or armoured cable is carrying an alternating current there is usually an appreciable potential difference between different points on the metal covering, and if any two points are connected by a telephone as a shunt, a characteristic hum will be heard corresponding to the frequency. In order to carry out this test, a telephone of about 50 ohms resistance and two long flexible wires are required. Select a length of the cable which is not touching any conductor, and having bared both ends of the two flexibles wind one end of each flexible round the cable sheathing, and connect the two other ends to the telephone terminals as shown in the diagram. The distance A should be made as great as possible.

On three-core cables carrying three-phase current, if the phases were exactly balanced no sound might be heard, as

the induced E.M.F.'s tend to neutralise each other, but the phases are usually sufficiently out of balance for this test to be used. If the cables are sufficiently slack so that a temporary U-bend can be made, a much better result will be obtained by using a search coil of about 50 turns of No. 20 S.W.G. cotton-covered wire wound into a coil about a foot in diameter. This is connected to the telephone, and the coil held near the U-bend and parallel to it. Both the above methods require a large current to be flowing in the cables.

After testing all the cables in the above manner, those which produce no sound in the telephone should be re-tested



with the search coil connected to a sensitive galvanometer of about 20 ohms resistance (a Unipivot instrument would do). On jerking the search coil about in front of the U-bend a deflection will be produced on the galvanometer if continuous current is flowing in the cable.

There is no method of distinguishing between cables which are dead and those which are alive, but not carrying current, without cutting the cables, and since the metal covering is earthed a leakage test cannot be used.

## ANSWERS TO CORRESPONDENTS

**INTERESTED.**—The conductivity of your armouring is ample; that of the copper sheath alone is considerably more than the value required by the regulations, which is half that of one conductor.

## CATALOGUES, PAMPHLETS, &c., RECEIVED

**ELECTRIC PORTABLE TOOLS, &c.**—A collection of leaflets from the Westminster Tool and Electric Co. (Suffolk House, Lawrence Pountney Hill, Cannon Street, E.C.) gives particulars of a variety of patterns of portable electric-driven drills, pillar drills, magnetic holding on devices, chucks and fixing plates, electric grinders, and other convenient portable tools.

**COLLIERY CABLES.**—The Paper read a short time ago by Mr. W. T. Anderson before the Manchester Geological and Mining Society on Colliery Cables (*ELECTRICAL ENGINEERING*, March 6th, p. 132), is now available complete with the discussion. Messrs. W. T. Glover and Co., Ltd. (Trafford Park, Manchester), will be glad to supply a copy to any of our readers who are interested in this subject.

**GLOVER'S ALMANAC.**—This well-known collection of humour, wisdom, and art makes its twelfth appearance, as usual, in the middle of the year. The contents appear to be well up to the high average already established, and we look forward to enjoying each daily slip in due sequence.

**Air Filtration.**—A clerical error occurred in our report of Mr. J. Shepherd's remarks during the discussion on Air Filtration, published last week (p. 376). The example he gave was of a 10,000-kw. generator, and not of a 1,000-kw. generator. Our readers will doubtless already have divined this from the context; and, in fact, the machine is actually mentioned as a 10,000 kw. machine lower down in the report.

**Conversazione of the Institution of Electrical Engineers.**—The annual conversazione of the Institution of Electrical Engineers was held on Thursday last at the Natural History Museum, South Kensington. About 1,200 members and guests were received by the President, Mr. W. Duddell, and Mrs. John Smithers and the Council. Enjoyable selections of music were rendered by the String Band of the Royal Engineers in the Central Hall, and the Royal Windsor Glee Singers executed a varied programme of vocal music with the same ability as on previous occasions.

# "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

## Specifications Published June 26th, 1913

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

Names in italics indicate communicators of inventions from abroad.

152/12. **Lighting Gas Lamps.** H. S. COOKE and F. WESTWOOD. To light the lamps on automobiles, a circuit is taken to the lamps from the magneto or ignition coil through a make and break switch, the circuit to each lamp ending in a spark gap over the burner. Two figures.

5,424/12. **Projecting Pictures.** F. DUSSAUD. For projecting pictures from transparent or opaque films, &c., low-pressure incandescent lamps (i.e., below 25 volts) emitting a light less than 30 c.p. at the normal pressure, are subjected to a pressure of 50 to 150 per cent. above their normal pressure, and are supplied with a parabolic reflector or short-focus condenser with a ratio between diameter and focal length of 1.8. It is claimed that the apparatus gives results as good as when one or two hundred times the energy is used in other apparatus. Five figures.

10,576/12. **Detecting Presence of Icebergs, &c.** ADAM HILGER, LTD., and L. BELLINGHAM. A ship is provided with a thermopile or bolometer, which is directed towards the region to be searched. It is connected to indicators through relays actuated by changes in the E.M.F. of the thermopile, or in the resistance of the bolometer due to variations in the radiation of energy to or from the receiver due to the presence of cooler or warmer bodies. Two figures.

12,530/12. **Manufacture of Insulated Wire Coils.** L. FRENKEL. The whole of the operations of varnishing, fibre-covering, baking, &c., are performed while the wire passes from the unwinding drum in its bare condition to the drum on which it arrives in its finished coiled state. The wire is simply made to travel through successive baths, where the desired operations are carried out. One figure.

15,155/12. **Submarine Telegraphy.** E. S. HEURTLEY. Morse signals are sent into the cable by impulses produced by a vibrating contact maker controlled by the sending apparatus, so that the impulses are in all cases fully completed and of equal duration, independently of the contact made by the key. It is arranged that consecutive signals are of opposite sign, and the speed of the contact maker is controlled by electric retardation, mechanical inertia, cams, or by a train of wheels. The duration of the impulses is controlled by a relay, and two messages may be sent through the cable in the same direction at one time, and also code signals may be formed. Five figures.

14,518/12. **Ammeters, Voltmeters, and Wattmeters.** B. T.-H. Co. and A. P. YOUNG. A thin strip of a conductor on one side of a coil is mounted in the narrow air gap of a permanent or electro-magnet. This coil is mounted on light strip conducting springs, so that on the passage of current it is compelled to move bodily across the lines of force. The springs are very flexible in the direction in which motion takes place, but stiff to motion in other directions. The motion is transmitted to the pointer through suitable multiplying gear. Five figures.

16,318/12. **Conduit Continuity Clip.** E. A. EDWARDS (Credenda Conduits Co.). A split tapered sleeve or bush is knurled or roughened externally or internally, and embraces the conduit and enters the adjacent end of a fitting in which it is a tight fit. Four figures.

18,087/12. **Cooling Dynamos and Motors.** SIEMENS DYNAMO WORKS and J. W. HOWARD. A transverse air current is set up between an inner and an outer casing by a fan on the end of the spindle. The inner casing encloses the working parts, and the main frame forms the outer casing, while the former comprises two cup-like shells secured to the stator and the shaft bearings. Two figures.

18,746/12. **Storage Battery Cranes.** B. T.-H. Co. (G.E. Co., U.S.A.). A hoisting jib, which may be locked in the hoisting position, is located at the forward end of a chassis so as to overhang it, and the hoisting gear, consisting of a winding drum, motor, and controller, is situated at the base of the jib, while a propelling motor is located at the back of the chassis and drives the road wheels through chains, and is controlled by a separate controller. The storage battery is also located on the rear platform. Five figures.

29,160/12. **Arc Lamps.** F. R., R. V., and F. BOARDMAN. A multiple carbon arc lamp has a common striking frame for supporting the clutches, a series and an auxiliary shunt solenoid for controlling the movement of the frame and the feed, and a flexible switch arm carried by the striking frame and arranged to momentarily make contact with a fixed arm as the striking frame falls, due to the weakening of the pull due to the series coil. The contact in the shunt-coil circuit is broken by the sudden pull of the shunt solenoid. Two figures.

## Specifications Published To-day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free.

Summaries of some of the more important of these patents will appear in our next issue.

**Arc Lamps:** RAILING and ANGOLD, 21,411/12.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** SCHOLES [Insulators for flexibles] 13,401/12.

**Dynamos, Motors, and Transformers:** DÉRI [Commutating devices] 14,236/12; ASHTON [A.C. distribution] 17,386/12; VANDERVELL and MIDGLEY [Self-regulating dynamos] 17,838/12; B. T.-H. Co. [Dynamos] 21,762/12.

**Electrometallurgy:** SOKOLL [Electric welding] 15,216/12.

**Heating:** SIMPEX CONDUITS and WATERHOUSE [Elements] 15,275/12.

**Ignition:** CHARLES [Sparking plugs] 22,387/12; JOHNSON [Sparking plugs] 23,605/12; MASON [Systems] 4,670/13.

**Incandescent Lamps:** B. T.-H. Co. (G. E. Co., U.S.A.) [Joining tungsten to copper] 10,338/12.

**Meters:** BEATHY [Adjusting] 29,566/12.

**Switchgear, Fuses and Fittings:** GOURDON [Swivel joint for fittings] 13,804/12; MARKT [Ceiling roses] 13,865/12; DONOVAN [Starters] 14,036/12; BROADBENT [Starters] 14,088/12; BONNIN [Name plates and pushes] 15,841/12; WINTERHALDER [Automatic cut-outs] 19,164/12; FRENCH B.T.-H. Co. [Regulators for variable speed dynamos] 19,537/12; MOLLETT and EDWARDS [Shade supports] 19,621/12; SIEMENS-SCHUCKERT [Safety device for generators] 28,483/12; FRENCH B.T.-H. Co. [Regulators for variable speed dynamos] 5,020/13.

**Telephony and Telegraphy:** LYONS [Selective receivers] 10,911/12; BLOCK [Telephone disinfectant] 411/13.

**Traction:** COLLINS [Points] 5,703/12; GIBSON, FARMER and READ [Fog signalling] 22,494/12; ALLISON (Wooding Railway Warning Device Co.) [Signalling] 29,238/12.

**Miscellaneous:** J. STONE & Co. and DARKER [Fans] 13,785/12; SIEMENS & HALSKE [Fire alarms] 24,037/12; SIEMENS BROS. (Siemens & Halske) [Medical electrodes] 28,645/12; BROWN [Testing] 178/13; MENZEL and PORDES [Portable battery lamps] 6,673/13.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Dynamos:** GIRARDEAU [High frequency] 12,809/13.

**Incandescent Lamps:** WOLFRAM LAMPEN A.G. [Tungsten alloys] 27,442/12; [Supports for filaments] 12,753/13.

**Miscellaneous:** NATHORST [Magnetic separators] 12,368/13; RENNERFELT [Power transmission] 12,810/13; DECLERE [Silvering of glass] 13,109/13.

The following Amended Specification may now be obtained.

B. T.-H. Co. (G.E. Co., U.S.A.) [Moulded insulator] 6,405/12.

## Opposition entered to Grant of Patents

5,692/12. "Direction" Tell-tales. J. C. CLARKE and CHADBURN'S (SHIP) TELEGRAPH CO. Electrical tell-tale apparatus for indicating speed and direction of marine engines.

9,981/12. C. H. FISCHER. Drawn Tungsten Wires. (ELECTRICAL ENGINEERING, May 8th, p. 264.)

19,014/12. Selective Wireless Call System. F. JAMIESON. (ELECTRICAL ENGINEERING, May 8th, p. 264.)

## Expired Patents

The following are the more important Patents that have become void through non-payment of renewal fees.

**Arc Lamps:** T. L. SCOTT [Suspension] 5,719/08.

**Dynamos, Motors and Transformers:** M. DÉRI [Dynamos and converters] 4,784/00; B. T.-H. Co. (G.E. Co., U.S.A.) [Dynamos] 6,195/06.

**Incandescent Lamps:** B. T.-H. Co. (G.E. Co., U.S.A.) [Metalised filaments] 5,416/08, A.E.G. [Filament holders] 5,610/08.

**Switchgear, Fuses and Fittings:** G. CHARLTON [Switches, meters, &c.] 5,172/01; B. T.-H. Co. (G.E. Co., U.S.A.) [Resistances] 5,415/08.

**Telephony and Telegraphy:** J. H. WILLIAMS [Line tapper] 5,331/07.

**Traction:** B. T.-H. Co. [Magnetic track brakes] 4,881/05; B. T.-H. Co. and B. HORPS [Control in petrol-electric system] 5,671/07; W. L. WISE (C. C. Anthony) [Signalling] 5,729/07; C. E. S. BILL [Overhead conductors] 6,057/07; W. R. SKES [Signalling] 5,489/08.

**Miscellaneous:** L. B. MILLER [Winding induction coils] 5,811/03; C. A. STEVENSON [Lighthouse lamps, &c.] 5,916/07; P. G. TRIQUET [Primary batteries] 5,925/07; J. B. STRUBLE [Lightning arresters] 5,390/08.



## ELECTRIC TRACTION NOTES

The retirement of Col. Sir H. A. Yorke from the post of Chief Inspecting Officer of Railways to the Board of Trade by superannuation, recalls an amusing incident in August, 1908, when Col. Yorke inspected a section of tramway track at Ealing, the condition of which had been complained of, by walking along it in company with representatives of the local authority, and was so far from being superannuated that he outdistanced the surveyor and the mayor, and covered 2 miles 10 yards in 27 minutes.

It is understood that the proposal of the National Electric Construction Company to deal with the Oxford tramway question by the installation of petrol-electric tramcars in the centre of the city and the overhead trolley system on the rest of the routes is recommended for acceptance by the Tramways Committee. Sir Alexander Kennedy has reported to the Council that the petrol-electric system is perfectly workable from the engineering point of view.

The opening of the Loetschberg Tunnel was postponed from the date originally announced, but last Saturday morning it was formally inaugurated by the passage of two special trains containing a number of visitors and officials. The trains, which were drawn by the single-phase locomotives which will be used for regular traffic, made the passage of the  $8\frac{1}{2}$  miles of tunnel in 14 minutes. The date for the commencement of ordinary traffic does not seem to have been settled as yet. It will be remembered that the construction of the tunnel was commenced in October, 1906, and the actual piercing was completed after considerable troubles had been overcome on March 31st, 1911. The total cost of the tunnel was about £4,000,000. Particulars of the electrical locomotives have already been given in ELECTRICAL ENGINEERING.

The Birmingham Tramways Committee have prepared a scheme of extensions which it is estimated will involve an expenditure of £245,709.

TELEPHONY AND TELEGRAPHY  
(INCLUDING WIRELESS)

On Tuesday, in the Appeal Court, contrary to expectations, the terms of the compromise between the Post Office and the National Telephone Company, by which both sides withdrew their appeals against the arbitrator's award, were not announced in Court. We are in a position to state, however, that as a result it will be possible for the National Telephone Company to pay off the deferred shares in full, and that there will be a handsome surplus, which will be dealt with subsequently as the Court may direct. One of the terms of the compromise is that the Government will liquidate the Exchequer bonds at 97 per cent. In the Company's Liquidator's report, recently issued, it was stated that, subject to the Company being successful in the appeal, there would be an estimated surplus of £137,470 after paying off the deferred shares in full, and after allowing for the 5 per cent. premium already paid in paying off the preferred shares. We understand that the surplus will now actually exceed this figure, although the appeals have been withdrawn, and the deferred shareholders who have already received 15s. in the £ will shortly receive the remaining 5s.

According to *The Times* correspondent at Copenhagen, a company has been formed to establish a wireless service on the Poulsen system from Denmark, via Greenland and Canada, to the Danish West Indies. The service is expected to be in operation by May next year.

The Postmaster-General was asked the question in the House of Commons last week whether in consideration of an expression of regret by Mr. J. E. Taylor, who was reduced in rank for investing in Marconi shares, the question of reinstating him in his former position would be considered. Mr. Samuel replied to the effect that he could not see his way to adopt this suggestion.

The Greek Government state that the islands of Choi and Metelin are now connected by a submarine cable.—Montenegro states that the office which that Government established at Skutari is now closed.—The Martinique-Paramaribo cable was once again repaired on June 27th.—A submarine cable has also been laid by the Greek Government connecting the Island of Imbros to the Island of Lemnos.

## LOCAL NOTES

**Aberdeen: City Electrical Engineer's Libel Action.**—The libel action in which Mr. J. A. Bell, the City Electrical Engineer, claimed £1,000 damages for slander against Mr. A. E. Milne, Hon. Secretary of the Aberdeen Branch of the Electrical Contractors' Association, ended last week in a verdict for Mr. Bell for £250 damages and costs. The action arose through Mr. Bell's advice upon an estimate by a local firm for an electric lighting and heating installation. From the papers in the case it seems that the estimate was for 23s. 1d. per point, and Mr. Bell, in the capacity of consulting engineer, expressed the opinion that this charge was excessive. Following on this, a letter was sent by the Hon. Secretary of the Aberdeen Branch of the Electrical Contractors' Association to the Aberdeen Town Clerk, commenting on this matter, and couched in language which Mr. Bell maintained was a reflection upon his ability, and implied ignorance, incompetence, and want of professional skill on his part. Further, he claimed that the letter was intended to damage him in the eyes of the Aberdeen Town Council, and that in fact he had been greatly injured in his professional reputation by the statements made, of which, by the way, a withdrawal of and apology for was refused. For the defendant it was claimed that the statements were privileged and that the letter in question was written under the instructions of the Association. Further, it was contended that, looking to the character of the work, the statements made by Mr. Bell were untrue. The judge, in his summing-up, held that the defendant was not privileged, and expressed the opinion that Mr. Bell, in making his comments upon the price quoted by the contractor, was not actuated by malice, as he did not himself carry out wiring work. The jury found that Mr. Bell had been accused of professional incompetence, and that the defendant had made statements reflecting upon his honesty which were untrue.

**Brighton: Electricity Accounts.**—In spite of the advice of the Electricity Committee and Mr. J. Christie, the Borough Electrical Engineer, that the sum of £1,406 profit upon the electricity undertaking for the last year should be transferred to reserve, as notified in our issue of June 19th, page 669, the Corporation has decided to transfer it to relief of rates. The Finance Committee of the Corporation took the somewhat unusual course at the beginning of the year of estimating, for the purpose of its annual forecast, a larger profit from the electricity undertaking than Mr. Christie anticipated would be the case, and, furthermore, the Finance Committee budgeted in advanced for this profit to be transferred to relief of rates.

**Colne: Heating and Cooking.**—The Council has decided to charge as from July 1st, one penny per unit for all current supplied for heating and cooking purposes where supply is at present taken for lighting.

**Cromer: Sale of Electricity Undertaking.**—The Board of Trade have decided to hold a local inquiry concerning the proposal of the Corporation to sell their electricity undertaking to Edmundsons' Electricity Corporation. This decision is the result of the very considerable local opposition to the proposal.

**Grimby: Engineer's Salary.**—By ten votes to six the Corporation has agreed to pay the Engineer a commission of 5 per cent. on the profits of the electricity undertaking when they exceed £2,500 per annum, the maximum amount on which this commission is to be paid being £4,000.

**Hove: Purchase of Electrical Undertaking.**—The Bill of the Hove Corporation to purchase the undertaking of the Hove Electric Lighting Co., Ltd., was before the Local Legislation Committee of the House of Commons last week, when some discussion took place as to the period for the repayment of the loan. The Corporation asked for thirty years, but the Local Government Board objected to anything beyond twenty years. The argument in favour of the longer period was that it is hoped to immediately reduce the price of current by  $\frac{1}{2}$ d. per unit, but if only twenty years were granted this could not be done. Eventually the Committee sanctioned thirty years in which the purchase-money should be repaid.

**Keighley: Electric Lighting Tariff.**—The lighting tariff has been amended so that consumers who take over 4,000 units per half-year will be charged 2 $\frac{1}{2}$ d. per unit.

**L.C.C.: Greenwich Power Plant.**—The Highways Committee of the L.C.C. report that none of the tenders received

for the purchase and removal of the Musgrave engines and other plant, which will not be required when the new turbines are installed, are satisfactory, and arrangements are being made for tenders to be invited in a slightly different form.

**Weston-super-Mare:** "Stealing" Electricity.—The proprietor of a "flying machine" on the old pier has been summoned for fraud in connection with the supply of electricity given by the Weston-super-Mare Electric Supply Co. It appears that the defendant has both a power and lighting meter, and it was discovered a short time ago that although his arc and incandescent lamps were burning, the lighting meter was not recording. On the other hand, the power meter was registering although the "flying machine" was not working. The Company resorted to the expedient of switching off the lighting current, which, of course, had no effect upon the lights, and followed this up by switching off the power supply, which immediately stopped the "flying machine" and also put out the lights. It was then found that he had connected his lamps to the power circuit with a view to getting the supply at 2d. per unit cheaper than the ordinary lighting rate. The further hearing of the case has been adjourned.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

### Generating Stations, Sub-Stations, Mains, &c.

**Belfast.**—A 3,500-ampere traction switchboard panel is required. (See an advertisement on another page.)

**Birmingham.**—Two 5,000-kw. turbo-generators are to be installed at the Summer Lane power station. Two additional cooling towers are also to be installed at an estimated cost of £6,300.

**Hebden Bridge.**—A loan of £3,250 has been sanctioned for additional plant at the electricity works.

**Ireland.**—A complete generating plant is required by the Roscrea Bacon Factory, Ltd. Secretary. July 11th.

**Ipswich.**—The Council have sanctioned an additional expenditure of £33,500 upon the electrical undertaking. About half of this sum is required for mains and services extensions, whilst the remainder is in connection with developing a new area to the east of Ipswich.

**Keighley.**—A loan of £6,800 has been sanctioned for electrical extensions.

**Leeds.**—Additional mains estimated to cost £10,200 are to be laid.

**London: Hackney.**—Sub-station plant and switchgear, conduits, and cranes are required by the Council. Borough Electrical Engineer, July 24th.

**Mile End.**—The Guardians of the Mile End Old Town require an electric lighting installation at their workhouse in Baucroft Road. Particulars from Clerk, Guardians' Offices.

**Stepney.**—The Finance Committee of the L.C.C. has sanctioned a loan of £25,000 in connection with the electricity undertaking.

**Sunderland.**—A standby motor-generator is required in connection with the tramway supply at an estimated cost of £2,000.

**Willesden.**—New sub-station at Acton Lane. Borough Electrical Engineer.

### Wiring

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Barrow-in-Furness.**—New theatre.

**Birmingham.**—Alterations and additions to Maxstoke Schools. Architects, Buckland & Farmer, Norwich Union Chambers, Congreve Street.

**Coventry.** Municipal Technical Institute.

**FOR  
STEAM JOINTS  
USE**

**JOHN HUDSON & CO.'S SUCCESSORS, Mansell St., London, E.**



**Darlington.**—Harrogate Club and Institute. Architect, G. W. Davis, High Road Chambers.

**Dublin.**—New art gallery.

**Finchley.**—200 working-men's houses. Clerk to Council.

**Greenock.**—Electric lighting at Ladyburn School. Architect, A. C. Thomson, Ayr.

**Lancaster.**—New mill. By Lord Ashton.

**Manchester.**—Public baths and wash-houses. New Quay Street.

**Portsmouth.**—Electric lighting installation in boys' secondary school, Victoria Road, N. Town Clerk, July 8th.

**Scarborough.**—Three hundred and sixty-light installation at the workhouse and infirmary. Clerk to Guardians, 14 Dean Road.

**Twickenham.**—Considerable additions to Orleans Council School.

**Wallasey.**—The Local Government Board has sanctioned a loan for a new town hall.

**West Ham.**—Electric lighting installations at Forest House workhouse and Forest House cottages, Leytonstone. Clerk, Union Road, Leytonstone.

### Miscellaneous

**Llandiloos.**—Street lighting for a period of seven years. (See an advertisement on another page.)

**London: L.C.C.**—A supply of incandescent electric lamps is required, at an estimated cost of about £200.

**H.M. Office of Works.**—Twelve months' supply of electric cable and wire. Storekeeper, 12 Lambeth Palace Road. July 11th. (See advertisement on another page.)

**St. Pancras.**—The Council has decided to replace the arc lamps in Tottenham Court Road by lamps of more modern type.

## TENDERS RECEIVED AND ACCEPTED

**Admiralty.**—An order has been placed with Messrs. S. Blaikie & Son, of Kirkwall, for the erection of a wireless telegraph station at Brough Head, Orkney.

**Bedworth.**—Tenders have been received by the Council for the lighting of the streets by electricity and gas, and the tender by the Leicestershire & Warwickshire Supply Company, at £3 10s. per 50-candle-power lamp per annum, including maintenance and repairs, has been accepted. The gas company's tender was £3 15s. per annum for a minimum of 100 lamps, the Council providing the standards and keeping the lamps in repair. In the gas company's tender the candle-power of the lamps was from 75 to 85.

**Belfast.**—The tender of Messrs. Dick Kerr & Co. has been accepted for tramway track renewals.

**Bolton.**—The tender of Messrs. Musgrave & Co. has been accepted for condensing plant.

**London: L.C.C.**—The following tenders have been received for a supply of high and low tension cables:—Western Electric Co., Ltd., £25,409 16s.; Johnson & Phillips, Ltd., £26,018 3s.; Siemens Bros. & Co., Ltd., £26,169; W. T. Henley's Telegraph Works Co., Ltd., £26,187 10s.; Callander's Cable & Construction Co., Ltd., £26,941 18s.; W. T. Glover & Co., Ltd., £27,201 5s.; British Insulated & Helsby Cables, Ltd., £27,837 11s. The lowest tender, namely, that of the Western Electric Co., Ltd., is recommended for acceptance.

**Stalybridge.**—The following tenders have been accepted by the Joint Tramways and Electricity Board:—Economisers, Goodbrand & Co.; feed-water filter, Babcock & Wilcox.

**L.C.C. Armature Winders.**—The armature winders in the employ of the L.C.C. Tramways Department recently asked for an advance of wages from 9½d. to 10½d. an hour. The matter was referred to the Conciliation Board, and an agreement has been arrived at on the basis of the rate of pay being increased to 10d. per hour.

**An Osram Fire Brigade.**—In every department of the organisation of the General Electric Co. the importance of an efficient fire brigade is fully recognised, and a new brigade has recently been formed at the central stores in Union Street, Southwark, which are worked in conjunction with the Union Street works, and where the main stock of Osram drawn wire lamps is stored. The brigade consists of 23 members, with Mr. C. Rennie as captain. Mr. W. Riley, formerly of the Metropolitan Fire Brigade, has been engaged as instructor, and weekly drills are being held. Practice has shown that the staff can be dismissed from the premises and the firemen be at their posts in 30 seconds.

## APPOINTMENTS AND PERSONAL NOTES

Lt.-Col. P. G. von Donop has been appointed to succeed Lt.-Col. Sir H. A. Yorke as Chief Inspecting Officer of Railways to the Board of Trade.

Mr. J. W. Beauchamp, Chief Electrical Engineer to the West Ham Corporation, has been elected a member of the "Point Fives."

The salary of Mr. T. R. Whitehead, Manager and Engineer of the Coventry Corporation Tramways, has been increased from £400 to £450 per annum.

Mr. H. E. Blain, who, as we recently announced, has resigned his position as General Manager of the West Ham Corporation Tramways, has been appointed Assistant Purchasing Agent to the District & Associated Tube Railways.

Mr. William Travis has resigned his position as Chief Assistant Engineer to the Hastings Corporation Electricity Department, and has joined the staff of the Brompton & Kensington Accessories Co., Ltd.

Mr. Frank Bailey has been awarded a silver medal by the Royal Society of Arts for his Paper on "Electric Supply in London," and Dr. F. Mollwo Perkin has a similar award for his Paper on "Natural and Synthetic Rubber."

Competent electrician, wanted for 3-phase coal-cutters during night shift. (See an advertisement on another page.)

An electrical engineer is required for the United Provinces of Agra and Oudh. Application to the Director-General of Stores, India Office, Whitehall.

A Junior Switchboard Attendant is required at Derby. (See an advertisement on another page.)

A Shift Engineer is required at Ipswich. (See an advertisement on another page.)

Switchboard attendant; also driver, required in the Stoke-on-Trent Electricity Department. (See an advertisement on another page.)

## MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. G. Smith & Son, of 5 Philpot Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night was £67 10s. to £80 (last week £67 15s. to £68 5s.).

**Peebles' Annual Outing.**—The employees of Messrs. Bruce Peebles & Co. went for their annual excursion on Saturday last. St. Andrews was the place selected, and the whole outing proved a thorough success.

## COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &c.

**Crompton & Co.**—With reference to the scheme for the rearrangement of capital referred to in our last issue, we are informed that this has been successfully carried through and the new shares allotted. The new Company takes over all the assets and pays all the liabilities of the old Company. The new board has been strengthened by the addition of Mr. A. A. Campbell Swinton and Mr. W. Churchill Hale. Mr. Thomas Britten, for many years with the Electric Construction Co., has been appointed Works Manager in succession to Mr. A. J. Hodgson, who resigned in November last, but continued his duties at the request of the board until the new scheme had been carried through. Mr. E. Reeves, Joint Manager of the old Company, now becomes Managing Director.

**R. Waygood & Co.**—At the Annual Meeting last week a final dividend, making 7 per cent. for the year was declared, and the sum of £9,691 was carried forward. The Chairman stated that the Company has secured the contract for 32 lifts for the new hotel in Regent Street now being built by the Strand Palace Hotel Company. Additional capital is to be raised in order to meet the rapid development of the business.

**Meter Approved.**—The Board of Trade has approved of the Electrical Company's polyphase meter type Da., and for the means provided for fixing same.

## ARON ELECTRICITY METER

THE annual meeting was held at Winchester House on Tuesday this week, Mr. H. Hirst, Chairman of the Company, presiding. After the notice convening the meeting had been read, the Chairman said:—

It is my pleasure to move that the report and accounts as submitted to the shareholders be taken as read. You will no doubt share the satisfaction which your Board feel at the continued progress of our Company. The year under review has not been one of continual sunshine; many a black cloud has appeared in one or other of the territories in which we operate. The rise in the price of raw material, political troubles, and labour unrest have all contributed to the anxiety of your Board and management. Nevertheless, the result of the year's work is exceedingly pleasing, and our net profit of £32,652 is about £2,000 ahead of last year. This practically represents the exact amount of the increase in our gross profits, which are £53,000. That is proof that the same careful principles have prevailed during the last year which have helped us in the past in lifting this Company from adverse conditions into a flourishing concern with every appearance of continued progress. So much for the profit and loss. As regards the balance sheet, the items are clear, and I cannot think of any necessary comments except so far as the first item on the credit side is concerned, viz., £213,298. This item, I notice, from correspondence and inquiries which I have received, is looked upon by many shareholders as representing goodwill and patents only. The people who complain most about the insufficiency of details in balance sheets are generally the greatest sinners in the way of reading them. This item includes such solid assets as valuable freehold land in Schwerdnitz, Vienna, and Pau, very important and expensive buildings, modern machinery, and tools. The actual hard cash spent on additions to these items since the formation of the Company amounts to a grand total of £120,000. I personally am of opinion that the actual amount for goodwill and patents has been, by very generous depreciation on the one side and by reserves on the other, reduced to quite a normal and unimportant figure. I doubt very much, if our property were valued to-day by a conservative valuer, whether he could debit that account with more than £50,000 for goodwill and patents. Perhaps the Board, for the satisfaction of the shareholders, will arrange in the coming year for such a valuation to be made. The only other comment of utility which I can make is with reference to the appropriation of our profits. The Directors have decided to recommend the payment of a dividend on the ordinary shares of 7 per cent., or 1 per cent. more than last year. No doubt there are those among you who think we ought to pay more. I wish to assure you that the Directors have given the fullest consideration to this problem. The constant increase of business absorbs our finances to the full, and I may tell you that during the period which has elapsed since March 31st this year, to which date our accounts are made up, our sales have again gone up considerably as compared with the same period of last year. Whilst business increases, the profits do not show entirely in cash, but largely in the additional outstandings of stock necessary to satisfy our customers. In addition to this it must not be forgotten that the bulk of the business of this Company is done in the central European countries—Germany, Austria, France, and Belgium. The war cloud which hung over Austria has not entirely disappeared, and whilst we have no fear of severe bad debts, we have to deal with slower payments and increased outstandings. The present financial position in other countries is so well known that I am sure if you give the situation one moment's thought you will agree with us that this is not the time when we should part too lightly with such liquid assets as hard cash. The whole of the future welfare of this Company might be seriously affected by so doing. I wish again to thank Professor Aron and his staff for the skilful manner in which they have handled our business during the past year. I now formally move that the report and accounts as audited and submitted to the meeting be received and adopted.

Sir James Pender seconded, and after the Chairman had answered one or two questions put by shareholders, the Report and Accounts were carried unanimously.

The Chairman then proposed that the dividends of 3 per cent. on the preference shares for the six months to March 31st, 1913, and of 7 per cent. on the ordinary shares for twelve months to the same date, as recommended by the directors, be paid. Mr. Roger W. Wallace, K.C., seconded.

Mr. Roger Wallace, K.C., then proposed the re-election to the Board of Mr. H. Hirst and Sir James Pender, which was seconded by Colonel Crompton, and the proposal was carried.

Mr. Fisher then proposed the re-election of the auditors, Messrs. Price, Waterhouse & Co., which was seconded by Mr. Ashby and carried.

The auditors were unanimously re-elected.

A vote of thanks to the Chairman, proposed by Mr. Edgar Newgass, and seconded by Mr. A. G. Sawell, closed the proceedings.

# TRADES DIRECTORY OF ADVERTISERS IN "ELECTRICAL ENGINEERING."

(One Free Entry is given to every Advertiser. Entries under additional headings, 6d. per insertion.)

## ACCESSORIES (Electric Light and General Supplies).

Cuttriss (S. W.), 72, Prudential Buildings, Park Row, Leeds.  
Edison & Swan United Electric Light Co., Ltd., Ponders End, Middlesex.  
Electrical Co., Ltd., 122 to 124, Charing Cross Rd., W.C.  
General Electric Co., Ltd., 67, Queen Victoria St., E.C.  
Guilbert-Martin, 9, Edmund Place, E.C.  
Lundberg (A. P.) & Sons, Liverpool Rd., N.  
Scholey & Co., Ltd., 151, Queen Victoria St., E.C.  
Simplex Conduits, Ltd., 113 to 117, Charing Cross Rd., W.C.  
Sun Electrical Co., Ltd., 118, Charing Cross Road, W.C.  
Wardle Engineering Co., Ltd., 196, Deansgate, Manchester.

## ACCUMULATORS, &c.

Copper, Pass & Son, Ltd., Bedminster Smelting Works, Bristol.  
D.P. Battery Co., Ltd., Bakewell, Derbyshire.  
Electrical Power Storage Co., Ltd., 4, Great Winchester St., E.C.  
Hart Accumulator Co., Ltd., Marshgate Lane, Stratford.  
Tudor Accumulator Co., Ltd., 119, Victoria St., S.W.  
Wernop & Co., Ltd., Carlton Lamp Works, Halifax.

## AIR FILTERS.

Balcke & Co., Ltd., Broadway Court, Westminster, S.W.  
Carrier Air Conditioning Co., Caxton House, Westminster, S.W.  
Startevant Engineering Co., Ltd., 147, Queen Victoria St., E.C.

## ALUMINIUM.

British Aluminium Co., Ltd., 109, Queen Victoria St., E.C.

## ARC LAMPS AND ACCESSORIES.

British Thomson-Houston Co., Ltd., Rugby.  
General Electric Co., Ltd., 67, Queen Victoria St., E.C.  
London Electric Firm, Oroydon.  
Oliver Arc Lamp Ltd., Cambridge Place, Burrage Rd., Woolwich.  
Union Electric Co., Ltd., Park Street, Southwark, S.E.

## ARMATURE REPAIRS.

Marryat & Place, 28, Hatton Garden, E.C.

## BOILERS.

Babcock & Wilcox, Ltd., Oriel House, Farringdon St., E.C.

## CABLES AND WIRES.

Callenders Cable & Construction Co., Ltd., Hamilton House, Victoria Embankment.  
General Cable Manufacturing Co., 68a, Lincoln's Inn Fields, W.C. (ment, E.C.).  
Ges. für Elektrotechnische Industrie m.b.H., 88 Belle-Alliance Str., Berlin.  
Hanley's (W. T.) Telegraph Works Co., Ltd., Blomfield Street, E.C.  
Hooper's Telegraph & India Rubber Works, Millwall Dock, E.  
India Rubber, Gutta Percha, & Telegraph Works Co., Ltd., 106, Cannon St., E.C.  
and Silvertown, E.  
Key Engineering Co., Ltd., 4, Queen Victoria St., E.C.  
Liverpool Electric Cable Co., Ltd., Linacre Lane, Bootle, Liverpool.  
London Electric Wire Co. & Smiths Ltd., Playhouse Yard, Golden Lane, E.C.  
Macintosh (Chas.) & Co., Ltd., 22 & 23, Jewin St., E.C.  
Rickard (Wm.), Ltd., Ashbourne Road Mills, Derby.  
Siemens Bros. & Co., Ltd., Woolwich.  
Union Cable Co., Ltd., Dagenham Dock, Essex.

## CASTINGS, &c.

Dore (J.) & Co., Bromley, E.

## CATALOGUES AND PROCESS ENGRAVING.

Swain (John) & Son, Ltd., Shoe Lane, E.C.

## CONDENSING PLANTS.

Mirreles Watson Co., Ltd., Scotland Street, Glasgow.  
Storey (Isaac) & Sons, Ltd., Empress Foundry, Cornbrook, Manchester.  
Willans & Robinson, Ltd., Rugby.

## DIE-FINISHED CASTINGS.

Aerators, Ltd., Upper Edmonton, N.

## DYNAMOS, see Motors and Dynamos.

## ELECTRO-PLATING.

Canning (W.) & Co., 133 to 137, Gt. Hampton St., Birmingham.

## FLEXIBLE METALLIC TUBING.

United Flexible Metallic Tubing Co., Ltd., 112, Queen Victoria St., E.C.

## GAS AND OIL ENGINES.

British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester.  
Premier Gas Engine Co., Sandiacre, Nottingham.

## HEATING AND COOKING APPARATUS.

Bastian Electric Heating Syndicate, Ltd., Palmerston House, Old Broad St., E.C.  
Belling & Co., Lancaster Works, Enfield, N.  
British Prometheus Co., Ltd., Balop St. Works, Birmingham.  
British Thomson-Houston Co., Ltd., Rugby.  
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester.  
Dowsing Radiant Heat Co., Ltd., 105, Great Portland St., W.  
Ferranti, Ltd., Central House, Kingsway, W.C.  
General Electric Co., Ltd., 67, Queen Victoria St., E.C.  
Holmquist Electric Co., 1911 Ltd., 27, Kingly St., Regent St., W.  
Schmiewindt Electric Co., 40-1, Staunfort St., Birmingham.  
Siemens Bros. Dynamo Works, Ltd., 39, Upper Thames St., E.C.  
Simplex Conduits, Ltd., 113 to 117, Charing Cross Rd., E.C.  
Townhend's Art Metal Co., Ltd., Ernest St., Birmingham.

## INSTRUMENTS.

Everett, Edgecumbe & Co., Ltd., 117, Victoria St., S.W.  
Evershed & Vignoles, Ltd., Acton Lane Works, Chiswick.  
India Rubber, Gutta Percha and Telegraph Works Co., Ltd., 106, Cannon St., E.C.  
Kelvin & James White, Ltd., 18, Cambridge St., Glasgow.  
Nalder Bros. & Thompson, Ltd., 34, Queen Street, E.C.  
Record Electrical Co., Ltd., Caxton House, Westminster, S.W.

## INSULATING VARNISH, ENAMELS, PAINTS AND LACQUERS.

Blame (Chas. H.), The White Building, Sheffield.  
Fredk. Oran Chemical Co., 22 & 23, Newhall Hill, Birmingham.  
Griffiths Bros. & Co., Mackie Rd., Bermondsey, S.E.  
Pinchin, Johnson & Co., Ltd., 26, Bevis Marks, E.C.  
Sterling Varnish Co., Royal London Buildings, 196, Deansgate, Manchester.

## INSULATORS AND INSULATING MATERIALS.

Macintyre (J.) & Co., Ltd., Burslem.  
Moseley (D.) & Sons, Ltd., Ardwick, Manchester.  
Mosses & Mitchell, 122 to 124, Golden Lane, E.C.  
Rugg (William) & Co., Ltd., 63, Regency Street, S.W.  
Traun (Dr. Heinr.) & Sons, 25, Goswell Rd., E.C.  
Weldmann (H.), Kapperswil, Switzerland.

## INSURANCE.

Phoenix Assurance Co., Ltd., 19 & 70, Lombard St., E.C.

## LADDERS.

Heathman & Co., 10, Parsons Green, S.W.

## LAMPS (Incandescent).

British Thomson-Houston Co., Ltd., Mazia House, 77, Upper Thames St., E.C.  
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester.  
Cryselco, Ltd., Kempston Works, Bedford.  
Edison & Swan United Electric Light Co., Ltd., Ponders End, Middlesex.  
General Electric Co., Ltd., 67, Queen Victoria St., E.C.  
Siemens Bros. Dynamo Works, Ltd., Tyssen St., Dalton, N.E.  
Simplex Conduits, Ltd., 113 to 117, Charing Cross Rd., W.C.  
Steam Electric Lamp Co., Ltd., 47, Victoria St., S.W.  
"Z" Electric Lamp Manufg. Co., Ltd., Orient House, New Broad St., E.C.

## LIFTS.

Marryat & Place, 28, Hatton Garden, E.C.  
Waygood (R.) & Co., Ltd., Falmouth Road, S.E.

## MACHINE TOOLS.

Taylor & Challen, Ltd., Constitution Hill, Birmingham.

## METERS.

Bastian Meter Co., Ltd., Kentish Town, N.W.  
Ferranti, Ltd., Central House, Kingsway, W.C.  
Isaria, Ltd., 208, Tower Bridge Road, S.E.

## MICA.

British Mica Co., Ltd., Lebanon Road Works, Wandsworth, S.W.  
Jaroslaw (D.), 19, Tower Hill, E.C.  
Micanite & Insulators Co., Ltd., Walthamstow, E.  
Sear, Page & Co., 16 & 17, Devonshire Sq., E.C.  
Wiggins (F.) & Sons, 102 to 104, Minories, E.C.

## MINE EQUIPMENTS AND APPARATUS.

Dick, Kerr & Co., Ltd., Abchurch Yard, E.C.  
Ellison (George), Warstone Lane, Birmingham.  
Ferranti, Ltd., Central House, Kingsway, W.C.  
General Electric Co., Ltd., 67, Queen Victoria St., E.C.  
Reyrolle & Co., Ltd., Hebburn-on-Tyne.  
Siemens Bros. Dynamo Works, Ltd., Caxton House, Westminster, S.W.  
Switchgear & Cowans, Ltd., Springfield Lane, Salford, Manchester.  
Willans & Robinson, Ltd., Rugby.

## MOTORS AND DYNAMOS.

British Thomson-Houston Co., Ltd., Rugby.  
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester.  
Brown Boveri & Co., Ltd., Caxton House, Westminster, S.W.  
Dick, Kerr & Co., Ltd., Abchurch Yard, E.C.  
Matthews & Yates, Ltd., Swinton, Manchester.  
Peelies (Bruce) & Co., Ltd., Edinburgh.  
Siemens Bros. Dynamo Works, Ltd., Caxton House Westminster, S.W.  
Vickers, Ltd., River Don Works, Sheffield.

## OIL CANS.

Kaye (J.) & Sons, Ltd., Lock Works, Leeds.

## PACKING.

United States Metallic Packing Co., Ltd., Bradford.

## PATENT AGENTS.

Lorain (J. G.), Norfolk House, Norfolk St., W.C.  
Raworth (J. E.), 30, Broadway, Westminster.

## PETROL AIR GAS.

Safety Light, Ltd., 118, Queen Victoria St., E.C.

## PRESSPAHN, &c.

Weldmann (H.), Rapperswil, Switzerland.

## PUMPING PLANT.

Merryweather & Sons, Fire Engine Works, Greenwich, S.E.  
Willans & Robinson, Ltd., Rugby.

## STEAM ENGINES AND TURBINES.

Allen (W. H.) Son & Co., Ltd., Queen's Engineering Works, Bedford.  
British Thomson-Houston Co., Ltd., Rugby.  
Dick, Kerr & Co., Ltd., Abchurch Yard, E.C.  
Vickers, Ltd., River Don Works, Sheffield.  
Willans & Robinson, Ltd., Rugby.

## STEAM ENGINE ACCESSORIES.

Lea Recorder Co., 32, Deansgate, Manchester.

## SWITCHGEAR.

Adams Manufacturing Co., Ltd., Balfour House, Finsbury Pavement, E.C.  
Berry, Skinner & Co., 78, Upper Thames St., E.C.  
British Thomson-Houston Co., Ltd., Rugby.  
Dorman & Smith, Ordsal Electrical Works, Salford.  
Eckstein, Heap & Co., Ltd., Caroline Street, Broughton, Manchester.  
Ellison (George), Warstone Lane, Birmingham.  
Ferranti, Ltd., Central House, Kingsway, W.C.  
Record Electrical Co., Ltd., Caxton House, Westminster, S.W.  
Reyrolle & Co., Ltd., Hebburn-on-Tyne.  
Switchgear & Cowans, Ltd., Springfield Lane, Salford, Manchester.

## TECHNICAL BOOKS AND JOURNALS.

Cambridge University Press, Fetter Lane, E.C.  
Cassell & Co., Ltd., La Belle Sauvage, K.C.  
Caxton Publishing Co., Clun House, Surrey Street, Strand, W.C.  
Constable (Archibald) & Co., Ltd., 10 Orange St., Haymarket, W.  
Crosby Lockwood & Son, 7, Stationers' Hall Court, E.C., and 5, Broadway, [Westminster, S.W.]  
Electric Journal, St. Stephens House, Westminster, S.W.  
Gresham Publishing Co., 34, Southampton St., W.C.  
Griffin (Chas.) & Co., Ltd., 12, Exeter St., Strand, W.C.  
Indian Industries and Power, 204, Temple Chambers, E.C.  
Lorgans, Green & Co., 39, Paternoster Row, E.C.  
Whittaker & Co., 2, White Hart Street, Paternoster Square, London, E.C.

## TELEPHONES.

British L.M. Ericsson Mfg. Co., Ltd., 4, Chancery Lane, W.C.  
General Electric Co., Ltd., 67, Queen Victoria St., E.C.  
Graham (Alfred) & Co., St. Andrew's Works, Crofton Park, London, S.E.  
Siemens Bros. & Co., Ltd., Woolwich.  
Sterling Telephone & Electric Co., Ltd., 200, Upper Thames St., E.C.  
Western Electric Co., Ltd., North Woolwich, E.

## TESTING LABORATORIES.

Electrical Standardising & Testing Institution, (Faraday House), 62 to 70, Southampton Row, W.C.

## WATER SOFTENERS.

Kennicott Water Softener Co., Wolverhampton.

## WIRELESS TIME SIGNALS.

Synchrone Co., Ltd., 32 & 34, Clerkenwell Rd., E.C.

## WIRING CONTRACTORS. See page iv.

When corresponding with Advertisers, please mention "Electrical Engineering."



# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

NO. 341 [VOL. IX., No. 28]  
*All rights reserved.*

THURSDAY, JULY 10, 1913.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES and TECHNICAL COLLEGE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

*Other Advertisement Rates on Application.*

#### *Latest Time for Receiving*

Letters for Insertion, Tuesday first post.

Small Advertisements and Official Announcements, Wednesday first post.

Displayed Advertisements, Tuesday first post.

Corrections in Standing Advertisements, Monday first post.

All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 208-206, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Circling, Fleet, London."

Telephone No.: 5509 Holborn.

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

THE petition for an extension of term of the fundamental telegraph patent beyond the customary 14 years was heard by Mr. Justice Warrington on Tuesday and Wednesday. The extension was, however, not granted. (Page 404.)

THE conclusion of the Paper read recently by Mr. B. Welbourn and the discussion thereon is reported this week. (Page 405.)

AN example of indirect lighting is illustrated on page 406.

AN instrument for magnetising permanent magnets is described. (Page 407.)

PARTICULARS are given of a large cable in use on board ship. (Page 407.)

SOME street lighting fittings are illustrated on page 408.

THE calculation of the mechanical forces on transformer coils on short circuit is discussed in our Questions and Answers columns. (Page 409.)

A PATENT for electric automobiles, in which each wheel is driven by a special design of motor, by E. Cantono, expires this week after a full life. The specifications published last Thursday include one for a method of joining tungsten to copper by the B.T.H. Co., one to enable "inching" to be easily carried out

with automatic motor starters by F. Broadbent, and one for a universal method of obtaining sparkless commutation in dynamo and motors by M. Déri. (Page 410.)

AN agreement is said to have been arrived at between the Metropolitan and Great Northern Railway Companies for the working of the Great Northern and City tube railway. (Page 411.)

A NEW contract for the Imperial wireless telegraph scheme is being negotiated with the Marconi Company.—£10,000,000 is to be spent on telephone developments.—Dissatisfaction has been caused by the imposition of a fee of one guinea by the Post Office for experimental wireless telegraph licences. (Page 411.)

SUBSTANTIAL profits were made last year by a number of large provincial electric supply undertakings.—A new regulation with regard to electric cooking apparatus has been framed by the Board of Trade.—Supply at Newcastle-under-Lyme has been changed over to the three-wire continuous-current system. (Page 413.)

EXPENDITURE on new plant is contemplated as follows:—Sheffield, £130,860; Cardiff, £30,000; Loughborough, £14,000; Peterborough, £7,000; Stoke-on-Trent, £1,555; Belfast, £35,000; Hamilton, £10,000; Manchester, £75,000; and South Shields, £30,000. A large quantity of cable is required in Australia, arc lamp carbons in Malta, and turbo-alternators at Shipley. (Page 413.)

A 10 per cent. dividend is recommended by the General Electric Co., and 5 per cent. by the Electric Construction Co. (Page 414.)

**Damage to Electricity Mains.**—The Charing Cross, West End, and City Electricity Supply Co. have been successful in an action against the London Hydraulic Power Co. for damage to their electric mains, due to burst water mains. Mr. Justice Scrutton found that the Hydraulic Power Co. was liable for damages, notwithstanding that he did not find the company guilty of negligence, on the ground that their statutory powers are qualified by the proviso that they would be liable at law for any nuisance caused by their works.

**Load Factors of Large Power Stations.**—With the increasing diversity of the load on large power stations, and the better terms offered for limited night and early morning supply, the load factors are steadily improving. The following figures for December, 1912, are of interest. The Commonwealth Edison Co. of Chicago had a peak load of 233,000 kw., an annual output of 799 million units, and a load factor of between 43 and 44 per cent. The New York Edison Co. had a peak load of 210,800 kw., an annual output of 619 million units, and a load factor of 33·4 per cent. The Brooklyn Edison, Boston Edison, and Philadelphia Electric Companies, with peak loads of from 40,000 kw. to 66,000 kw., had load factors of 33·7, 30·6, and 32 per cent. respectively. The Victoria Falls and Transvaal Power Co. expect the load factors of most of their stations will shortly be in the neighbourhood of 70 per cent., on account of the almost continuous work at the mines.



### THE "TELEGRAPHONE" PATENT

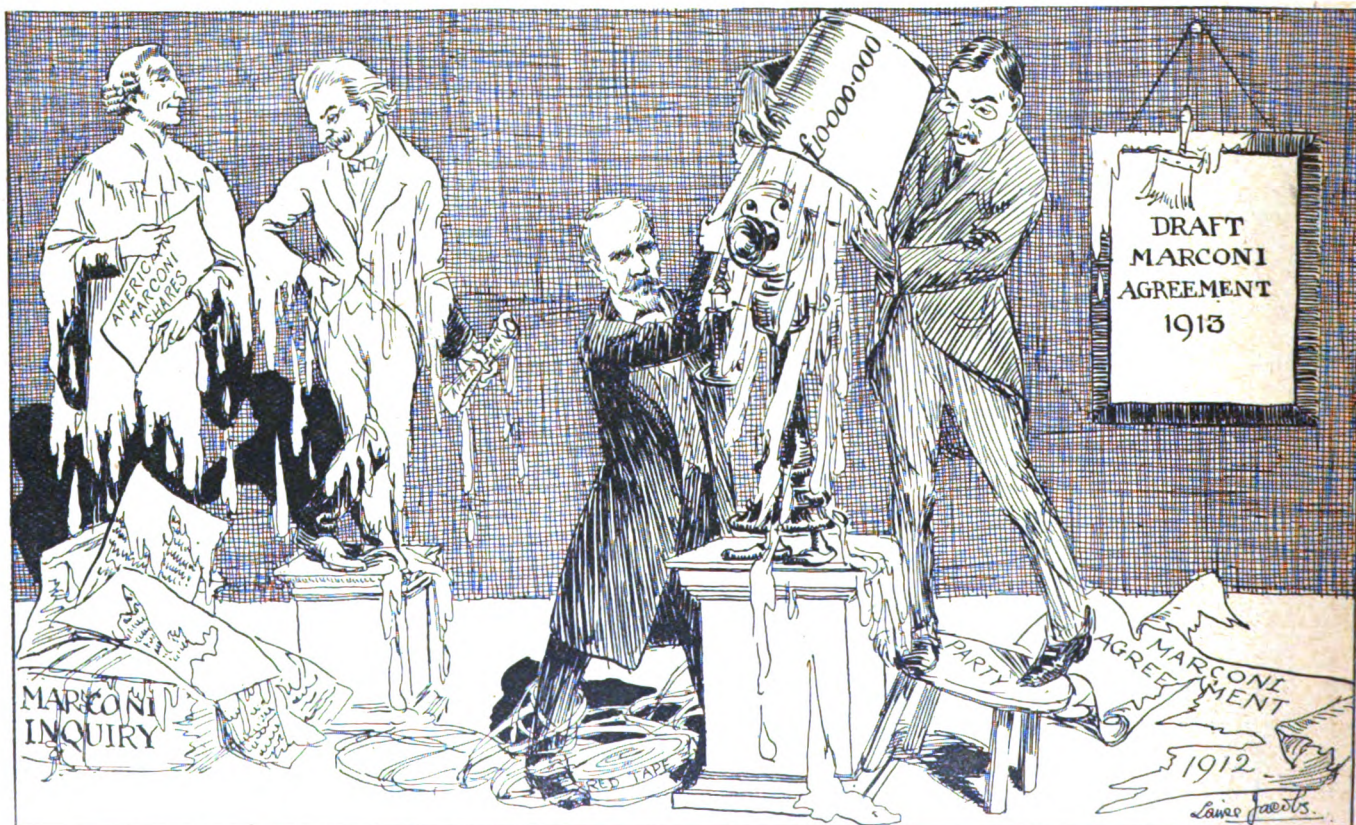
THE oft-delayed petition for extension of term of the fundamental patent (No. 8,961, of April 28th, 1899) for the "telegraphone," by the Telegraphone Corporation (of New York), was considered by Mr. Justice Warrington in the Chancery Division on Tuesday and Wednesday last. The patent was granted to V. Poulsen (Denmark), and covers the storage and reproduction of spoken words, &c., by a moving wire or band electro-magnetically (ELECTRICAL ENGINEERING, Oct. 31st, 1912, p. 600). After hearing the evidence in support of an extension, the judge decided that the petition had failed, largely because little attempt had been made to manufacture in this country, and because the patentee was only indirectly interested in the petitioning company.

There was no opposition, and the Board of Trade, through the Solicitor-General, stated that, in order to obtain the special privilege of extension, petitioners must prove that the invention is of great public utility, and as so few machines had been sold it would seem that they were not of much utility. It was also necessary to show that great efforts had been made to establish manufacture. He also said that the case of an assignee was not so strong as that of a patentee. The petition did not contain any indication that the patentee had made £10,000 by the sale of shares in one of the companies, as had transpired in evidence.

It appears that since 1899, the patentee, in conjunction with Professor Pedersen, of Copenhagen, has been continuously experimenting to improve the apparatus, until now by using steel piano wire on two drums driven by either one or two motors to rewind the wire from one drum to the other and pass it under the "talking" electromagnet, so that the latter is not worn away, a machine has just been produced which is said to be fool-proof and is capable of recording or reproducing messages for thirty minutes with a single wire, whereas the original machines could only run for about thirty seconds. In addition an indicator shows where one message ends and another begins, and the wires when filled can be changed in about five seconds. Mr. J. Swinburne, who gave evidence, saw a future for the telegraphone for tape machines, for machines like the "Dictaphone," and for teaching singing and foreign languages, &c., as the reproduction is very clear and not broken by extraneous sounds.

It appears that a company was formed in Denmark when the patent was taken out; this parent company sold the manufacturing business to subsidiary companies in different parts of the world including Denmark, Mexico, America, Canada, and Germany. None of these companies paid any dividends, and in Canada and Mexico the companies are in a moribund condition, while the German interests were handled by Siemens & Halske and subsequently by other companies, who have been unable to make any progress at all in that country. Since January the Telegraphone Corporation of New York, as the American Selling Co. (who take the machines from an American manufacturing company), sold several machines, but very few of the earlier types have been disposed of. The Telegraphone Corporation holds the patents, all of which are in force, for practically every country in the world except Mexico, Canada, Germany, and Denmark. The patentee and Professor Pedersen are still interested in the various companies, and seem to have received so far only £4,439 for the fundamental patent and the subsidiary patents relating to constructional details which have enabled the present perfected machines to be produced, besides the £10,000 by the sale of shares.

**Examination in Electric Light Switching.**—Messrs. A. P. Lundberg & Sons (479 to 487 Liverpool Road, N.) have for long given great attention to the development of convenient systems of control for electric lamps, and in addition to designing and manufacturing suitable apparatus for the purpose, have done much by the publication of literature and otherwise to spread a knowledge of this hitherto rather neglected subject. Their latest step in this direction takes the form of a scheme of examinations, which will be conducted for them by Mr. W. Perren Maycock. On the results of these not only will certificates be given, but a certain number of money prizes, from £3 downwards, will be awarded, and prizes consisting of copies of their book, "Small Switches and their Circuits." There are three grades of certificates: elementary, intermediate, and advanced; and the lighting engineer, engineering student, contractor, foreman, and wireman, will find that the examination paper is full of tests suited to their varying capabilities. All they have to do is to write for one to Messrs. A. P. Lundberg & Sons, and then send in their answers by the time specified therein. The first series of results will be announced in November. We should add that there is no entrance fee of any kind.



### MORE WHITWASH.

The POSTMASTER-GENERAL, replying to a Deputation from the London Chamber of Commerce last Friday, said that many of the complaints with regard to the inefficiency of the telephone service were untrue and many were couched in the most exaggerated terms; but, nevertheless, he proposed to spend £10,000,000 on the development of the service during the next few years.



## ALUMINIUM v. COPPER CABLES

IN our last issue we published the first part of a Paper on aluminium and copper cables, by Mr. B. Welbourn, read before the Institution of Mining Engineers. The latter parts of the Paper dealt with overhead cables and jointing.

Usually, said Mr. Welbourn, overhead cables are considerably cheaper than insulated cables, and the saving that may be effected frequently is as much as 50 per cent. The procedure to be followed before any overhead line may be erected in the United Kingdom is rather tedious, except where the line is entirely erected on private property. The governing authority is the Board of Trade, who will, on application, furnish copies of their regulations, and of the "Model Description." Before commencing the work, it is necessary to send for approval a description of the proposed line to the Board of Trade. It must not be assumed from reading this "Model Description" or the regulations that no variation is permitted in regard to factors of safety. The attitude of the Board of Trade's electrical adviser regarding factors of safety and other details is very reasonable, and usually the best way to solve any difficulty is to have an interview with him. It is customary to use a stranded conductor, because its breaking-strain is greater than for a solid conductor of equal cross-sectional area. It is also usual to employ the smallest practicable number of wires in a strand, so that each wire may be made to take its proper share of the longitudinal stress; but it is not advisable to use any aluminium wire exceeding 0.25 inch in diameter; and in conductors up to 0.25 sq. in. no individual wire should exceed 0.169 inch in diameter.

There are legitimate differences of opinion as to factors of safety for copper and aluminium wires. The practice varies widely: for example, in North America, where both aluminium and copper overhead lines are extensively used, the maximum stress employed for both copper and aluminium is 250 per cent. greater than is called for in the British Board of Trade regulations. Making allowance for the elasticity of the metals, experience shows that in most parts of the United Kingdom it is sufficient to allow 17 pounds per sq. ft. of wind pressure and a factor of safety of  $3\frac{1}{2}$  for copper and  $4\frac{1}{2}$  for aluminium at a temperature of  $22^{\circ}$  F. when metals are employed which are of the quality previously suggested in this paper.

Mr. Welbourn gave the following comparisons of costs in actual cases which have occurred:—

(1) In 1910 Messrs. Kennedy and Jenkin, as consulting engineers to H.M. Secretary of State for War, issued specifications for 7.6 miles of 3,000-volt, four-wire, three-phase lines at Aldershot. The strength of poles, length of span (200 feet), &c., were kept the same throughout for the conductors, which were of 0.10, 0.05, and 0.025 sq. in., respectively, for aluminium, or equivalent copper. The tendered prices showed a saving of 7.42 per cent. in favour of aluminium, with copper at £60 5s. and aluminium at £74 10s. per ton.

(2) In 1910, under the scheme prepared by Mr. M. H. Habershon, two 600-volt, two-wire, direct-current lines were erected for Messrs. Newton Chambers and Company, Ltd., at Rockingham, Yorkshire, as follows:—(a) A 950-yard run of two 0.40 sq. in. (19/0.164 in.) double-braided aluminium conductors to carry 150 kw. (b) A 2,100-yard run of two 1.40 sq. in. (37/0.222 in.) bare aluminium conductors to carry 500 kw. 40-yard spans were allowed for aluminium and 50-yard spans for the equivalent copper cable. Line (a) erected complete, including all poles, was 25 per cent. cheaper in aluminium than in copper. Line (b) erected complete, including all poles, was 27½ per cent. cheaper in aluminium than in copper.

(3) In 1912, a 6,600-volt three-phase line was built for the Ebbw Vale Street Coal and Iron Company, Ltd., for whom Messrs. Walter Dixon and Company, of Glasgow, act as consulting engineers. The 5,850-yd. run of line, using 7/0.196-in. bare aluminium wires, and capable of carrying 1,100 kw. without any overloading, showed a saving in favour of aluminium of 20 per cent.

Experience has shown in North America that there is much less trouble with aluminium than with copper from ice and snow collecting on the conductors; and if in the future it can be demonstrated that aluminium does not collect these as readily as copper does in this country, then modifications in pole design, &c., will follow, with a further saving in cost in favour of aluminium. Aluminium conductors, being very light and of larger diameter than copper, are blown up vertically as well as horizontally in strong gusts of wind, and they require to be amply spaced, which increases the cost. So far as the author knows, copper wires in this country are never blown in any other direction than sideways.

Dealing next with jointing, the author said that so far as his experience goes, there is not a single solder which is permanently satisfactory, and he does not recommend either cast-aluminium joints or autogenous welding for cables, owing to the effect of the heat on the insulation. On the other hand, he confidently recommends the type of joint used on the large aluminium cables in Manchester, described in *ELECTRICAL ENGINEERING* of Nov. 24, 1910.

Usually, in this country joints on copper and aluminium conductors on overhead lines are made at an insulator, so as not to be under stress. Copper joints can be easily made in various ways. Probably the best method on overhead lines, or on insulated cables carrying any considerable current, is by means of flexible copper braid bound and soldered to the joint, a method by Mr. Chas. Vernier, for use on both overhead and underground conductors.

There are various ways of jointing aluminium conductors on overhead lines. Up to 0.25 sq. in. welded joints can be made by making the ends butt inside a metal sleeve and heating them by means of a blow-lamp until the ends can be forced together by hand. After cooling, the metal sleeve is then removed. This type of joint must not be subjected to stress. It was used throughout on the Aldershot lines already mentioned, with the approval of Messrs. Kennedy and Jenkin, and has proved entirely satisfactory, its conductivity being higher per unit length than that of the hard-drawn conductors themselves. It is also being used for some of the lines under construction for the War Office on Salisbury Plain.

Another way of jointing large conductors is by means of the type of clamp-joint similar to those described in the articles on aluminium cables already referred to, but without the cast-iron protecting box. Such a joint cannot be used under stress, and it should be painted, immediately after fixing, with a high-class paint, in order to prevent oxidation of the strands inside the clamp.

The well-known torsion sleeve-joint may be employed for jointing conductors up to about 0.30 sq. in., under strain. It has not been much used in this country, but it is commonly employed in the United States and Canada, and is understood to be satisfactory. It should also be painted.

A specially-designed joint for use under stress was employed on Messrs. Newton Chambers & Co.'s 1.4 sq. in. line. It is clearly shown in Fig. 1, and has been quite

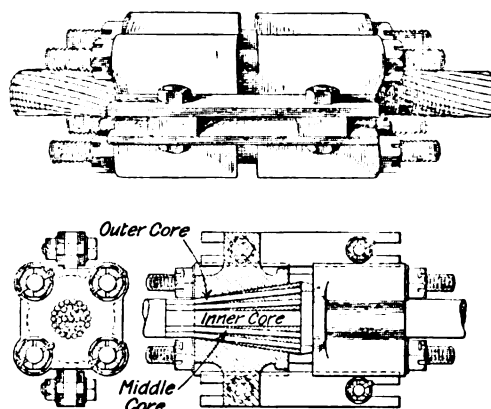


FIG. 1.

successful. To prevent electrolytic action, the steel holding-bolts were stoved and enamelled. It should be painted as mentioned above.

## DISCUSSION.

Mr. Robert NELSON (H. M. Chief Electrical Inspector of Mines) felt generally in the position of being able to agree with Mr. Welbourn on the Paper, and one point he would emphasise was the preference expressed for lead-covered cables. It was quite correct to say that, as an electrical apparatus, there was nothing more reliable than the lead-sheathed and armoured cable, and for a mine where there might be some slight risk of accident there was no safer method of transmitting electrical power.

Mr. A. RICHARDS (W. T. Glover and Co.) regretted that Mr. Welbourn had not entered into a more detailed discussion of paper v. bitumen. He agreed that too much stress was often placed on the corrosive action of water. Very often water was reputed to be bad for cables when it was not so. He had had a case quite recently in which he was told that a certain pit water was strongly alkaline, but it turned out to be slightly

acid. In his opinion vulcanised bitumen cable had advantages over lead-sheathed: it was much more flexible, and for awkward places this gave it a great pull over the lead-covered cable; the jointing was simpler, and the terminals could be treated in a much more haphazard way. He mentioned a curious instance of what a bitumen cable would stand. It had been on its drum for five years, not having been delivered owing to some dispute, but although the drum was found to be rotten, the cable itself was as good as when made. It was decided to instal it in a pit, and in doing so, through an accident, the whole thing went down the shaft and had to be hacked to pieces. They took seven of the worst pieces and tested them, and six out of the seven stood the full working pressure of 3,300 volts, whilst the other one took 10,000 volts. Another similar instance was that of a low-tension cable which was accidentally dropped down the shaft, and was got out again in two or three lengths and put to work. He could not imagine a paper, lead-covered cable standing this. He did not agree that Mr. Welbourn's joint was quite as simple as he tried to make out, and he criticised the figures given for the resistance of the Manchester aluminium cable joints. Mr. C. J. Beaver, he said, had made many tests of conductivity of joints of that description, and the best he got was 66 per cent., and of the torsion joint used in America, some were as bad as 6 per cent., and none better than 60 per cent. The difficulty of torsion joints appeared to be in the contact. It seemed to be necessary to get hold of each individual wire in order to get good contact.

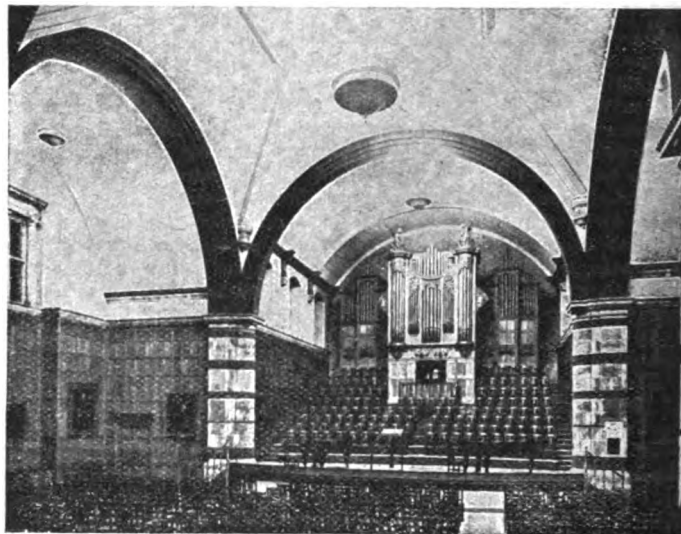
Mr. A. Jacob (British Aluminium Company) said that aluminium showed to the best advantage on insulated cables in connection with low-tension feeders where the cross-section of the conductor was relatively large. He was pleased to note Mr. Welbourn's conclusions that, at the average price of aluminium and copper—the price of aluminium being abnormally high at present—there was real economy in using aluminium in connection with that particular class of cable. He agreed with Mr. Welbourn on the question of welding, and as there were at least 15,000 tons of aluminium transmission lines in operation, it was clear that these joints had been effective. There was a good deal in the making of the joint. In the making of the torsion sleeve joint it was desirable to have the sleeve as close a fit as possible to the conductor, and not make the twists too short. The reason for the present high price of aluminium was entirely due to the increasing use of the material, which had absorbed all the available stocks. There was considerable shortage of the metal at the moment, and producers were busy increasing their output as fast as they could get concessions for the necessary water power, which was the key to the economic production of aluminium; the present condition as to price was only of a temporary character. As a matter of fact, the development of the electrical uses of aluminium had been so rapid that it would take manufacturers all their time to keep pace with this demand alone.

It was announced that the Paper should be further discussed at the Annual Meeting of the Institution in Manchester in September.

**Electric Zinc Smelting in France.**—According to the Board of Trade Journal, an interesting development in the French electro-metallurgical industry is announced in the formation of a company for the production of zinc in the electric furnace by a process invented by two Frenchmen. A similar method is already being worked in Norway, but in France zinc ore has hitherto been treated in furnaces heated with coal, and owing to the heavy cost of the carriage of this fuel, smelting has been confined to coal-bearing districts, which are for the most part far from the deposits of zinc. The carriage of ore to the coal-fields, though less costly than the transport of coal to the zinc mines, throws a heavy burden on the industry, and necessitates preliminary treatment at the mines in order that the percentage of metal in the ore to be transported may be as high as possible. As a result of these conditions, the French zinc mines have hitherto been comparatively neglected; but the employment of water-power, which exists in abundance in close proximity to the zinc mines in the Pyrenees, will, it is believed, create a new situation. It is hoped that production will be rendered more economical by the use of the electric furnace instead of coal, while the cost of labour will be very considerably diminished owing to the simplicity of the electric process and the small number of hands needed to work it. Preliminary experiments have been carried out at Arudy (Basses-Pyrénées) and Ugines (Haute-Savoie), and the rights have been acquired by a company which has bought falls at Arrens (Haute-Pyrénées) capable of generating 7,000 h.p. Power will be conveyed to smelting works at Argeles, situated within easy distance of all the principal zinc deposits in the district (Pierrefitte, Chèze, Arrens, and Anglas). The works at Argeles will not be ready for two years, and the company, in order not to lose time, has meanwhile rented some existing works in Savoy having rights over water-power of 1,500 h.p., and conveniently situated for receiving ore for treatment. It is proposed to devote these works chiefly to the production of white zinc, for which there is a big demand in France now that the use of white lead is forbidden.

## INDIRECT LIGHTING AT RUGBY SCHOOL

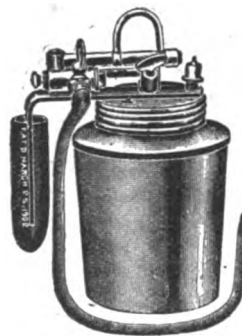
ONE of the latest "eye-rest" installations which has been designed by the British Thomson-Houston Co. (Mazda House, Upper Thames Street, E.C.) is in the Temple speech room at Rugby school. This installation completely upsets all the charges of "shadowlessness" and "flatness" which have been urged against indirect lighting. The illumination is certainly uniform and well diffused, but there is no suppression of detail or relief. The room is fairly lofty and the "eye-rest" fittings are suspended close to the ceiling, but the pictures on the lower part of the wall are excellently lighted. The installation consists of one 55-inch fitting, con-



THE TEMPLE SPEECH ROOM, RUGBY.

taining nine 200-watt Mazda lamps in the centre of the room; one 36-inch fitting, containing nine 100-watt Mazda lamps at each end; and one 24-inch fitting, containing three 100-watt Mazda lamps in each of the transepts. There are thus five "eye-rest" fittings in all, containing Mazda lamps with a total wattage of 4,200. The fittings are attached to the ceiling by means of contact suspension gear, so that they can be lowered to the ground for cleaning.

## PAINT SPRAYERS



THE use of the ordinary brush for the distribution of paints, lacquers, varnishes, enamels, &c., over large areas is rapidly being superseded by the sprayer, which distributes the material quicker and much more evenly, giving work that is much more penetrative, while effecting great economy in material. A number of patterns of this are described in a list issued by the F. Crane Chemical Co. (Armoury Close, Bordesley Green, Birmingham), ranging in price from 45s. upwards, in capacities of a pint or quart. They embody a number of

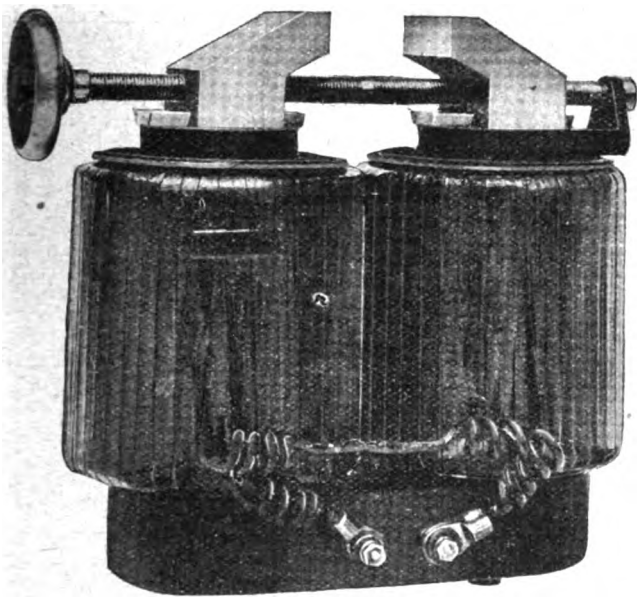
good points in design and construction, which are the result of extensive experience. One pattern is illustrated here.

**Kelvin Memorial.**—On Tuesday next, at 3 p.m., the dedication will take place in Westminster Abbey of a window in memory of Lord Kelvin. The window, which is the result of action taken by engineers in the British Dominions and the United States, has been placed in the north aisle of the nave, in close proximity to the one erected in 1909 by civil engineers to the memory of Sir Benjamin Baker, and has been designed and made by the same artist, Mr. J. N. Comper. A special service is being arranged, and Mr. R. Elliott-Cooper, President of the Institution of Civil Engineers, will make the formal presentation of the window on behalf of the donors. Members of the American Engineering Societies and of the Canadian Society of Civil Engineers who may be in London at the time are invited to attend the dedication ceremony, whether they subscribed to the cost of the window or not, and they may obtain cards of admission by writing before Monday, July 14th, to the Secretary of the Institution of Civil Engineers, 12 Dartmouth Street, Westminster, S.W.



## MAGNETISING PERMANENT MAGNETS

A NEW magnetising device for permanent magnets has just been designed by the Witton Kramer Electric Tool and Hoist Co. (for whom the General Electric Co., Ltd., of 67 Queen Victoria Street, London, E.C., are the sole selling agents), which has been specially designed at the request of large manufacturers of permanent magnets with a view to enable a large magnetising force to be effectively applied to the magnet during the magnetising process. As will be seen from the accompanying illustration, it consists of a strong electro magnet with steel pole-pieces working along slides, machined and fitted with high accuracy. The moving poles may be drawn together by a right and left-handed copper screw. The permanent magnet is gripped between the two pole-pieces by operating the hand-wheel attached to the screw. The particular magnet shown requires 1 kw. to energise it. The jaws may be opened out from 1 in. to 8 in. The exact procedure that has to be followed during the magnetising process has to be chosen with very great care. No advantage is to be gained by retaining the magnet in the jaws for a long period, since the resulting magnetism depends not upon the time, but upon the maximum magnetising force applied. Hence the importance of a strong magnetising force with a



MAGNETISING APPARATUS FOR PERMANENT MAGNETS.

low reluctance in the path of the flux. An advantage is to be gained for magnets that need to have extreme constancy, through slightly reducing the magnetism several times by subjecting them to demagnetising forces during the treatment. The best procedure to follow is, after putting the magnet in the jaws, switch on the current to its full value. Then the current is reversed, and the magnetising force applied in the opposite direction. This is repeated several times, and on the final application of the current in the correct direction for magnetising the current should not be suddenly switched off, but should be diminished gradually to zero, otherwise the inductive kick of the coil would exert a demagnetising influence. A number of these magnetising devices have been supplied to various firms for making permanent magnets for meters.

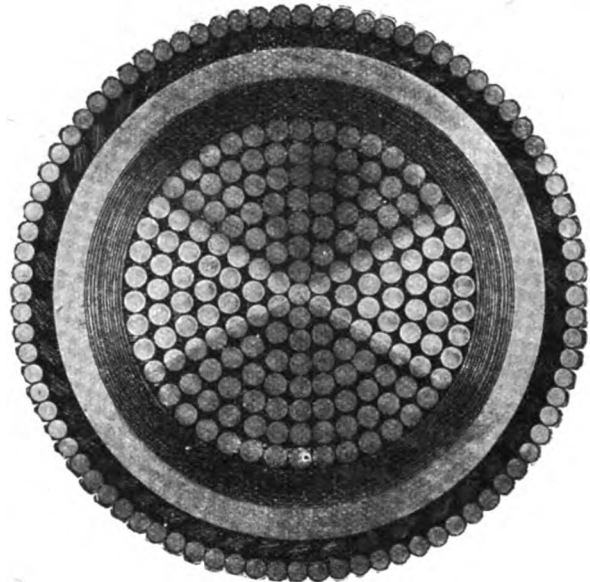
**The Batti Wallahs' Journal.**—The third issue of the bright quarterly official journal of the Batti Wallahs Society contains some amusing and interesting items, including the semi submarine experiences of some members who participated in an eventful down river trip in a motor launch.

**Osram Lamps in China.**—The General Electric Co., Ltd. (67 Queen Victoria Street, E.C.), have sent us illustrations of several buildings in China now lighted by Osram lamps, including a Shanghai club and a hotel, and some street scenes where they are used.

**Electric Heating.**—Dr. Niethammer reports in *Elektrische Kraftbetriebe u. Bahnen* that the New York Edison Co. have now over 3,000 kw. connected in heating and cooking apparatus. In some tailoring establishments a consumption of 350 units per flat-iron per annum is reached. For private houses the 6 lb. flat-iron is most favoured, the average time in use being 14 hours per month, and the average consumption 84 units per annum.

## A LARGE CABLE ON BOARD SHIP

AN interesting item of information has been sent us regarding the new battle cruiser *Australia*, which will be the flagship of the first unit of the Australasian squadron, by W. T. Henley's Telegraph Works Co., Ltd. (Blomfield Street, London Wall, E.C.). This vessel is fitted as part of her electrical installation with a ring main cable, which is, we believe, the largest that has ever been installed on any ship. We reproduce a full-sized section of this cable in the



SECTION OF RING MAIN CABLE ON H.M.S. "AUSTRALIA."

figure. It will be observed that its diameter is nearly 3 in. The sectional area is 2 sq. in., and its weight per thousand yards 23½ tons, the specification being as follows:—169 H.C. tinued copper wires, each 0.124 in diameter, insulated with long fibre paper sheathed with a solid drawn tube of lead, served with tarred jute yarn and armoured with galvanised steel wires, left bright. H.M.A.S. *Australia* was built by Messrs. John Brown & Co., Ltd., of Clydebank, and the cable referred to above, as well as the whole of the cable used in the vessel, was supplied by Messrs Henley's.

**The International Electrical Congress at San Francisco in 1915.**—Arrangements are advancing for the International Electrical Congress which is to be held in San Francisco during the week beginning September 13th, 1915, in conjunction with the Panama-Pacific International Exposition, under the auspices of the American Institute of Electrical Engineers. The Congress is being divided into twelve sections relating to: *Generation, Transmission, and Distribution*.—Central station and sub-station design, control and operation. Long-distance transmission of electric power. *Apparatus Design*.—Generators, motors and transformers. Prime movers and their relations. The rating of machinery. *Electric Traction and Transportation*.—City, surface, and rapid transit railways; inter-urban and trunk lines; electric vehicles, ship propulsion, mining railways, elevators and hoists. *Electric Power for Industrial and Domestic Use*.—Factories, mills, refrigeration, heating devices, &c. *Lighting and Illumination*.—Arc and incandescent lighting; the science and art of illumination. *Protective Devices*; *Transients*.—Switches, circuit-breakers; condensers; electrostatics; disruptive phenomena; high frequency phenomena. *Electrochemistry and Electrometallurgy*.—Electrolytic and metallurgical apparatus and processes. *Telegraphy and Telephony*.—(a) All communication of intelligence by the use of wires; (b) Electromagnetic waves and radio-telegraphy and telephony. *Electrical Instruments and Electrical Measurements*.—Switchboard, portable, standard, and absolute instruments. Testing and standardisation methods; absolute measurements. *Economics of Central Stations and Systems*.—Load factors, power factors, and all problems affecting the economy of central stations; also rates and regulation by public service commissions. *Electro-Physics*.—Radio-activity; Röntgen rays; gas and vapour conduction; electron theory; constitution of matter. *Miscellaneous*.—Such as history of literature of electrical engineering; symbols and nomenclature; engineering education and ethics. In each section it is desired to include Papers dealing with the status or the progress of the art. Offers of Papers and suggestions should be directed to the Secretary of the Committee on Organisation, Dr. E. B. Rosa, Bureau of Standards, Washington, D.C., U.S.A.

## STREET LIGHTING FITTINGS

IN a new list embracing numerous designs of weather-proof lanterns and street-lighting fittings just issued by Siemens Bros. Dynamo Works, Ltd. (Incandescent Lamp and Fittings Department, Tyssen Street, Dalston, N.E.), are some new designs of interior reflectors for the conversion of existing gas lamps to electricity. We illustrate in Figs. 1 and 2 two of the Company's registered designs which are made in white enamelled zinc, and, as may be seen, combine an efficient lighting fitting with the advantages of a cheap and easy method of converting gas lamps to electricity, using "Wotan" metal filament lamps. In

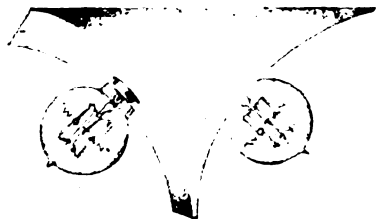


FIG. 1.—ENAMELLED ZINC REFLECTOR  
FOR USE IN GAS LAMP.



FIG. 2.—CONVERTED GAS  
LAMP.

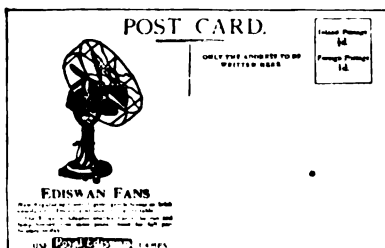
Fig. 2 may be seen how neat is the appearance of one of these converted lanterns, with a D.P. switch inserted between the lamp standard and the lantern. Included with the well-known standard fittings supplied by the firm there is also the new Goliath Edison screw lamp-holder for use with high candle-power metal filament lamps on the "Brighton" series system (ELECTRICAL ENGINEERING, April 24th, p. 230). Although this fitting is fitted with a special shunting device to keep the circuit complete on the failure or withdrawal of the lamp, it is extremely neat, and is only 3 in. diameter by 4 in. deep.

## CATALOGUES, PAMPHLETS, &c., RECEIVED

**INSTRUMENTS.**—A new leaflet from Everett, Edgcombe & Co., Ltd., describes their new "disc" type, long-scale, moving-coil switchboard ammeters and voltmeters. The advantages of long-scale instruments such as these, with a scale embracing an arc of some 300 degrees, have been for some time recognised in connection with A.C. instruments, and are by the introduction of these instruments extended to continuous current, so that all the different class of instrument on a combined board can be uniform in appearance.

**FANS.**—A neat postcard, as shown by our illustration, in black and gold, depicting Ediswan fans, is being issued to the trade by the Edison & Swan United Electric Light Co., Ltd. (Ponder's End, Middlesex). Although the supply is necessarily limited, we understand from the Ediswan Co. that they will be pleased to send a supply of these cards, until exhausted, to any of their "Fan" customers, who have not already ordered any, if they mention ELECTRICAL ENGINEERING.

**FITTINGS.**—A new catalogue from Siemens Brothers' Dynamo Works (Incandescent Lamp and Fittings Dept., Tyssen Street, Dalston) deals with fittings for semi-indirect and inverted illumination, and contains a very tasteful selection of fittings for use with Opal, Holophane, Cervix, and Alabaster bowls, as well as inverted pendants in enamelled iron, in sizes suitable for all classes of buildings. The reflectors of the inverted fittings are of various forms, including steel and white enamel.



**WATERTIGHT TELEPHONES.**—The Siemens type of watertight, loud-speaking marine type telephone is described in a new list from Siemens Brothers & Co., Ltd. (Woolwich). Special deck and engine-room patterns are included with suitable selector switches.

**HOLOPHANE.**—A neat, comprehensive, and complete list giving particulars and prices of all present standard Holophane glassware, as well as a large variety of fittings specially designed for use with these shades, has been issued by the Sun Electrical Co., Ltd. (118 and 120 Charing Cross Road, W.C.).

**FANS.**—Another seasonable new list embracing electric fans of all kinds and accessories has also just been produced by this company, who will forward copies to any of our readers on request. Besides the many fans suitable for domestic, office, and industrial use, we notice the Sun special type of railway fan, which is supplied very largely to Colonial and foreign railway companies. As well as the ordinary desk and oscillating fans, a special feature is made of a combined fan and table lamp, and a combined fan and fruit dish.

*Readers desiring copies of catalogues or pamphlets should apply to the firms in question, referring to the notice in "Electrical Engineering."*

**MERCURY VAPOUR RECTIFIERS.**—A list dealing with mercury vapour rectifiers for projection arcs for cinematographs, &c., has been sent us by the Westinghouse Cooper Hewitt Co., Ltd. (80 York Road, King's Cross, N.). The apparatus provides low voltage direct current for the arc while retaining the advantage of A.C. regulation, and the cost of the equipment is considerably less than that of a motor generator or rotary converter.

**TUMBLER SWITCH CONTROL.**—A second and enlarged edition of the special circular relating to the use of tumbler switches for the control of heating and cooking apparatus, by A. P. Lundberg & Sons (477 to 489 Liverpool Road, N.), which was first issued a year ago, has just made its appearance. Twelve distinct types of control are described, using series-parallel, two-way, "All-or-Part-and-off" switches, "Twinob" switches, and others developed by the company, giving various degrees of regulation. The switches are made in surface and flush patterns, the insulation is heat resisting, and the parts well made to withstand constant manipulation and prolonged currents. Special arrangements for pilot or tell-tale switches are also described, and the list concludes with illustrations of switch, plug, and combined switch and plug connections, specially suitable for radiator circuits, with or without extra earthing connections.

**BATTERY FANS, &c.**—Several types of small fans are described in a new leaflet from the General Electric Co., Ltd. (67 Queen Victoria Street, E.C.), suitable for driving from Edison-Lalande cells or accumulators. An attractive shop window novelty, consisting of two captive electrically driven model aeroplanes is also included.

**ELECTRIC SIGNS.**—Recognising the value of the illuminated sign as an aid to business, Siemens Brothers Dynamo Works, Ltd. (Incandescent Lamp and Fittings Department, Tyssen Street, Dalston), have got out a list of representative designs in classified sections, including special signs for theatres and cinematograph halls, compact signs for use on board ship, and hanging signs. These can be fitted with several varieties of glassware, but special reference should be made to "Opalex" glass, in which a special coloured ground can be fired on to a sheet of white opal glass. Cloisone and cloiglasic panels are used for more elaborate colour schemes. A number of different patterns of flashes are included.

**Dielectric Fatigue.**—A series of tests to determine the nature of dielectric fatigue in ebonite and presspahn, carried out at the University of Liverpool by W. Holtum, are contained in a Paper which has been accepted for publication in the Journal of the Institution of Electrical Engineers. The method adopted was to apply an alternating pressure to the sample under test for a certain time, and then to find a pressure which, applied for 0.1 sec. at 50 or 60 frequency, caused breakdown. This was taken as a measure of the instantaneous strength. The switching operations were carried out automatically, and a large number of samples were tested. The general conclusions deduced are: (1) That fatigue due to electric stress alone is almost negligible for ebonite and presspahn until the point of breakdown is approached, the greatest amount measured for ebonite being 2 per cent. of the initial instantaneous strength. (2) That the least pressure which will cause breakdown if applied continuously is about 80 per cent. of the lowest measured value to which the instantaneous strength can be reduced by fatigue. The conclusion of greatest practical importance is that the dielectric strength of ebonite for sudden stresses lasting for a fraction of a second is only some 28 per cent. greater than it is for long-continued stress, and that any ebonite used for insulation purposes should be designed for the greatest pressure which may occur as though that pressure were continuous.

## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,346.

Describe a regular course of routine inspection and testing for a central station battery of about 250 cells of say 1,000 ampere hours' capacity at the five hour rate; (a) with end regulating cells, and (b) without end regulating cells.—"NASCENT HYDROGEN."

(Replies must be received not later than first post July 17th.)

### ANSWERS TO No. 1,344.

In what way can the forces on transformer coils due to short circuit be determined in three-phase core type and single-phase shell type transformers with sandwich windings?—J. W.

The first award (10s.) is made to "ALPH," for the following reply:—

The mechanical forces due to leakage flux tending to wreck a transformer on short circuit may be divided into three classes: (1) Leakage flux bridging between two faces of the core tends to draw these faces together. This may be neglected, since the core will always be sufficiently strong to prevent any appreciable distortion. (2) Leakage flux encircling one or more coils tends to compress the coil or to draw together its component parts if it is split into sections. This effect is sometimes observable in a transformer which has withstood a short circuit, but it is not usually sufficient to cause damage. (3) Leakage flux between two coils exerts a compressive force at right angles to the direction of the flux, tending to separate the coils. This is the force which usually proves destructive to the transformer by bursting the coils apart.

The stresses due to a magnetic field, both the tension in the direction of the lines and the compression at right angles to the lines, can be calculated from the well-known formula,  $S = B^2/8\pi$ . Where  $S$  is the stress in dynes per sq. cm., and  $B$  is the flux density in lines per sq. cm. Also

$$B = \frac{4\sqrt{2} \times \pi N I \mu}{10L}; \text{ where } B = \text{max. flux density in lines per}$$

sq. cm.,  $N$  = effective number of turns,  $I$  r.m.s. current in amperes,  $\mu$  = permeability of circuit, and in air is unity;  $L$  = length of path in cms. The factor  $\sqrt{2}$  is, of course, the ratio of the maximum current to the r.m.s. current, and is strictly only applicable to a sine wave. It may, however, be taken as sufficiently accurate in most cases, but if the current wave is very much distorted the maximum value of current should be used instead of  $\sqrt{2}I$ . Combining these formulæ and converting to English measure we have,  $S = \frac{2.82 \times 10^{-7} N^2 I^2}{L^2}$ ,

where  $S$  is the maximum stress in lbs. per sq. inch, and  $L$  = length of gap in inches, measured in the direction of the lines of force.  $NI$  must be determined for each gap between primary and secondary windings, by taking the algebraical sum of the various ampere turns assisting and opposing the resultant leakage flux in the gap in question. The maximum

pressure on the coils on each side of the gap is  $SA$ , where  $A$  is the area of the face of the coil in square inches, i.e.,  $A = LL'$ , where  $L'$  is the length of the portion of the coil under consideration, measured along the conductors, and  $L$  is the length of the gap in the direction of the lines of force, which run at right angles to the conductors. The resultant pressure tending to bend any coil is the difference between the pressures calculated for the gaps on each side of the coil, for that portion of the coil which lies outside the core. The pressure tending to burst apart the ends of the core is  $P = S_{\text{max}} ML$ , where  $S_{\text{max}}$  is the stress in the gap for which  $NI$  is a maximum, and  $M$  is the mean length of one turn of the winding,  $L$  being the length of gap as above.

It will be seen that the mechanical forces acting on the transformer are proportional to the square of the current, and it is therefore necessary to determine the maximum current which can flow on short circuit. If the capacity of the supply system is very large compared with that of the transformer, and the line between generators and transformer is short, the current flowing in the event of a short circuit at the secondary terminals will be limited only by the impedance of the transformer. Assuming this is 3 per cent., the short-circuit current will be thirty-three times the full-load current, and the forces acting on the windings 1,100 times those at full load. This is, however, the worst possible case, and as a rule there will be a drop in voltage due to the overload on the generators, as well as a drop in the line. The simplest way to take this into account is to assume a probable value for the short-circuit current and calculate the volts drop in generators and line for this current. The resultant voltage at the transformer terminals, divided by the transformer impedance, gives a closer approximation to the true short-circuit current, which can be used as a basis for working the calculation through again, if the current assumed in the first instance was very far from the true value.

From the above, the stresses in the single-phase shell-type transformer can be readily calculated. In the case of the core-type transformer it will be seen that if the primary and secondary windings are concentric and symmetrical (as is probably the case), the forces due to the leakage flux merely tend to expand the outer winding and compress the inner. The compression will be taken by the solid core, and it is unlikely that the tension in the outer winding will reach a dangerous value. It may, however, be calculated from  $S_t = \frac{4.5 \times 10^{-8} N^2 I^2 L_1}{aL}$ , where  $S_t$  = tension stress in the copper wire,  $L_1$  = length of inside turn of outer winding,  $a$  = total section of copper in outer winding, and the other symbols have the same meaning as before.

It should be noted that the actual forces are not steady, but vibratory, varying from the maximum values calculated as above to zero twice in each cycle. If the natural frequency of vibration of any part of the transformer (such as the portion of a coil projecting beyond the core, for instance) should happen to be the same as the frequency of the stress, i.e., twice the supply frequency, a condition of resonance would be established, giving rise to forces very much higher than the calculated value—theoretically infinitely great. It is practically impossible to guard against this contingency, on account of the impossibility of determining the natural frequency of vibration of the various parts of the transformer, but it may very probably explain the occasional failure of a transformer to withstand short-circuit currents which on calculation appeared well within the limits of safety.

**University College Entrance Scholarships.**—The Entrance Scholarships in the Faculty of Engineering awarded to Messrs. C. H. Avery and G. G. Dawson have been renewed for a further year, as has also the Goldsmid Scholarship that was awarded to Mr. P. L. Capper. The Archibald P. Head Medal and Prize goes to Mr. W. J. Duncan. The following students have obtained Engineering Diplomas:—Messrs. L. S. B. Alder, P. R. Coursey (with distinction), A. M. Fahmy, D. W. Fletcher, D. N. Gautam, A. F. Gimson, A. F. Hewett, E. W. A. Hunt, N. R. Kapur, N. F. Kelsey, B. G. G. Manton, A. El R. Orfy, L. J. Powis, C. H. E. Ridpath, M. H. Schwab, and R. T. Singh.

## "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

### Specifications Published July 3rd, 1913

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

Names in italics indicate communicators of inventions from abroad.

10,338/12. **Joining Tungsten to Copper.** B. T.-H. Co. (G.E. Co., U.S.A.). The copper is purified by treating at a temperature considerably above its melting point with an oxidisable boron compound, and then melted or cast in contact with the tungsten.

14,088/12. **Automatic Motor Starters.** F. BROADBENT. In starters in which the rheostat arm is first moved by hand into the full resistance position and then allowed to return automatically, "inching" movements at starting are obtained by an auxiliary switch governed through a pilot switch or push-button, without it being necessary for the rheostat arm to be clear of the starting resistance studs. This switch may be in parallel with the contacts controlling the auxiliary switch, so that the actual "inching" is controlled by the rheostat arm, or it may be placed near the topmost position of the rheostat arm so that it can be operated intermittently without releasing this, or the magnet coil of the auxiliary switch may be connected across the mains through the "inching" switch, which is normally open and controls a branch of the main circuit connected with the starting resistance. Three figures.

14,161/12. **Coupling Metallic Tubing.** G. P. M. LEE and W. A. BRAME. To couple metallic tubing together or to a fixed casing, an open helix of steel or other strong wire is used. The tubing is screwed into this and soldered. Four figures.

14,236/12. **Commutating Dynamos and Motors.** M. DÉRI. Sparkless commutation is obtained by arranging pairs of brushes so as to prevent the armature coils from being directly short-circuited. The brushes for each pair of poles are kept connected to an external circuit, in which are produced alternating pressures of the frequency of commutation. To effect this an auxiliary machine having coils inserted between the two brushes of every pair, and acted on inductively by a field energised from the main current, may be used with or without condensers. Other ways, using transformers as well as auxiliary machines, are also described. Ten figures.

15,275/12. **Heating Element.** SIMPLEX CONDUITS, L. M. WATERHOUSE, and T. BIRKETT. Two insulating strips, the central portions of which are held a fixed distance apart by a longitudinal separator, over which is wound transversely a resistance ribbon sufficiently taut to elastically bend the strips and bring their longitudinal edges together, thus forming a resilient core. The strips may be of mica, and the separator of metal. Twelve figures.

17,386/12. **A.C. Current Limiter.** A. W. ASHTON. A choking coil is connected in series with the consumer's circuit to effect a reduction in the supply pressure when a predetermined maximum load is reached. The coil has a tapering air-gap closed by a spring when the flux reaches a certain amount, so that the self-induction is increased. As the permissible load may be different at different times, this may be allowed for by altering the reluctance of the coil by a clock-driven iron disc which partially closes the air-gap at predetermined times.

17,838/12. **Self-Regulating Dynamos.** C. A. VANDERVELL and A. H. MIDGLEY. Main and supplementary poles and brushes are used. The windings on the supplementary poles are connected to a main and supplementary brush, arranged to span the armature conductors under the supplementary pole, so that a field opposing but less than the armature cross-field under the main poles is produced. Seven figures.

### Specifications Published To-day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free.

Summaries of some of the more important of these patents will appear in our next issue.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** TAYLOR [Fault clearing on A.C. systems] 16,830/12.

**Dynamos, Motors, and Transformers:** LAKE (*Le Carbone Co.*) [Brushes] 24,343/12; SIEMENS DYNAMO WORKS, KIEFFER and PARKER [Ventilating] 3,224/13.

**Electrometallurgy and Electrochemistry:** JOHNSON [Welding] 14,145/12; HÉROULT [High-grade pig iron] 25,858/12.

**Heating:** VON HENTZEL [Liquids] 28,359/12.

**Ignition:** LAWRENCE [Driving rotary magnetos to facilitate engine starting] 14,324/12; BROOKS and HOLT [Motor vehicle ignition and lighting] 18,764/12; HARTMANN & BRAUN [Magnet] 19,913/12; JUSTICE (*North East Electric Co.*) [Engine starter] 28,930/12.

**Incandescent Lamps:** FARKAS [Drawn wire lamps] 14,655/12; HANSEN and MOHR [Boron-tungsten compound] 3,525/13.

**Instruments and Meters:** DAVIS and HUNTER, 14,576/12; LANDIS & GYR [Two-rate meters] 22,592/12; SCHOLLER [Meter] 24,954/12.

**Switchgear, Fuses, and Fittings:** HARRIMAN and A. REYROLLE & Co. [Dash-pots] 13,997/12; LEITNER [Switches] 14,270/12; SIEMENS BROS. and GRINSTED [Electro-magnetic relays] 14,564/12 and 28,824/12; ELECTRIC & ORDNANCE Co. and COX [Resistance grids] 20,252/12; FISCHER [Mica plates for resistances] 23,869/12; HUTTMANN and HABERL [Time switches] 25,787/12; BOSCH [Automatic regulators] 27,961/12.

**Telephony and Telegraphy:** CRAVEN [Switchboard connecting cords] 11,306/12; HINZPETER [Telephonically ordering cabs, messengers, &c.] 13,807/12; AUTOMATIC TELEPHONE MFG. Co. (*Automatic Elec. Co., U.S.A.*) [Telephone systems] 13,970/12, 13,971/12, 13,972/12, 13,973/12, 13,974/12, and 13,975/12; AITKEN [Telephone sub-station switching] 14,317/12; ZIVNOTSKA BANKA V. PRAZE [Subscribers' automatic telephone stations] 16,374/12; CIE GENERALE RADIOTELEGRAPHIQUE [Charging condensers in parallel and discharging in series] 29,375/12; GRASME [Mechanical type-printing telegraphs for toys] 4,665/13.

**Traction:** HAWORTH and THOMAS TRANSMISSION, LTD. [Control and use of series dynamos] 14,396/12.

**Miscellaneous:** MASCHINENBAU-ANSTALT HUMBOLDT [Rotary annular multipolar magnetic separators] 9,147/12; BRETTLELL (*Martenson*) [Light diffuser] 14,192/12; THOMSON and ROTHWELL [Miners' safety lamps] 14,202/12; GOY [Massage device] 18,271/12; TURNER [Portable electro-medical appliance for use in the bath] 22,807/12; SIEMENS & HALSKE [Refractory articles of tantalum] 23,050/12; JUSTICE (*North-East Electric Co.*) [Power gearing] 28,931/12; STERN and BRITISH EVER READY ELECC. Co. [Portable lamps] 29,302/12; BARES and WEISS [Fire and burglar alarm] 1,285/13; ELECTROMECHANISCHE INDUSTRIE GES. [Pocket lamp and compass] 5,646/13; ELECTROMOTOR EQUIPMENT Co. and MEACOCK [Gearing] 8,503/13.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Incandescent Lamps:** GRAMMONT [Tortuous filament] 13,632/13.

**Meters:** SCHOTT & GEN [Electrolytic] 10,512/13.

**Switches:** FAGERLUND, 13,654/13.

**Miscellaneous:** FORSTER [Friction couplings] 13,308/13.

### Grant of Patent Allowed

10,600/12. **Footstep for Telegraph Poles.** H. LENCH. The grant of the patent has been allowed, in spite of opposition.

### Expiring and Expired Patents

The following Patent expires during the current week, after a life of fourteen years:—

14,304 of July 11th, 1899. **Electric Automobiles.** W. P. THOMPSON (*E. Cantono, Italy*). The system described is based on the employment of the "Cantono" flat-ring inductor motors described in specifications Nos. 25,245/97 and 3,218/98, with variations in the intermediate plate obtained by slight variations in the excitation. The motors (two per axle) can be connected, so that each shaft independently actuates a motor wheel by means of gearing; or the two motors can be separate, each actuating a motor wheel through worm and spurwheel gearing. This method is preferable for driving heavy vehicles, such as omnibuses. The worm has four or five threadings, with a progression equal to the diameter, whereby a high efficiency is obtained, and the motors can act as electric brakes. The worm is keyed on the shaft, and is movable longitudinally, being held in place by two springs, so that the wheel is not rotated until one spring is compressed till its reaction is stronger than the resistance to the road wheel. Three figures.

The following are the more important Patents that have become void through non-payment of renewal fees.

**Distributing Systems, Insulating Materials, &c.:** C. J. BEAVER and E. A. CLAREMONT [Insulating materials, &c.] 6,708/07.

**Dynamos and Motors:** MATHER & PLATT, E. HOPKINSON, and J. FRITH [Polyphase induction motor with several rotors and two stators, the magnetic field being made to progress oppositely in the two stators] 5,899/05; A. WIGH [Wheel-driven dynamos for vehicle and motor-boat lighting, &c.] 5,972/08.

**Electrochemistry:** G. J. ATKINS [Obtaining chlorine by electrolysis of an alkaline earth chloride] 5,596/01; N. J. NIELSEN [Regulating high-pressure milk sterilisation] 5,776/05.

**Switchgear and Fittings:** G. H. IDE [Cord grip] 6,310/08.

**Telephony and Telegraphy:** S. EVERSHED and EVERSHED & VIGNOLES [Ships' telegraphs for gunnery purposes] 5,903/01.

**Miscellaneous:** W. G. HEYS (*J. Scott, R. Farley and J. C. Anderson, U.S.A.*) [Winding coils of bare wire and insulating with threads and paper] 5,257/00; MÄRKISCHE MASCHINENBAUANSTALT. L. STUCKENHOLZ [Lifting magnets] 21,030/07.



# ADAMS IGRANIC

ELECTRIC CONTROL GEAR FOR CAPSTANS.

ADAMS  
M<sup>C</sup>C<sup>2</sup>L<sup>2</sup>  
BEDFORD  
AND  
LONDON

## ELECTRIC TRACTION NOTES

An agreement is said to have been arrived at between the Metropolitan and Great Northern Railway Companies for the joint control and working of the Great Northern and City Tube Railway. It is anticipated that physical connections will be made between the Great Northern system and the Tube railway at Finsbury Park, and with the Metropolitan line at Moorgate Street. One of the drawbacks to the financial success of the Great Northern and City Railway has been the one of a physical connection with the Great Northern system at Finsbury Park, which was originally anticipated when the line was first built, but which, for obvious reasons, was never given effect to.

The point as to whether a tramway sanctioned under the Light Railways Act is liable to be rated as a tramway or a railway for purposes of local taxation has been discussed at considerable length before the House of Lords. The case in question was the final appeal in the action taken by the Tottenham Urban District Council against the Metropolitan Electric Tramways, Ltd. The Local Justices, and subsequently a Divisional Court, held that the lines in question did not come within the definition of a railway, and ordered the company to pay rates on the full assessable value of the undertaking, and not upon a quarter, as in the case of a railway. The Court of Appeal, however, subsequently reversed this decision, and it is against this that the Tottenham Council is now appealing to the House of Lords. Judgment will be given later.

Owing to the small net surplus upon the London County Council tramways last year, namely, £497, the Highways Committee reports that it is unable to make the usual provision for renewals at the rate of 3d. per car mile. It recommends that the amount available this year should be transferred to the renewals fund, and that any rearrangement of the basis of contribution to this account be postponed for two years.

As a result of the recent discussion upon electric battery vehicles at the I.M.E.A., Alderman Fred Smith, Chairman of the Liverpool Tramways Committee, has been instrumental in securing an investigation into the possibilities of this method of traction in Liverpool. The General Manager of the tramways system has to report as to the use of this method of traction in connection with the docks.

The members of the Metropolitan Association of Electric Tramway Managers entertained Mr. H. E. Blain, their late chairman, to dinner at the Municipal and County Club on Friday evening last.

## TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

Considerable dissatisfaction has been caused by the imposition of a fee of one guinea by the Post Office for the issue of licences for experimental wireless telegraphy. Under Clause 2, sub-section 1, of the Wireless Telegraphy Act of 1904 it is expressly provided that licences to conduct experiments in wireless telegraphy shall not be subject to any rent or royalty. The Post Office is apparently trying to get out of this by calling the guinea which they charge a fee for office expenses in connection with the issue of licences, and we understand that they have taken legal advice as to whether they are entitled to make this charge. Although it is not a serious burden upon the majority of *bona fide* investigators who wish to conduct a series of experimental researches in wireless telegraphy, and is presumably intended principally to discourage the amateur, yet it is to be regretted that the Post Office should adopt a course which certainly evades the spirit of the Wireless Telegraphy Act, although it is not in conflict with the letter of it.

On Friday last a petition was presented to the Judicial

Committee of the Privy Council by the Australian Government through Mr. Danckwerts, K.C., and Mr. E. A. Harney, K.C. (Australia). Special leave was sought to appeal from the order of the Australian High Court permitting an inspection by the Marconi Co. of the Australian wireless stations, in connection with their action for infringement against the Australian Government, which claims to be working a system under the patents of Mr. Balsillie. Mr. Danckwerts urged that the matter of law involved was of great public importance. This was whether the opinion of a responsible Minister of the Crown was conclusive, or whether it could be examined by the Court. The majority of the Australian Court inclined to the latter view, and thought that there could be nothing to warrant even a conjecture that the inspection would disclose anything which could reasonably be called a State secret. Without calling on Mr. A. J. Walter, K.C., and Mr. J. Hunter-Gray, who represented the Marconi Co., the Lord Chancellor said that this was not a convenient case to discuss the matter of law raised, and they must refuse the petition.

In announcing to a deputation from the London Chamber of Commerce last week that he will shortly ask Parliament for authority to borrow £10,000,000 for the development of the Post Office telephone system, the Postmaster-General emphasised the point that in his opinion the complaints against the telephone service since it has been in the hands of the Government have been considerably exaggerated. Among the developments foreshadowed is the spending of £300,000 on a new underground cable from London to Birmingham.

In the House of Commons last week the Postmaster-General announced that the price agreed with the National Telephone Co. for the purchase of their undertaking is £12,470,300, or £45,000 less than the amount actually awarded by the arbitrator. On the other hand, the Post Office has, it will be seen, abandoned its claim with regard to the item of £247,200, the cost of raising capital, which, it has been suggested, should have been deducted from the award.

The Post Office has been negotiating the terms of a new agreement with the Marconi Co. for the Imperial wireless telegraph scheme. This will involve an additional expenditure compared with the old contract, due, in the first place, to the increased cost of materials necessary for the equipment of the stations, which the Company estimates at about £6,500 per station. Briefly, the other alterations in the old contract are that 10 per cent. royalty is to be paid the Company for each station separately, such royalty to be paid only in respect of the receipts of those stations where Marconi patents are to be used. The Government have the right to instal other apparatus in the stations even before the completion of the first six stations. On the other hand, the Company, which had previously guaranteed the speed of transmission of fifty words a minute by automatic apparatus, now guarantees seventy-five words a minute. With regard to the right of the Company to inspect any plant installed by the Government which it is suspected infringes their patents, such inspection is now to be made by an independent engineer. The new contract provides for the construction of the stations by the Company, the Government holding the view that the only alternative was the creation of a new staff, and the employment of an engineer of distinction to supervise the work. This, however, it was not felt the Government could undertake. The contract is not to be binding unless ratified by the House of Commons before August 31st this year.

It is stated that the Danish Naval authorities will adopt the Poulsen wireless telegraph system in the Danish Navy.

Sitia-Rhodes cable failed on the 2nd inst., and was repaired on the 5th.—The Servian authorities announce that telegrams for Salonika may not pass over their territory, while the Roumanian Government has suspended all private telegraphic intercourse in code or cipher language.—The Fort-de-France Paramaribo cable of the French Cable Co. failed once again on the 3rd inst, but it was put in order again on the 7th inst.—The Bulgarian Administration has prohibited the exchange of telegrams with their office at Salonika.—Newfoundland has become an official adherent to the Radiotelegraphic Convention of Berlin.

# ELECTRICIANS !



Have you seen  
**Moseley's** latest production in  
**Rubber Gloves ?**

**THEY ARE ABSOLUTELY THE BEST.**

You cannot afford to run risks, and should use the best glove that can be made.

Write for particulars. Samples sent on approval.

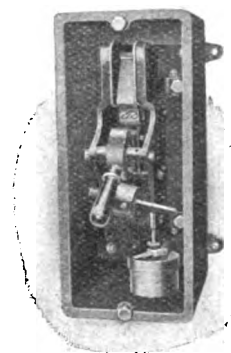
**DAVID MOSELEY & SONS, Ltd.,**  
ARDWICK, MANCHESTER.

## SWITCHGEAR & COWANS, L<sup>TD</sup>.

Salford,  
MANCHESTER

50 Amps.  
to  
5,000 Amps.

Max.  
Reverse.  
No. Volt.



Large  
Stock  
Kept.

## CIRCUIT BREAKERS

# MICA

Plate Tubes,  
Rings, &c., in

**BRITISH MICA CO., LTD.**

Contractors to  
H.M. Government,  
Lebanon Road Works,  
Wandsworth, S.W.  
Tel.—405 P.O. Putney  
Tele.—"Micamint," London.

**MICANITE**

The Micanite & Insulators Co., Ltd.  
WALTHAMSTOW,  
London, E.

FOR **FIBRE**  
SHEETS, RODS  
AND  
TUBES.

**ELECTRICAL PORCELAIN**

OF  
HIGHEST QUALITY  
APPLY TO

**JAMES MACINTYRE & CO., LTD.,**  
BURSLEM.

**CRYSELCO**  
**ELECTRIC**  
**LAMPS.**

KEMPSTON WORKS, BEDFORD.

Telegrams: "Cryselco," Bedford.  
Telephone: 177 Bedford.

**GLASS TUBES**  
**AND RODS**

FOR ELECTRICAL PURPOSES

**GUILBERT-MARTIN**  
9, Edmund Place, LONDON, E.C.

**F. WIGGINS & SONS,**  
FOR

**MICA** INSULATION

102, 103 & 104, MINORIES, LONDON.

# SILVERTOWN

## PRIMARY BATTERIES



## LECLANCHÉ

(Original Manufacturers in Great Britain)

**DANIELL, POGGENDORFF,**  
**BUNSEN, MINOTTI,**  
**GROVE, Etc.**

**FIRING CELLS & BATTERIES,**  
**MEDICAL BATTERIES,**  
**MEDICAL COILS, Etc.**

**HIGHEST GRADE ONLY**

SPECIAL TERMS FOR QUANTITIES.

List No. 31 on application.

**The India Rubber, Gutta Percha and**  
**Telegraph Works Co., Ltd.,**

Head Offices:—106, Cannon Street, London, E.C.

Works:—Silvertown, London, E.



When corresponding with Advertisers, please mention "Electrical Engineering."

## LOCAL NOTES

**Bootle: New Power Station.**—The new power station is approaching completion. The Committee has decided to postpone any revision of tariffs until the new works have come into beneficial use.

**Bradford: Electrical Developments.**—In view of the important developments in the near future in the Bradford electricity undertaking, the members of the Electricity Committee have recently been inspecting the Manchester power stations.

**Electricity Accounts.**—There was a net profit of £8,477 upon last year's working on the electricity undertaking.

**Bridlington: Electricity Accounts.**—There was a net profit of £1,825 upon the electrical undertaking last year. In spite of the extra coal costs the total cost of production was slightly decreased, compared with the previous year. The sum of £500 to be transferred to renewal fund from the profit for the year.

**Dalkey: Electric Supply.**—The Alliance and Dublin Consumers' Gas Co. intends to apply for electric lighting provisional orders for a number of towns, including Dalkey.

**Dudley: Sale of Electrical Undertaking.**—We pointed out a short time ago that a difficulty had arisen in connection with the sale of the electrical undertaking to a private company, inasmuch as under the terms of the proposed sale the rates of the Borough would still be liable, in the event of failure on the part of the purchasing company, to repay the outstanding loans on the undertaking. The Company has now offered the Council certain securities in this matter, which the Council are being recommended to accept by the Electric Supply Committee.

**London: Hammersmith: Electricity Accounts.**—The sum of £2,500 is to be carried to reserve from the electricity accounts for last year, and provision is also to be made out of the profits of £4,540 for £300 for conversion of gas lamps and £300 for an electrical exhibition to be held later.

**Hampstead: Electricity Accounts.**—In view of the expansion of the Council's electricity undertaking, it has been decided to engage a firm of chartered accountants at a fee of 100 guineas per annum to report quarterly upon the accounts.

**St. Marylebone: Electricity Accounts.**—The past year's working of the electricity undertaking shows a net profit of £4,014. This is about £2,800 less than was estimated for at the beginning of the year, but the Finance Committee, in reporting upon the situation, thinks the Council is to be congratulated upon the results, in view of the advance in the cost of fuel, which exceeded the estimates by £4,500, and is an increase of £6,600 in actual expenditure compared with the previous twelve months.

**St. Marylebone: Electric Cooking Apparatus.**—In connection with the regulation which the Board of Trade proposes to prescribe with respect to the supply of energy at medium pressure for cooking purposes, the London County Council has expressed the opinion that the framework of cooking apparatus, as well as the guard protecting the heating elements, should be efficiently earthed.

**Tottenham: Gas Company's Electric Powers.**—The bill of the Tottenham and Edmonton Gas Co., which transfers the Wood Green Council's electric lighting order to the Company, has now passed through both Houses of Parliament. The North Metropolitan Electric Power Supply Co. and the North Metropolitan Electric Power Distribution Co. endeavoured to oppose the bill at various stages, but both in the House of Commons and in the House of Lords they were refused a locus.

**Middleton: Street Lighting.**—The lighting of the centre of the town is engaging attention, and further additions to the electric lighting of the streets are contemplated.

**Newcastle-under-Lyme: New Plant.**—Two Diesel engines have been installed and are now running daily with very satisfactory results. The supply was changed over to the three-wire system in Whitsun week, and a supply at both 460 and 230 volts is now being given.

**Sunderland: Electricity Accounts.**—The report of the Borough Electrical Engineer for the year ended March 31st shows a net profit of £6,248, which would, however, have been considerably more but for the effects of the coal strike. The net profit is to be carried to depreciation and renewals fund. Dealing with the disposal of the steam generating plant in the Dunning Street works, and the disused continuous-current generating plant at Hylton Road, the report

points out that the original cost of this was £64,927, whilst the outstanding debt upon it at March, 1912, was £31,255. Towards this the sinking fund is to contribute £2,186, and £5,069 is to be taken from depreciation and renewals fund. Adding to this the estimated amount to be realised by the sale of the plant, namely, £7,250, there will remain an outstanding book debt on the plant of £16,750.

**Weston-super-Mare: "Stealing" Electricity.**—The proprietor of the flying machine who resorted to the practice of connecting his lighting circuits to his power meter, in order to get current at the cheaper rate, as reported in our last issue, has been fined £10.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

## Generating Stations, Sub-Stations, Mains, &amp;c.

**Belfast.**—A loan of £35,000 for electrical extensions is to be applied for.

**Cardiff.**—A loan of £30,000 is to be applied for in connection with extensions at the electricity works.

**Darwen.**—The sanction has been given to a loan of £3,572 for mains, &c.

**Durham.**—An electric lighting plant is required for the Richard Murray Hospital, Blackhill, Co. Durham. Secretary.

**Hamilton, N.B.**—Additions to electricity works, at estimated cost of £10,000.

**London: L.C.C.**—High and low-tension sub-station switchgear. (See an advertisement on another page.)

**Battersea.**—Mains extensions at an estimated cost of £2,179 are to be carried out.

**Loughborough.**—Loans of £11,000 for plant, and £3,000 for mains are to be applied for.

**Manchester.**—Borrowing powers have been sanctioned for £45,000 and £30,000 for electricity purposes.

**Newport (Mon.).**—Extra high-tension switchgear. Borough Electrical Engineer, July 19th.

**Perth (W.A.).**—Switchgear and accessories are required for the municipal power station. Particulars from Consulting Engineers, Messrs. Merz & McLellan, 52 Victoria Street, London, S.W.

**Peterborough.**—Sanction has been received to the borrowing of £7,000 for a new generating set, boilers, &c.

**Rochdale.**—Sanction has been given to a loan of £30,000 for extensions at the electricity works.

**Sheffield.**—An inquiry was held last week concerning a loan of £130,860 for the electrical undertaking. During the course of the proceedings it was stated that the demand for power purposes has increased from 868,943 units in 1904, to 16,717,000 at the present time. In addition to the remarkable increase now taking place, both in the lighting and power demands, the installation of electricity for street lighting is under consideration.

**Shipley.**—Two 1,000-kw. steam turbo-alternators with surface condensers and switchboard. (See an advertisement on another page.)

**South Shields.**—New generating plant, estimated to cost £30,000, is to be installed.

**Stoke-on-Trent.**—Mains extensions, at an estimated cost of £1,555, are to be carried out.

**York.**—A proposal has been made to extend considerably the limits of supply for electricity purposes.

An expenditure of £16,450 is contemplated upon street electric lighting works.

The City Electrical Engineer has reported that the cost of laying mains throughout the city for domestic purposes would be £100,000. The Electricity Committee, however, recommend that extensions be made from time to time.

## THE RECORD ELECTRICAL Co., Ltd.

LONDON OFFICE:  
CAXTON HOUSE,  
WESTMINSTER, S.W.

Telephone:  
3057 Victoria.  
Telegrams & Cablegrams:  
"Infusion,"  
London.

MEASURING  
INSTRUMENTS.

RECORD'S PATENT.

Write for Prices & Particulars.

WORKS:  
BROADHEATH,  
MANCHESTER.

Telephone:  
164 Altrincham.

Telegrams & Cablegrams:  
"Infusion,"  
Altrincham.

### Wiring

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Barnsley.**—Variety theatre. Architect, P. A. Hinchcliffe, 14 Regent Street.

**Barrow-in-Furness.**—New secondary school.

**Blackburn.**—New fire station and firemen's dwellings.

**Brighton.**—School Hall, Brighton College (£6,000).

**Croydon.**—Thirty-eight houses in Ashburton Avenue. W. Nottle, 250 Albert Road. Thirty-two houses, Compton Road. C. D. Gooch, 54 Gresham Street.

**Darwen.**—Cinema theatre in Bolton Road.

**Doncaster.**—Block of offices, corner of French Street. Borough Surveyor.

**Gomersal.**—Reconstruction of Gomersal Mills. T. Barnsley & Sons. Architect, C. D. Swale, 5 Cabinet Chambers, Leeds.

**Greenock.**—Electric lighting of Highlanders' Academy. Consulting Engineer, T. C. Fulton, 143 West Regent Street, Glasgow.

**Kingston-on-Thames.**—Alterations to St. Luke's Schools. Borough Surveyor.

**Leeds.**—Offices for Board of Overseers. Architect, A. Neill, 38 Park Row.

**London:** L.C.C.—235 points, Tollit Street School, Mile End. (See an advertisement.)

**Middleton.**—Extensions to the Rhodes Council School. Borough Surveyor, July 4th.

New Town Hall (£30,000).

**Sale.**—New Council Offices.

**St. Helens.**—Municipal hall and fire station.

**Southend.**—Alterations and additions, Leigh Road School. Borough Engineer.

**South Wales.**—Capel Hotel, Bargoed. Architect, S. Williams, Wharton Street, Cardiff.

**Watford.**—Working-class houses.

### Miscellaneous

**Australia.**—It is stated that Mr. R. P. Wilson has reported with reference to the electrification of the Perth-Northam section of the Trans-Continental Railway through the Darling Ranges.

105 miles lead-covered paper-insulated cable. Deputy Postmaster-General, Melbourne, August 19th. Particulars from High Commissioner, 72 Victoria Street, S.W.

**Malta.**—Supply of arc lamp carbons. Crown Agents for Colonies, Whitehall Gardens, S.W.

### TENDERS RECEIVED AND ACCEPTED

**Belfast.**—The tender of the Sturtevant Engineering Co. has been accepted for wet air filters at £369.

**London: Hammersmith.**—The following tenders have been received for ten 100-kw. transformers and five 50-kw. transformers:—Johnson & Phillips, £79 each and £46 17s. 6d. each respectively; British Electric Transformer Co., £85 and £50 5s.; W. E. Burnand & Co., £87 10s. and £54; Brush Electrical Engineering Co., £93 10s. and £56 12s. 6d.; Foster Engineering Co., £94 and £47 10s.; Ferranti, £94 and £60; Electrical Engineering & Equipment Co., £105 10s. and £59; British Westinghouse Electric & Manufacturing Co., £141 and £83 10s. The tender of the British Electric Transformer Co. is recommended for acceptance in both cases.

**Peterborough.**—The tender of Messrs. F. Danks & Co., of Oldbury, for the supply of a steam boiler, at £1,162 15s., is recommended for acceptance.

**Regina (Canada).**—The City Commissioners of Regina, Saskatchewan, have just ordered from Messrs. Bruce Peebles & Co. a 1,200-kw. motor-converter (Peebles' La Cour Patents).

**West Hartlepool.**—The tender of the British Thomson-Houston Co. has been accepted for rotary-converters in connection with the tramway supply.

### APPOINTMENTS AND PERSONAL NOTES

Mr. George Westinghouse, of the Westinghouse Co., Pittsburgh, has been presented with a gold medal by the Verein Deutscher Ingenieure, in recognition of his pioneer engineering work, in particular in connection with the "Westinghouse"

air brake. Mr. George Westinghouse is now President of thirty companies employing some 50,000 workers, and having a total capital of about £24,000,000.

Mr. R. N. Mayne, Deputy Electrical Engineer to the Erith Urban District Council, has been appointed Manager of the Redditch Electricity undertaking.

Mr. Alexander Pratt, of Edinburgh, has been elected President of the Electrical Contractors' Association of Scotland.

Mr. A. G. Cross, of the Newcastle-on-Tyne Electric Supply Co., has been appointed shift engineer at the Avonmouth sub-station of the Bristol Corporation.

Mr. J. S. D. Moffat, General Manager of the Rochdale Corporation Tramways, has been appointed to succeed Mr. H. E. Blain as General Manager of the West Ham Corporation Tramways.

Mr. W. E. Hart, Solicitor to the National Telephone Co. up to the time of its absorption by the Government, has been appointed Town Clerk at Sheffield in succession to the late Mr. R. M. Prescott, at a salary of £1,250, rising to £1,500 per annum.

A car shed electrician is required by the Ipswich Corporation tramways department. (See an advertisement on another page.)

### MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. G. Smith & Son, of 5 Philpot Lane, E.C., informed us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night, was £67 10s. to £68 (last week, £67 10s. to £80).

**Change of Telephone Number.**—The telephone number of Scholey & Co. (151 Queen Victoria Street, E.C.) has been changed to City 5863 (two lines).

**Annual Outings.**—The employees of Page & Miles, Electrical Contractors, of Brighton and Worthing, held their annual outing on Saturday, when they journeyed by motor coach to Fittleworth, where very successful sports were held.

The Head Office Fire Brigade of the General Electric Co., Ltd., held their first annual outing at Windsor on Saturday last.

Nearly a thousand employees of the Western Electric Co. had an enjoyable outing at Herne Bay last week.

**Australian Agency.**—The principal of a Sydney firm, now in London, wishes to get into touch with the United Kingdom manufacturers of all kinds of electrical goods and machinery. Further particulars from London Chamber of Commerce, Oxford Court, Cannon Street, E.C.

**Liquidations.**—Creditors of the Doncaster Electrical Co. are requested to send in particulars of their claim to A. E. Stringer, Manor Row Chambers, Bradford, by July 21st.

**Change of Title and Address.**—The technical department of the business of Marcus Heber Smith, formerly carried on at 4 Racquet Court, Fleet Street, E.C., and managed by Mr. A. J. Greenly, is now being carried on under the style of Robinson, Greenly & Co., at 116 Charing Cross Road, W.C.

### COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &c.

**General Electric Co.**—The available profit for the year to March 31st, including £32,050 brought forward, is £177,311. After setting aside £32,543 for debenture interest and depreciation, and paying the 6 per cent. preference dividend, a 10 per cent. dividend is recommended on the ordinary shares, transferring £50,000 to reserve, and carrying forward £32,331. The company's works have been fully employed throughout the year, and further extensions are contemplated, and the directors draw attention to the continued expansion of the business.

**Electric Construction Co.** A dividend of 5 per cent. is recommended on the ordinary shares for the year to May 31st, transferring £10,691 to general reserve, and carrying forward £6,899. The company's position has considerably improved during the past two years.

**Edmundson's Electricity Corporation.**—The net profit for the year to March 31st was £18,899, and after meeting the 6 per cent. preference dividend, the balance of £6,899 is carried forward.



# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 342 [Vol. IX., No. 29]  
*All rights reserved.*

THURSDAY, JULY 17, 1913.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum:

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES AND TECHNICAL COLLEGE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

*Other Advertisement Rates on Application.*

#### Latest Time for Receiving

Letters for Insertion, Tuesday first post.

Small Advertisements and Official Announcements, Wednesday first post.

Displayed Advertisements, Tuesday first post.

Corrections in Standing Advertisements, Monday first post.

All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 208-206, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Circling, Fleet, London."

Telephone No.: 5509 Holborn.

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

### SUMMARY

It is expected that one or possibly two makes of very high candle-power (5,000—10,000) metal filament lamps, with an efficiency of  $\frac{1}{2}$ -watt per Hefner candle-power, will make an appearance this autumn. There is no question of lamps of any smaller candle-power being placed on the market at this efficiency. (Page 416.)

AGENTS have been appointed in England for the American National Board of Underwriters, so that apparatus to be supplied under the National Electric Code to Canada can be inspected and passed in this country. (Page 416.)

THE London electric supply companies are opposing the Post Office tube railway on the ground that it gives the Postmaster General powers to compete with the companies for the supply of electricity to post offices all over London. (Page 416.)

THE exhaust steam station at West Hartlepool is just being put into commission. It is interesting in that it is the first waste-heat generating station in the country to be run by a local authority, and also for the fact that Rosenberg self-starting rotary converters are used in the sub-stations. Current is generated by two alternators of 1,250 k.v.a. capacity at 6,000 volts. (Page 417.)

A NEW intercommunication telephone working entirely by push-buttons is described and illustrated. (Page 418.)

A DESCRIPTION of the "Knight" open or closed circuit public fire alarm system is given in a Paper published in the *Journal* of the Institution of Electrical Engineers. The system is very comprehensive. (Page 422.)

AN automatic star-delta starter is described. (Page 423.)

DETAILS are given of a wireless receiving outfit specially designed for the reception of international time signals by clockmakers. (Page 423.)

THE patent specifications published last Thursday include one for electric braking arrangements for the "Thomas" transmission by H. F. Haworth and the Thomas Transmission, Ltd., two relating to metal filament lamps by K. Farkas, and F. Hansen and W. F. Mohr respectively. A new design of the mechanism of moving iron instruments is also protected by W. J. Davis and C. E. Hunter, of the Ediswan Co. A method of charging condensers in parallel and discharging in series for wireless working is described in a specification by the Cie Générale Radiotélégraphique. Two important patents for flaming arc carbons taken out by H. Bremer expire to-day after a full life. (Page 424.)

A QUESTION of interest to shift engineers in central stations is propounded in our Questions and Answers columns. (Page 423.)

AN illustration is given of a telephone exchange switchboard which is being shown at the Ghent Exhibition. (Page 425.)

THE acquisition of the Great Northern and City Tube Railway by the Metropolitan Railway Co., the enlargement of the tunnels of the City and South London Railway, and the running of trolley 'buses from Wood Green to Walthamstow have all been sanctioned during the week by Parliament.—The Croydon Tramway Manager is urging Members of Parliament to consider the necessity of legislation for compelling motor omnibus companies to be placed on the same terms as tramway companies as regards road maintenance, &c.—We give some particulars of the work for the sub-station, on the Melbourne suburban railway system, which has been awarded to Messrs. Siemens Bros.' Dynamo Works. (Page 424.)

A LARGE number of questions have been asked during the week in the House of Commons on the proposed Marconi contract for the Imperial wireless telegraph scheme, in consequence of the announcement that communication over a distance of 3,600 geographical miles has been established by means of the Goldschmidt system.—The pending action by the Marconi Co. for alleged infringement of patents by the Helsby Wireless Telegraph Co. (Page 425.)

EDINBURGH cinematograph theatre proprietors are asking to be supplied with current at power rates.—Some definite progress now seems likely with the

Bethnal Green electric supply scheme.—In spite of the opposition of the Dublin Gas Co., an electric lighting Order has been granted to a private company for Kingstown.—Very satisfactory reports have been presented for the past year's working on the Sheffield, Wolverhampton, and Taunton electricity undertakings. (Page 427.)

A SWITCHBOARD panel and accessories is required at Christchurch (N.Z.); battery at Heywood; low-tension cables at West Hartlepool; converting plant, &c., at Todmorden; and an electric lighting scheme is to be undertaken at Waterford.—Extensions are contemplated at Shoreditch, St. Anne's-on-Sea, Stalybridge, Swansea, Loughborough, and Wallasey.—Trolley 'bus schemes are under consideration for Bloemfontein and Reading. (Page 427.)

At the General Electric Company's meeting last week Mr. H. Hirst, the Chairman, spoke of the very satisfactory result of the past year's working, in spite of the effect of the National Insurance tax, which amounts to from £3,000 to £4,000 per annum, and the coal and railway strikes. It is proposed to create a staff benevolent fund and possibly some superannuation scheme will be evolved. (Page 428.)

### THE "HALF-WATT" LAMP

**A**LTHOUGH it is likely that a metal filament lamp with an efficiency of about a half-watt per Hefner candle will be placed on the market in the autumn, it need not cause any unrest in the mind of the central station engineer who is anxious not to lose any of his lighting load, or of the contractor who will shortly be ordering his autumn stocks of lamps. The half-watt lamp, when it makes its first appearance, will certainly be no smaller than 1,000 c.p.; probably a start will be made by the A.E.G. Company with a 5,000 Hefner c.p. 2,500 watt lamp, suitable for 110 and 220 volts, and the 3,000, 2,000, and 1,000 c.p. sizes will follow later. The lamp has a drawn tungsten filament, which is subjected to a special treatment after drawing. The 5,000 c.p. lamp will doubtless compete strongly with are lamps for street lighting, and still more strongly for the lighting of large interiors, if the estimated life of from 1,000 to 1,500 hours is attained.

The Deutsche Gasglühlicht Aktiengesellschaft (the owners of the Osram lamp in Germany) are also developing a lamp on similar lines. This will also only be for very high candle powers at the outset—1,000 c.p. and more—and in this case possibly for voltages below standard.

It is seen that the announcements and comments that have been made in the Press with regard to the half-watt lamp—suggesting that the "half-watt" lamp will invade the market in its millions, and be taken up rapidly by contractors and the public, and that the central station engineer will have to seek consolation in the fact that there are other uses for electricity than for lighting—are all based on incomplete information. No panic is necessary, and the enthusiasm is premature; all that will happen in the immediate future is that arc lamp manufacturers will have to prepare for even more serious competition than hitherto from the metal filament lamp.

### ELECTRICAL TRADE WITH CANADA

**T**HOSE of our readers who are familiar with Canadian trade conditions are aware that the "National Electrical Code" of the rules and requirements of the National Board of Fire Underwriters, consisting of the British and American insurance companies, govern very closely the construction, component materials, and design of all such articles as switches, fuses, rubber-covered wire, flexible cord, conduits, flexible tubing, circuit breakers, lamp sockets, porcelain fittings, ceiling roses, motor starters and so forth, to be used in positions where a fire hazard is involved. The National Electrical

Code and the semi-annual "List of Electrical Fittings" issued by the Board of Fire Underwriters prescribe in the one case the general requirements to be met, and in the other case schedule of the approved fittings. The function of the Underwriters' Laboratories is to see that these rules and requirements are carried out. For this purpose it is necessary to submit samples of the apparatus to them for approval, after which inspections are made at regular intervals to ensure that the quality of the commercial article is maintained, and in certain specified cases supply labels which may be attached to them as evidence to the purchasing public that such have received their approval.

Hitherto all British-made electrical fittings of the above type for use in Canada have had to be examined by the Underwriters Laboratories' Inspectors after arrival. Arrangements have, however, now been made to enable this to be done in England. For this purpose, Messrs. A. C. Heap & W. Pollard Digby (48 Westminster Palace Gardens, Victoria Street, S.W.) have been appointed Engineers in Great Britain to the Underwriters Laboratories Inc., Chicago. They are prepared to make the necessary examination of goods before leaving the maker's factory, thereby giving to the British manufacturers the same facilities as those enjoyed by the American, and removing a difficulty to which his Majesty's Trade Commissioner in Canada has recently drawn attention.

Both partners have an intimate knowledge of British manufacturing conditions and apparatus, and Mr. Heap has paid several visits to Canada for the purpose of studying Canadian conditions and requirements. We are asked to intimate that Messrs. Heap & Digby will be pleased to give manufacturers any information they require as to the regulations of the Board of Fire Underwriters, and supply them with copies of the National Electrical Code.

### THE POST OFFICE TUBE RAILWAY

#### Opposition of Electric Lighting Companies

**T**HE proposal of the Postmaster-General to construct a tube railway from the east to west of London, linking up Mount Pleasant and the G.P.O. on the way, for the purpose of more expeditiously dealing with the mails, has been before a Committee of the House of Commons this week and last week. Although to the preamble of the Bill there is no real opposition, there are a considerable number of opponents who are seeking protective clauses, included among them being the London electric supply companies, who object to a power which, it is claimed, is taken under Clause 6 of the Bill, enabling the Postmaster-General to supply electrical energy in any part of London for post-office purposes.

The exact system to be adopted on the tube railway has not yet been definitely decided, but the tube will have a diameter of six feet, and some method of remote control is contemplated. It is estimated that 3,000,000 units per annum will be required, and this will be supplied from the existing Post Office power house at Blackfriars. Mr. W. Slingo, Engineer-in-Chief, in his evidence stated that the trains will consist of small trucks each carrying two motors capable of a maximum speed of 35 miles an hour. During the cross-examination of Mr. Slingo on behalf of the London electric supply companies, figures of the cost of generation at the Post Office power station were asked for, but were at first refused. Mr. Tyldesley Jones, who was cross-examining, asked for the ruling of the Committee upon the matter, and after consultation with his colleagues, the Chairman decided that these figures should be given. Mr. Slingo thereupon said that the cost of generation at Blackfriars, including capital charges, is 0.627d. per unit, and that the total cost delivered to either Mount Pleasant or King Edward Street would be 1.077d. per unit. This figure includes the cost of conversion to 440 volts, which is the voltage to be used on the railway, and will also be used on the three-wire system for lighting purposes at post offices if the Bill goes through as it is framed at present.

The electric supply companies' objection to Clause 6 is that it gives general powers to the Postmaster-General to compete with them in so far as Post Office property in any part of London is concerned. The complaint is made that the proposal is not confined even to lighting post offices on the line of the railway, but that the Clause as drafted enables streets to be broken up in any part of London. The electric supply companies have joined forces for the purposes of this opposition.

**A Floating Power House.**—The falls of the Ohio River at Louisville furnish perennial possibilities for the promoter, says the *Electrical World* (New York). The latest scheme contemplates a stationary barge or dock in mid-stream. Here energy is to be developed by turbines. The National Power Co. of Birmingham, Ala., is responsible for the scheme. A fifth of the authorised capital of a million dollars has been subscribed.

## THE EXHAUST STEAM GENERATING STATION AT WEST HARTLEPOOL

THE waste-heat generating station of the West Hartlepool Corporation is now completed, and about to take the whole of the load previously taken by the original station at Burn Road. Exhaust steam from the Seaton Carew Iron Company's blowing engines is supplied to two 1,250 k.v.a. 6,000-volt 3-phase 40-cycle improved Curtis two stage impulse reaction turbo-alternators in the new station, which is situated on land adjacent to the engine-house of the Iron Company. Should the low-pressure steam fail, high-pressure steam at 60 to 80 lbs. per sq. in. pressure can be obtained direct from the boilers and supplied to the turbines, which have a high-pressure stage for this emergency.

The original generating station at Burn Road will eventually become a substation, with some of the steam plant retained to deal with peak loads if necessary. The existing plant here consists of a miscellaneous assortment of small high-speed non-condensing sets of 1,500-kw. capacity, generating direct current at 460 volts, at which pressure a supply is given to various works, while domestic consumers in the town are supplied at 230 volts on the three-wire system. There is also a 460-volt 300-k.w. battery by the Tudor Accumulator Co., Ltd., and a steam balancer. This, together with a 600-kw. set and the battery, are to be retained and the smaller plant scrapped. The space so available will be occupied by Rosenberg self-starting rotary-converters, two of which are already installed, though only one is erected in its permanent position. As the battery is across the outers only, it is necessary to use balancers, and so a small booster capable of giving a 20-volt boost is erected on the shaft of each rotary. This machine may be connected between the third wire and either outer as required. The whole of the converting plant, including the transformers, was supplied by the British Westinghouse Electric and Manufacturing Co., Ltd. (Trafford Park, Manchester).

The station building is a steel skeleton structure with walls of concrete reinforced with expanded metal. It is 40 ft. high, 40 ft. wide, and 70 ft. long, and one end is of temporary construction so that the building can be readily extended to accommodate more plant, including the requisite steam raising equipment, if at any time the Iron Co. should cease its operations, so that continuity of the supply is assured. This was insisted on by the Local Government Board when the loan was sanctioned. The turbo-generators are situated on the upper floor of the power house and receive the exhaust steam from a 33-in. wrought-iron pipe fed from the exhaust of the Iron Co.'s blowing engines through a grease separator. In addition, a 10-in. pipe brings high-pressure steam from the Iron Co.'s boilers direct to the turbines. The boilers are fired by the waste gases from the blast furnaces. As there will therefore always be either a plentiful supply of exhaust steam or none at all, the turbines are arranged to work on either exhaust or high-pressure steam with the necessary governing, but the arrangements for changing over are not automatic. The usual trip gear to prevent the turbine running away is, of course, provided. The steam, after leaving the turbine, is condensed in a "contraflo" condenser installed on the ground floor of the station. Each condenser has 5,400 sq. ft. of cooling surface provided by 2,750 brass tubes  $\frac{3}{4}$  in. in diameter. The manufacturers of this apparatus are the Contraflo Condenser & Kinetic Air Pump Co., Ltd. (62 New Broad Street, E.C.). The condensed steam is pumped from the hot-well by a centrifugal pump back to the boiler-house of the Iron Co., and passes on its way through a Lea recorder. The cooling water is pumped from the Iron Co.'s deep well to tanks at the base of the three cooling towers, whence it is pumped through the condensers by 82-h.p. centrifugal pumps. Should this source fail, a supply of town water can be immediately obtained, as it is held in reserve. The condenser air pumps are of the "kinetic" type, and are each of 28 h.p. The cooling towers are of the Morrison cascade type, and are of very substantial construction. Each tower is divided into two parts and can easily deal with 115,000 gallons of water per hour, which is amply sufficient for one turbine. The contractors for the whole of the plant were Richardsons, Westgarth & Co., Ltd. (Hartlepool). The alternators were supplied by Siemens Bros. Dynamo Works,

Ltd. (Stafford), and have two poles. They are excited from a small machine on the end of the shaft at 100 volts through steel slip-rings. The efficiency of the alternators is about 93 per cent., and they are guaranteed to stand an overload of 25 per cent. for two-hours with only a 40° C. temperature rise. The stator terminals are conveniently arranged in a well at the bottom of the machine, which is ventilated by two fans on the rotor. These draw air in from the ground floor through a dry air filter supplied by the Sturtevant Engineering Co., Ltd. (147 Queen Victoria St., E.C.), along an inlet surrounding the shaft through the machine, and expel it out of a chimney at the top of the stator casing. Each alternator is provided with an earthing resistance and switch, so that only one need be used even when both machines are running. The main 6,000-volt switchboard consists of ten "fool-proof" ironclad panels of the well-known pedestal type, supplied by A. Reyrolle & Co., Ltd. (Hebburn-on-Tyne). A special panel and cable are set apart for the Seaton Carew Iron Co., Ltd. Current is conveyed to an oil-cooled transformer on the ground floor, where the pressure is stepped down to 440 volts. Thence it passes to a Rosenberg six-phase rotary-converter on the engine-room floor, so that a 230 and 460-volt D.C. supply is obtained. These rotary-converters are interesting as being among the first of the kind to be installed, and we understand the Westinghouse Co. guarantee to take them away and substitute the older type should they not give satisfaction. So far no tests have been made on the machines in the station, but we learnt from Mr. H. F. Friedrichs, who is the Borough Electrical Engineer, that the whole plant, including the rotaries, has been running, and the load taken by it very satisfactorily. The rotaries at the new station, and at the Burn Road station, which is now known as the Town substation, as well as one at a substation for supplying the South Durham Steel & Iron Co., are of 500-kw. capacity, giving 460/520 volts direct current when running at 600 r.p.m. They are wound six-phase and supplied from oil-cooled transformers stepping down from 6,000 volts, and are started by a small induction motor on the end of the shaft.

One is greatly impressed by the absence of the usual synchronising gear; in fact, the starting panel for each rotary contains only one instrument and a field discharge and reversing switch, which is only required if the machine should build up the wrong way—a contingency not likely to be realised, and low-pressure switches to short-circuit the starting motor when synchronism is reached, as indicated by a central zero voltmeter across the brushes of the converter, making a small oscillation from positive to negative for every slipping of one pole. Instead of labelling the various switches to show what circuits they control, they are numbered in the order in which the switchman has to attend to them, whereby there is no need for the switchman to have any technical knowledge at all.

The auxiliaries at the station are all driven by Siemens motors, and the various pumps are of the "Invincible" type, supplied by Gwynnes, Ltd., of Hammersmith. The pressure at which the motors work is 440 volts, obtained through an oil-cooled transformer, from which distribution is made by Reyrolle ironclad switchgear, using switch fuses of the type illustrated in *ELECTRICAL ENGINEERING*, Jan. 30th, p. 64. The equipment of the two turbo-alternators is exactly the same, and the auxiliaries can be connected through to either transformer by a link for the purpose. To start up the station two methods may be employed: (1) by running "back-over"; and (2) by closing all the switches to the auxiliaries in the station and admitting steam to the turbine. By this method a considerable time may elapse before the vacuum is picked up. The first method consists in starting up the rotary in the station from the D.C. side with current obtained from the Town substation, so that the auxiliaries may be supplied with power before the turbines are started up.

Besides the supply given to the Iron Co., two sets of cables connect the station with the Town substation, which is some 850 yards distant, one set direct, while the other supplies the South Durham Steel & Iron Co., through a looped-in substation on the way. The cables are mostly underground, but here they are taken overhead, as it was considered safer than to have them buried in the ground owing to the liability of heavy weights being dropped from the cranes in the yard. All the underground cables are paper insulated, lead covered

and armoured, and were supplied by Callender's Cable & Construction Co., Ltd. (Hamilton House, Victoria Embankment, E.C.)

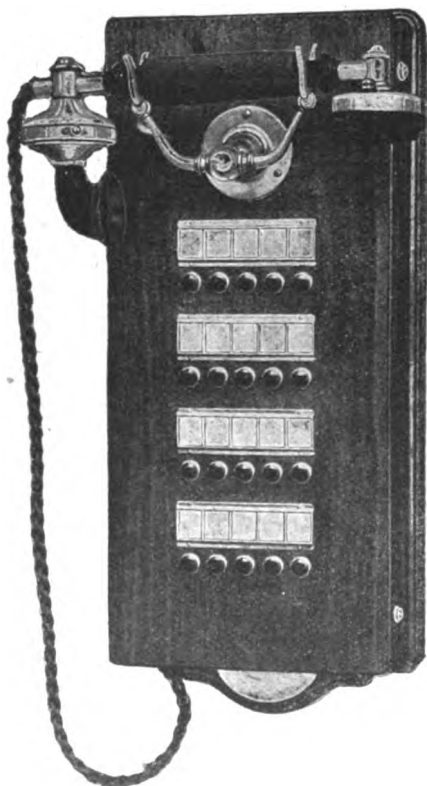
It is intended ultimately to supply power to the tramways from the new station through the Town substation, but at present these are supplied from the generating station which belonged to the Company, which, until the recent purchase by the Corporation, worked them. The consulting engineers to the scheme were Messrs. Tennant & Barrs (Newcastle), with whom is associated Mr. J. F. C. Snell (Preece, Cardew & Snell, of Westminster). It may be remarked that the Borough of West Hartlepool may be divided into two portions, between which is the Town substation. One part is residential, and the other contains the ironworks, pit prop-sawing yards, and other works, as well as the suburb of Seaton Carew, where there is a considerable lighting load. Thus the old and new generating stations are favourably situated with regard to distribution, and now that cheap power is available in quantities no doubt additional works will be attracted to the vacant land near the docks and provided with railway siding accommodation.

One result of the division of the load thus has been that two sets of bus-bars are necessary, which are kept separate during the day; but at night, when the loads are more nearly equal, all the circuits may be taken from one set of bars. The load factor of the station for the twenty-four hours is about 27 per cent.

Our representative, who was kindly afforded facilities recently for inspecting the new plant, learnt from Mr. H. F. Friedrichs, under whose immediate supervision the plant was erected, that the Electricity Committee are about to embark on a campaign for the furtherance of electric cooking and heating, now that there is a margin of power available over the present demand.

### INTERCOMMUNICATION TELEPHONES

IN some types of intercommunication telephones it is necessary to perform several movements in order to effect a connection. This objection has been overcome in the new "Geeko" double-line intercommunication telephone, which



NEW G.E.C. INTERCOMMUNICATION  
TELEPHONE SET.

will shortly be placed on the market by the General Electric Co., Ltd. It requires only one operation for selecting and ringing. In other words, one button is pushed once only. Besides simplifying the operation of these telephones, improvements have been extended to their construction, so that they are free from "cross-talk," common with single-line telephones. The "Geeko" double-line auto-reset wall and table intercommunication telephones comprise a hand com-

bination fitted with Hunningscone-Deckert transmitter, equipped with an induction coil, circular bell, automatic cradle switch, especially designed combined line selecting and ringing auto-reset push buttons. All terminals are enclosed, and the external metal parts are nickel plated. The woodwork is of well-seasoned polished walnut. The table set is provided with cord and wall rosette. The wall type is shown in the illustration.

### INDIRECT LIGHTING FOR RESTAURANTS

INCREASING attention is being paid to providing lighting of a restful nature in restaurants, tea-rooms, &c., and an example of a recent installation where advantage has been taken of the good points of the indirect system of lighting is presented in the illustration reproduced here, which has been sent us by the British Thomson-Houston Co. The "eye-rest"

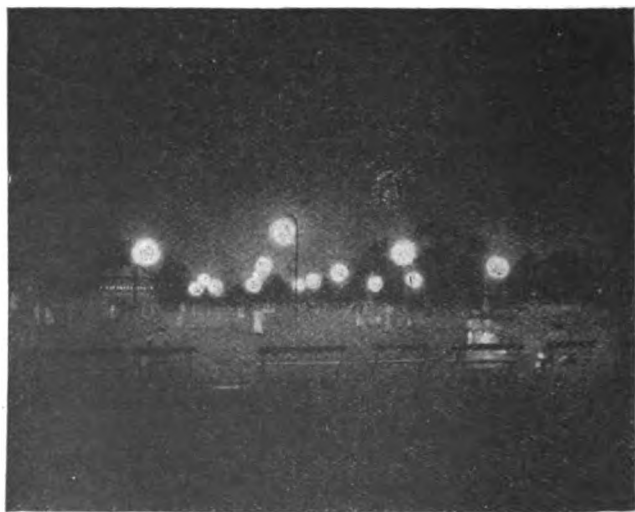


TEA-ROOM LIGHTED BY "EYE-REST" SYSTEM.

system, with its hidden reflector, which they have developed, has frequently been described in our columns, and is now extensively supplied to hotels, restaurants and tearooms. In the installation depicted, which is that of the tea-room of the new Empire Cinema, Newcastle-on-Tyne, the fittings were specially designed to harmonise with the style of the decorations.

### PUBLIC LIGHTING IN GARDENS

THE accompanying illustration portrays a night scene in the "Eden Gardens," Calcutta, which form the fashionable society rendezvous in the late afternoon and evenings. These gardens are under the control of the Public Works Department.



THE EDEN GARDENS, CALCUTTA.

For some time the illumination has been by means of arc lamps, but these have been recently replaced by 600-c.p. Osram lamps, fitted in cast-iron watertight fittings, on the existing arc-lamp poles. The improved illumination has been very favourably commented upon.



# IMPORTANT NOTICE TO THE PUBLIC.

## DRAWN TUNGSTEN FILAMENT LAMPS

**THE BRITISH THOMSON-HOUSTON  
COMPANY, LIMITED, OSRAM LAMP WORKS,  
LIMITED, and SIEMENS BROTHERS AND  
COMPANY, LIMITED,**

owners of Letters Patent relating to drawn wire tungsten filaments and lamps, beg to notify the trade and the public that the EDISON & SWAN UNITED ELECTRIC LIGHT COMPANY, LIMITED, have recognised the validity of the fundamental patent No. 21513/06 relating to such filaments owned by the British Thomson-Houston Company, Limited, and other Letters Patent of the British Thomson-Houston Company, Limited, Osram Lamp Works, Limited, and Siemens Brothers and Company, Limited, relating to drawn wire tungsten lamps, and have been granted a licence to manufacture and sell lamps under the said patents.

The Trade and the Public are hereby warned against selling or using infringing lamps. No possible risk or liability can be incurred by the Public in purchasing or using MAZDA, OSRAM or WOTAN LAMPS or lamps sold under licence from the undersigned.

**THE BRITISH THOMSON-HOUSTON COMPANY, LTD.,  
RUGBY AND LONDON.**

Lamp & Wiring Supplies Dept.,  
Mazda House,  
77, Upper Thames Street, London, E.C.

**OSRAM LAMP WORKS, LIMITED,**

Sole Selling Agents: The General Electric Co., Limited,  
67, Queen Victoria Street, London, E.C.

**SIEMENS BROTHERS & COMPANY, LIMITED,**

Sole Selling Agents: Siemens Brothers Dynamo Works, Limited,  
Caxton House, Westminster, London, S.W.

## PUBLIC FIRE-ALARM SYSTEMS

**A** PAPER by Mr. E. E. Moore, describing the "Knight" open- and closed-circuit fire-alarm systems, has been accepted by the Institution of Electrical Engineers and published in the *Journal*. In this system the code signal is sent by a contact drum, revolved by clockwork, which is set in motion by a release cam, operated by the outward motion of the pull-handle, so that once the clockwork has started the operator has no further power over the instrument. When the code drum has made two complete revolutions it is stopped by the release cam re-engaging with the pull-handle trigger. Should another post be in operation provision is made for holding up a signal by means of an electromagnet and an extension circuit-breaking drum, on the same axle as the release cam. The holding-up arm operated by the armature of the electromagnet engages with a pin on the code contact-wheel directly the two contact-springs are earthed by the first metallic segment after the pull-handle has been operated. Unless the current then flows round the electromagnet coils and the armature is attracted, the clockwork is stopped. The circuit-breaking drum normally keeps two pairs of line-extension contact-springs respectively in contact; but when the clockwork starts revolving, and before the code contact-springs are earthed, the two pairs of line-extension contact-springs break contact. To indicate that the signal has reached the station there is an answering bell in the transmitting station which is rung by the return current. Telephonic communication is also provided. With one pattern a jack only is fixed. The action of plugging in a portable set causes the station to be rung by a continuous ring. With a fixed transmitter and receiver it is arranged that, after the code signal has been sent, the person giving the alarm can speak to the station by following simple instructions. On the mainspring drum is fitted a projecting cam which, when the clockwork has run for a few seconds, engages with the bolt that holds the door of the box fastened, and unlocks it. The door is then pushed open by means of a spring plunger and another instruction tablet is disclosed, which gives sufficient particulars to enable the operator to use the telephone, which is accessible only when the door is open. The spring is re-wound by the fireman who replaces the broken glass. On the pull-handle rod and at right angles to it is a projecting rod, while on the spring drum is a circular disc with a diametrical slot which only allows the pull-handle to go right home when the spring is fully wound. The winding lever is fitted with a ratchet movement. The spring drum, code drum, and extension circuit-breaking drum, being in solid mesh, will all revolve in a backward direction when the spring is wound up; and, if no provision were made, would then send an erratic signal to the station and drop a flap there. Although this would not be recognised as a regular intermittent signal and fire-alarm, the necessity for dropping a flap at all is obviated by arranging a circuit-breaking lever operated by a cam on the winding lever, so that during the short process of winding, the code contact-springs are lifted slightly off the drum, and the circuit cannot thus be put to earth through it. A non-inductive resistance of 3,000 ohms is provided and connected across the extension terminals of the end post on a circuit. The telephone gear at the post consists simply of a microphone and a receiver. The receiver normally hangs on an automatic switch hook.

Extensions can be made from the station, where a drop-flap annunciator is used, to the firemen's houses or to other places desired, or the circuits can easily be arranged through sub-stations.

In the open-circuit system, when a point is operated the clockwork rotates the code and circuit-breaking drums and disconnects both lines from all points farther away from the station than the point operated. The two code contact-springs are then earthed at the code drum, thus allowing current to flow from the station along both lines and through the electromagnet coils. The code drum continuing to rotate, the circuit to the station is thus intermittently earthed and broken.

The two lines become common after passing through test keys, the path of the current being through a circuit-changer operated by a drop-flap annunciator, through the annunciator electromagnet winding to the top contact of a control-relay armature, through the armature of this to the electromagnet of an alarm relay, and then through an earth indicator, battery,

and back to earth. Directly the armature flap drops, its electromagnet coil is cut out, the line current being switched on to another segment of the circuit-changer, and from thence in series through each of the other circuit-changers on the board to the telephone speaking-key, and then direct to the alarm relay. An ink recorder in shunt with the alarm bell automatically starts and stops itself. The annunciator therefore discloses the circuit on which the alarm has been given and the code gives the identical point.

Should two or more points on the circuit be operated at about the same time, all boxes farther away from the station are electrically cut off until connection is again made at the extension circuit-breaking drum, when the alarm at the post operated nearer to the station has finished its call. If a box, therefore, is operated whilst one nearer to the station on that circuit is operating, the clockwork is held up by the catch on the electromagnet, and no further manipulation of the pull-handle will affect this. The point to notice is that the clockwork is held up almost immediately after the handle has been pulled, and with the code contact-fingers earthing on the first metallic segment of the code drum. When the nearer box has finished its signal, and the extension lines are again joined up, current from the station energises the electromagnet and liberates the clockwork. The signal of the box that was held up will then automatically come into the station. If while a signal is being transmitted an alarm is sent from a box nearer the station the more distant box is cut off, its signal ceases, and the alarm from the nearest box comes into the station. But the code of the distant box, although interrupted, is not lost at the station. If the distant box is interrupted before the completion of its first code signal, then it is held up at the end of the first revolution of the code wheel; and when the lines are again joined through to it by the completion of the signals of a nearer box or boxes, then it automatically sends through and records its complete repeat intermittent and code signal. If, on the other hand, the box is interrupted after the completion of its first code, the clockwork runs down and the remainder of the signal does not come in. This is immaterial, as the first intermittent and code signal has already been received and recorded.

If two or more points on different circuits are operated at about the same time, provision is made for current from all other lines to be cut off and the signals held up as soon as the annunciator flap for the line in operation has dropped, but as soon as it is replaced the signals which were held up come into operation. With regard to faults, any likely fault, with the exception of a broken line not earthing, makes itself known at the station on the open-circuit system; and on the closed-circuit system all faults show their presence at the station. The method of joining up the alarm-boxes by loop-lines generally obviates the necessity of running the out-line on the same route as the in-line, so that there is little chance of their coming in contact; but even if this happens any point operated will ring into the station if the lines are otherwise in order and any other fault immediately proclaims itself.

**Electric Ship Propulsion for Canals and Rivers.**—Among the papers read at the recent summer meeting of the Institution of Naval Architects at Glasgow was one by Mr. J. Reid and Mr. H. A. Mavor, entitled "A Case for Electric Propulsion." The paper dealt with the conditions to be met in the lake, river, and canal traffic in Canada, and it was shown how the nature of the manoeuvring required, the type of ship used, and other conditions favoured the use of a compact prime mover, such as the Diesel engine, of fairly high speed, combined with a propeller running at a low but readily variable speed. These conditions offered a very advantageous field for electric transmission gear. After sketching the main features of the alternating-current system developed by Mr. Mavor, a description was given of the equipment of the *Tynemount*, a vessel under construction for this class of traffic. This vessel has already been described in *ELECTRICAL ENGINEERING*, September 12th, 1912, page 505, in connection with Mr. Mavor's paper before the British Association on the subject. On this ship, two 300 h.p. Diesel engines drive the two main alternators of 6 and 8 poles respectively, and the propeller is driven by a single 500 h.p. slow speed, squirrel-cage induction motor. Speed control is effected by alterations in the connections of the two stator windings of the motor, which give 30 and 40 poles respectively, and the two alternators. At full speed and power one winding is connected to each alternator, while the lowest speed is obtained by connecting the 40-pole winding to the 6-pole alternator. A single controller gives two speeds ahead and astern in this way. Mention was also made of the suitability of the system for the propulsion of dredgers and similar vessels.

## AN AUTOMATIC STAR-DELTA STARTER

A NEW self-operating star-delta starter for squirrel-cage induction motors has recently been developed by Switchgear & Cowans, Ltd. (Springfield Lane, Salford), and a number are in use in collieries. The starter is designed to meet the usual Home Office requirements both as regards factories and fiery mines, but it also possesses, in addition to the usual overload and no-volt trips, features which make it capable of protecting motors and plant against mishaps through handling by unskilled persons, and from damage by any but the most violent forms of mischief. For instance, to start a motor it is merely necessary to switch on by means of the handle (a feat requiring the minimum of discretion), all further

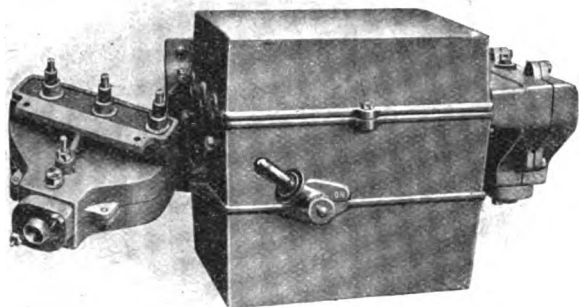


FIG. 1.—AUTOMATIC STAR-DELTA STARTER.

operations being left to the devices of the starter. The action of switching on closes the circuit and sets the change-over switch on "star" position (the laminated copper brushes and the "knife" type change-over switch, with their substantial auxiliary contacts, are clearly seen in the second illustration). When the motor has attained a predetermined speed, the switch automatically changes over from "star" to "delta," sufficient adjustment being provided to allow the change-over to be at normal working current or below it, or, as is sometimes necessary, above it. Switching off is either by hand, or, in the event of overload or loss of voltage, automatic. It is impossible to close the switch on a short circuit; moreover, if for any reason, such as an excessive starting load or a seized bearing, the motor fails to attain within an adjustable

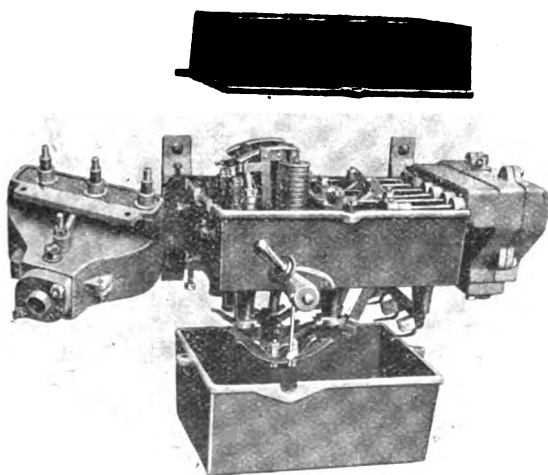


FIG. 2.—STARTER WITH COVER REMOVED.

limited time the speed at which the change from "star" to "delta" is arranged to take place, the circuit is broken. This feature is obtained by an ingenious application to the overload trip of the well-known Statler time-lag, together with a simple magnetic arrangement by which the pull for a given current value, tending to operate the overload release in "star" position, is less than half the pull for the same current value, tending to operate the overload release in delta position, thus

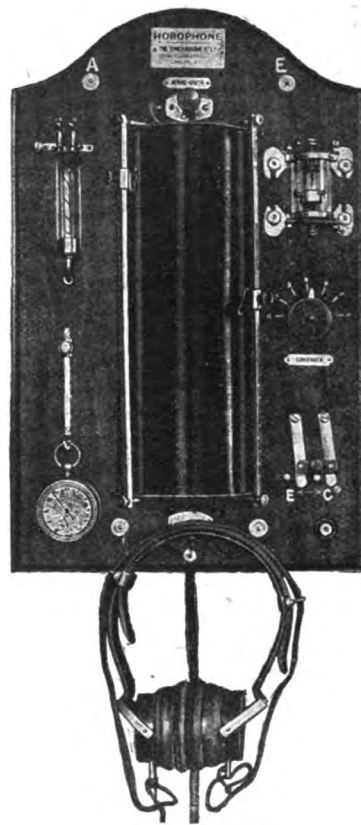
providing perfect protection against overload both in "starting" and in "running." Incidentally all contacts are oil-immersed, and Messrs. Switchgear & Cowans, Ltd., supply the starter with or without cable boxes, or with inlets and outlets either screwed for conduit or merely bushed. The many advantages of such a starter are readily appreciated in places where unskilled handling may be the rule, and where rough and exacting conditions prevail.

## A WIRELESS RECEIVING APPARATUS FOR TIME SIGNALS

THE accompanying illustration shows the appearance of the new wireless receiving set, which, as we have already announced, the Synchronome Co. have placed on the market for the purpose of picking up the international wireless time signal, &c. Primarily designed for watch and clock-makers, the apparatus is appropriately called the "Horphone," and has been introduced at this date to enable them to take the time signals under the new international arrangements which were inaugurated on July 1st. In the centre is a large inductance with two sliders, which will enable stations of a long wave-length to be picked up on small aeri-als. A variable condenser is provided, also a blocking condenser, and a buzzer is fixed inside the case, with a press to operate it on the outside, for testing purposes. In addition to the necessary terminals, a plug is provided for the purpose of earthing the aerial during thunderstorms.

The crystal detector shown on the right is of a special design, and is claimed by the designers to be a great improvement on anything already on the market. The top and bottom castings give it a rigidity which prevents it easily getting out of the adjustment, as so many of the present detectors with spring construction are liable to do. Another important feature is the use of ball-and-socket joints, which enable any part of the crystal to be selected. The crystal itself is similar to silicon, but is more sensitive and reliable, and does not require a local battery; in fact, it has been found that applied E.M.F. renders it less sensitive. The crystal, &c., is enclosed in a glass cylinder, thus affording protection against dust, &c., and the whole detector can be taken to pieces in a few seconds by simply loosening the four clamping screws.

The apparatus is made in two different types, one comprising all the instruments mentioned above, while the more complete outfit, which has been selected for illustration, has in addition an electrolytic detector, potentiometer and dry cells, and change-over switch for selecting either detector. Double head-gear telephones of 2,000 ohms resistance are provided in either case. When not in use they are replaced on a hook, which in the larger set takes the form of a switch, thus when the telephones are replaced the local battery current through the detector is automatically switched off. If desired, a high-class chronograph watch is supplied with this set at an extra charge. The whole apparatus is very compactly and neatly mounted on a polished hardwood board, and, being listed at a moderate price, should appeal to those who are taking up the study of wireless telegraphy. A very simple form of aerial is sufficient, and the obtaining of the necessary license from the Post Office does not usually entail much trouble, as the set is used for receiving only.



THE HORPHONE.

# "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

## Specifications Published July 10th, 1913

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

Names in italics indicate communicators of inventions from abroad.

13,997/12. **Dash-pots for Circuit Breakers, &c.** W. A. HARRIMAN and A. REYROLLE & Co. To overcome small obstructions, such as grit, a very thin flexible washer fits closely in the cylinder. The movement of the washer is limited by two discs or other means, and is also reinforced by them. One figure.

14,396/12. **"Thomas" Transmission System.** H. F. HAWORTH and THE THOMAS TRANSMISSION, LTD. To make possible the production of approximately steady pressure in spite of large current variations, two series machines mechanically coupled are used. The armature of one machine is in series with the fields of both, and this circuit is in parallel with the second armature. Thus, without special windings, the two series machines of the "Thomas" Transmission System may be temporarily converted into a serviceable generating set for regenerative purposes or electrical braking. Three figures.

14,576/12. **Ammeters and Voltmeters.** W. J. DAVIS and C. E. HUNTER (Ediswan Co.). Within a solenoid is a chamber of sector section with a vane constituting the moving iron pivoted along the apex. A fixed iron, with one end bent up round the edge of the moving vane when in the zero position, is also used. Five figures.

14,655/12. **Drawn Wire Lamps.** K. FARKAS. The filament is in two portions, each supported on insulated anchors interconnected within the lamp by a non-incandescing radial conductor passing diametrically through the stem. Four figures.

16,830/12. **Fault Clearing in A.C. Ring Main Systems.** A. M. TAYLOR. A star-connected primary and a delta-connected secondary on the consumers' pressure transformer are employed as well as a condenser. The secondary is also connected to the pressure coil of a wattmeter relay whose current coil is fed by transformers excited by the fault current in the line. This may be applied to systems of discriminating protection. One figure.

18,764/12. **Automobile Lighting and Ignition.** B. BROOKS and W. HOLZ. Within the interior of the poles of a lighting dynamo is a trembler ignition coil with its primary across the dynamo brushes, through a suitable switch. One figure.

24,343/12. **Dynamo Brushes.** W. E. LAKE (*Soc. Anon. le Carbone, France*). To improve the contact between brush and lead, a yoke or saddle piece is provided with corrugations or ribs near the angle formed by the end portions, and the central portion of the lead terminal in contact with the brush. Eight figures.

28,359/12. **Water Heater.** J. VON HENTZEL. The water is heated as it passes between two electrodes in a vessel which connects with the inlet and outlet pipes through insulating connections, and is surrounded by a non-conducting heat insulator. Four figures.

29,375/12. **Condenser Charging and Discharging for Wireless.** CIE. GÉNÉRALE RADIODÉGRAPHIQUE. Two groups of condensers are charged in parallel and discharged in series. After charging, one set is discharged for the time of a semi-oscillation and then discharged in series with the other group. This is effected by allowing the first set to discharge across a spark gap, or mercury vapour lamp, neither of which is in the series discharge circuit. Four figures.

3,525/13. **Boron-Tungsten Compound for Filaments.** F. HANSEN and W. F. MOHR. Tungstic trioxide is saturated with a solution of boric acid and then dried and heated in a neutral atmosphere. It is next mixed with zinc powder and reduced by heat, the zinc is removed by hydrochloric acid, and the residue thoroughly washed.

## Specifications Published To-day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free.

Summaries of some of the more important of these patents will appear in our next issue.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** PORAK [Cable insulating and tensioning device] 16,671/12; SIEMENS-SCHUCKERT [Screw-propeller motor control] 2,136/13.

**Dynamos, Motors and Transformers:** B. T.-H. Co. (*G.E. Co., U.S.A.*) [Rectifiers] 18,747/12; B. T.-H. Co. and WHITAKER [Brush-raising gear] 25,704/12; KITSEE [Motors for driving kinematographs] 10,519/13.

**Heating and Cooking:** HARRISON [Ovens] 15,065/12.

**Ignition:** KETTERING, 12,047/12.

**Incandescent Lamps:** CLARKE [Lamps with filaments of the second class] 15,127/12; JULIUS PINTSCH [Filament supports] 15,485/12; BEUTELL [Mounting] 16,307/12; WESTINGHOUSE METALLFADEN GLÜHLAMPENFABRIK [Filament carriers] 26,288/12.

**Instruments and Meters:** EVERSHED & VIGNOLES and BINSTED [Recording] 17,226/12; B. T.-H. Co. (*G.E. Co., U.S.A.*) [Combined electric indicators and steam-flow meters] 22,262/12.

**Storage Batteries:** SOKAL, 15,404/12.

**Switchgear, Fuses and Fittings:** MAURICE and BYNG [Floor lamps] 17,247/12; WILKIE [Cable connectors] 18,060/12; LAMBERT [Combined switch and plug] 18,275/12; MARKS (*"Vulkan" Maschinen Fabriks*) [Switches for reversing electromagnetic clutches] 23,150/12; THOMPSON and BOWDEN [Time switches] 1,496/13.

**Telephony and Telegraphy:** AITKEN (*Automatic Elec. Co., U.S.A.*) [Telephone exchanges] 14,318/12; HILTZ [Printing telegraph receivers] 14,837/12; CLAUSEN [Call distributing] 14,945/12; KEITH [Telephony] 15,072/12; W.E. Co. (*W.E. Co., U.S.A.*) [Automatic exchange circuits and switches] 17,858/12; STERN [Telephone holders] 21,725/12; GRAHAM [Electromagnetic diaphragms] 4,197/13.

**Traction:** ANGUS [Railway signalling] 7,081/12, 6,330/13, and 6,652/13; SAMATA [Gear for actuating conduit covers and collector ploughs] 9,637/12; CHEATHAM [Point-operating mechanism] 14,739/12; ELEKTRO MOTOREN WERKE HERMANN GRADENWITZ [Aerial rail or rope ways] 15,920/12.

**Miscellaneous:** STERLING TELEPHONE Co. (*Schaffner & Co.*) [Mine exploders] 22,450/12; GASTOROWSKI [Electric sterilisation of closet seats] 26,485/12; MIRAM [Electromagnets to produce mechanical movements] 27,922/12; MACFARLANE [Solder for aluminium] 2,036/13; ERCOLE MARELLI & Co. [Oscillating fans] 6,496/13.

The following Specifications are open to Inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Distributing Systems, &c.:** HARTFORD [System for combined generation, storage, distribution, and utilisation of electric energy] 8,792/13.

**Electrometallurgy and Electrochemistry:** A.E.G. [Welding by means of increased resistance] 14,518/13.

**Incandescent Lamps:** A.E.G. [Lamp-making machines] 14,433/13.

**Switchgear, &c.:** JAKOBSEN [Combined switches and plug contacts] 14,330/13.

**Telephony and Telegraphy:** GIRARDEAU [Supply to antennae] 14,035/13; SOC. DE TÉLÉGRAPHES MULTIPLEX (SYSTEME E. MERCAIER, H. MAGUNNA) [Conversion of D.C. into isochronous undulating currents] 14,122/13.

**Miscellaneous:** DELAUNAY & BELLEVILLE [Temperature regulators] 9,269/13; [Self-propelling torpedoes] 9,271/13; FAUX [Three-phase differential gear] 13,450/13; CHERON [Illuminating apparatus or instruments] 13,822/13.

## Expiring and Expired Patents

The following Patents expire during the current week, after a life of fourteen years:—

14,703 of July 17th, 1899. **Flame Arc Electrodes.** H. BREMER. To prevent the accumulation of slag a boron or equivalent compound is used as an airtight coating. This melts at the arc and dissolves the slag, causing it to drop off.

14,704 of July 17th, 1899, by the same inventor. This specification covers the addition of 15 to 60 per cent. of a luminiferous metallic salt, and at least 5 per cent. of fluorine to the carbon. Compounds of boron, potassium, or sodium, may also be added. Another electrode described contains 10 to 60 per cent. of calcium fluoride.

The following are the more important Patents that have become void through non-payment of renewal fees.

**Arc Lamps:** CROMPTON & Co. and C. CROMPTON [Combined hand and electromagnetic control for arc lamps] 6,421/08.

**Distributing Systems, Cables and Wires, &c.:** V. P. VON PINDERSHOVEN [High pressure cables] 6,757/08.

**Dynamos, Motors, and Transformers:** V. A. FENN [Fynn single-phase commutator motors: divided field to effect reversal of rotation without brush shifting] 26,897/05; B.T.-H. Co. (*G.E. Co., U.S.A.*) [Slot wedges for induction motor stators] 7,048/07; H. F. BIGGE, F. R. BUTT, and J. H. WEBB [Transformers for electro-therapy, &c.] 19,885/08.

**Ignition:** F. R. SIMMS [Moving screen of Simms-Bosch magnet] 7,217/04; K. GLÖSSL and L. LITTMANN [Magneto armatures] 7,309/07.

**Incandescent Lamps:** A. G. BLOXAM (*J. Lux, Vienna*) [Tungsten filaments with 0.1 to 0.5 per cent. of aluminium and magnesium] 7,188/06; [Squirited metallic filaments with oxide or sulphide of cadmium or zinc] 7,189/06.

**Traction:** W. P. THOMPSON (*C. T. M. V. de Bangor, France*) [Wheel arrangements for rolling stock] 6,715/03.

**Miscellaneous:** J. A. LIDDLE [Capstans and winches] 6,493/08; J. FOLEY [Fire alarm and extinguisher] 6,577/08.



## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

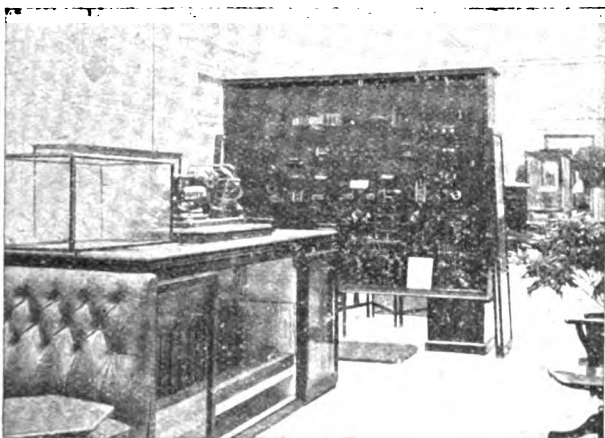
### QUESTION No. 1,347.

In a 2,000-volt A.C. generating station of 3,000-kw. plant capacity (2 units of 1,000 kw., 1 unit of 500 kw., and 2 units of 250 kw.), a 1,000-kw. set and a 500-kw. set are running at nearly full load about 2 hours before peak time. The peak load expected is 2,500 kw. The ammeters on one of the feeder panels and on the panel of the 1,000-kw. set suddenly go hard over, and the switches on these two panels trip. State, in chronological sequence, what you would do if you were in charge at the time.

(Replies must be received not later than first post, July 25th.)

## AN EXHIBITION TELEPHONE EXCHANGE BOARD

ONE of the most interesting stands from an electrical point of view in the British section of the Ghent Exhibition is that of the General Post Office occupying the whole of one court, where nearly all the apparatus is shown in actual operation. Of special interest is the model of a central battery telephone exchange equipment, as manufactured by the Western Electric Co., Ltd. (North Woolwich), arranged so as to show the various movements involved in connecting one telephone subscriber to another through a telephone exchange. The subscribers' switchboard, trunk switchboard, distributing frames, and coil racks are all shown



WESTERN ELECTRIC SWITCHBOARDS AT THE GHENT EXHIBITION.

in a truncated or modified form, with the wiring of the exchange equipments and the subscribers' telephones open to view, so that the whole sequence of operations may be followed with ease. A standard ringing dynamotor with inter-ringer attachment provides the ordinary ringing current, and the engaged and no-answer signals for the model. A battery

of portable accumulators by the Chloride Electrical Storage Co., Ltd., furnishes current for the speaking circuits and switchboard lamp signalling. It is seldom that the opportunity is given to follow the working of a modern telephone exchange in a way that will be so readily comprehended.

## INDUSTRIAL LIGHTING INSTALLATIONS

OUR attention has been called to some examples of lighting of industrial premises recently carried out from designs by the British Thomson-Houston Co., Ltd. (Mazda House, Upper Thames Street, E.C.). In these their metal "Mazdalux" reflector is used, which not only gives good efficiency in useful illumination, but at the same time serves to cover the lamps, so that the eyes of the workers shall not be dazzled and irritated by the glare of the incandescent filaments. These reflectors are made in four vertical types, giving respectively extra extensive, extensive, intensive, and focussing distributions of light, and in four angle types, giving maximum light intensity at 15°, 30°, 45°, and 90° from the vertical. Mazdalux reflectors have an aluminium reflecting surface, and the angle types are made entirely of aluminium, the others being supplied in steel or aluminium, as desired. The exterior surface is covered with a durable rust-proof



THE WESTMINSTER GARAGE, SHOWING ARRANGEMENT OF LIGHTING.

enamel. One of the installations in question is at Messrs. J. Ore & Sons, Textile Mills, Castleton, where the Mazda lamps are all suspended at such a height as to be outside the normal range of vision of the operatives. Another example is the Westminster garage. The problem in a motor garage is to get a uniformly distributed illumination of moderate intensity without dark shadows. With cars standing about in various positions, the last condition can only be fulfilled by suspending the light units at a considerable height, so that deep shadows are not cast. In this case these requirements are met by the use of Mazdalux reflectors and high candle-power Mazda lamps hung close to the ceiling. The ceiling lights are supplemented by a row of angle Mazdalux reflectors along each side wall.

**The Association of Consulting Engineers.**—Mr. G. Midgley Taylor presided over the Annual General Meeting of this Association at the Institution of Electrical Engineers on Monday, June 30th, when Prof. D. Capper, Mr. E. M. Eaton, Mr. R. Hammond, Mr. A. J. Martin, Mr. H. S. Childe, and Mr. W. L. Spence were elected to the Committee in place of Messrs. Douglas Latham, Mansergh, Stevenson, Harrison, and Miller, who had been drawn by ballot to retire in accordance with the rules. The Chairman referred to the meeting of foreign associations of consulting engineers, to be held in Ghent, July 17th to 22nd, which would probably be attended by their Treasurer, Mr. Lowcock. The report was adopted and auditors were appointed, and an amendment to the rules was carried (subject to confirmation at a special meeting) extending the qualification to members of the Institution of Civil Engineers of Ireland. It will be remembered that at present only corporate members of the Institution of Civil Engineers and full members of the Institution of Electrical Engineers are admitted.

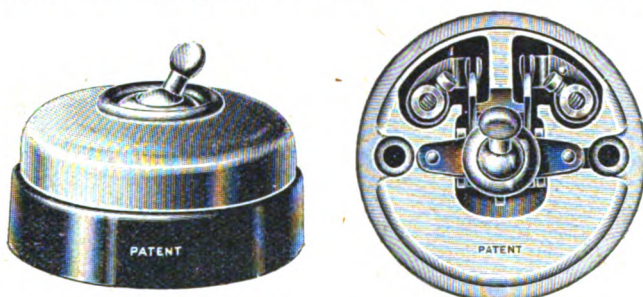


## CATALOGUES, PAMPHLETS, &amp;c., RECEIVED

**VACUUM CLEANERS.**—A leaflet from the General Electric Co., Ltd. (67 Queen Victoria Street, E.C.), describes the "Santo" electric vacuum cleaner, which is a very conveniently arranged set in a cylindrical case on ball castors, not too heavy to be carried by one person. The pump is of the diaphragm pattern, giving a much more powerful vacuum than the centrifugal fans used on the smaller machines. A particularly complete equipment of accessories is supplied. A smaller set of the self-contained type is also listed for those requiring a cheaper outfit.

**POCKET LAMPS.**—Another new leaflet from the General Electric Co. introduces us to an attractive pocket electric flash lamp resembling a magazine pistol in appearance.

**FLAT TUMBLER SWITCHES.**—The "Imp" single- and two-way tumbler switches are some of the latest products of A. P. Lundberg and Sons (477 to 489 Liverpool Road, N.). From the illustrations of the "Imp" flat switch with plain brass cover, here reproduced, it may be seen that the switch is



strongly constructed and efficiently insulated. The main features of the well-known "Pivot" movement have been retained, while the depth of switch is very little, and it is also adaptable and convenient for flush work. The covers for these switches are obtainable in a large number of handsome designs.

**INSULATING VARNISHES.**—A leaflet from Chas. H. Blume (Insulating Varnish Department, The White Building, Fitzalan Square, Sheffield) gives particulars of the various grades of "Megomac" and "Insulac" insulating varnishes which are manufactured by this firm.

*Readers desiring copies of catalogues or pamphlets should apply to the firms in question, referring to the notice in "Electrical Engineering."*

**THE DESIGN OF POLE LINES.**—We have received from Richard Wade, Sons & Co., Ltd. (Hull) a copy of a revised edition of their useful booklet of tables, giving particulars of wooden poles and data required for the design of overhead lines. These are very complete and well arranged. The revision of the tables has been rendered necessary by the Board of Trade having reduced the wind pressure for which wires and poles for E.H.T. lines have to be calculated from 30 to 25 lbs. per sq. in. The firm are sending copies to their regular customers, and any who have not received one are requested to communicate with the firm. Others can obtain a copy of "Wade's Tables" for 2s. 6d.

**MERCURY VAPOUR LAMPS FOR BLUE PRINTING.**—A compact piece of apparatus for producing blue prints from a continuous roll of printing paper by the light of mercury vapour lamps is described in a leaflet from the Westinghouse Cooper Hewitt Co., Ltd. (80 York Road, King's Cross). The paper and tracings travel continually at a speed of from 2 ft. to 4 ft. per minute over a glass cylinder, within which are two horizontal tube mercury vapour lamps. The feed rollers are electrically driven, and the whole apparatus is self-contained.

**HEATING AND COOKING APPARATUS.**—An illustrated catalogue and price-list from Credenda Conduits Co., Ltd. (Chester Street, Aston, Birmingham), deals with a very complete range of kettles, milk warmers, hot plates with special steel utensils for use thereon, boiling pots, irons, &c., and a new pattern of moderate-sized oven.

**SWITCH AND DISTRIBUTION BOARDS.**—The Emanda Engineering Co. (Emanda Works, Summer Avenue, Peckham, S.E.), who are specialists in distribution boards, accumulator switchboards, &c., have sent us a large illustrated sheet showing several patterns of these, accompanied by one of the neat little boxes of cigarettes which they are distributing to bring their name before the public.

**ENGINE-ROOM TELEGRAPHS.**—The Calten system of electrical engine-room telegraphs, which is extensively used in Dutch and other ships, is described in a pamphlet from Hogan and Wardrop (2 Gresham Buildings, Basinghall Street, E.C.).

## ELECTRIC TRACTION NOTES

The new railway that is to be constructed in Switzerland from Sierre (Valais) to Goppenstein, linking up the former town direct with Berne via the Loetschberg tunnel, will be run electrically on the single-phase system by locomotives. This railway will be a main line of standard gauge, 25 km. in length, and will involve six tunnels, two large viaducts, and four intermediate stations. The ruling gradient will be 2.75 per cent., and the total rise from Sierre in the Rhone Valley to Goppenstein in the Loetschenthal is about 2,250 ft.

Siemens Bros. Dynamo Works have been awarded the contract for rotary converters for the twelve substations of the Melbourne suburban railway system; the total capacity is 40,000 kw. It includes fourteen six-phase rotaries of 2,000 kw., 1,500 volt D.C., 25 cycle, 250 r.p.m.; ten rotaries of 1,000 kw., 500 r.p.m., and four rotaries of 500 kw. at 750 r.p.m. The rotaries must be capable of carrying these loads for twenty hours continuously, and of taking overloads of 3000 kw., 1,500 kw., and 750 kw. respectively after a twelve hours' run at rated load, without overheating. Finally, they must stand overloads of 4,000 kw., 2,000 kw., and 1,000 kw. respectively for ten minutes, and 6,000 kw., 3,000 kw., and 1,500 kw. momentary overloads. The static transformers will be supplied by the same firm, and will be oil-cooled with external oil circulation, and will be designed with large internal reactance in view of the wide regulation required for the rotaries. The direct-current voltage of 1,500 volts will be obtained off one commutator. Starting up will be accomplished on the three-phase side by means of an asynchronous starting motor.

The Sheffield tramway accounts record an increase in the traffic receipts of £21,137, bringing the total income up to £362,127. The balance on the year's working is £77,296. After apportioning £7,631 to street improvement and meeting renewal and other special charges, £30,234 was contributed to the rates.

The Board of Trade report of Major Pringle on the derailment of a portion of an electric train on the Metropolitan District Railway near Sloane Square station on April 26th has been issued. The train came to a stand owing to the current being cut off, and it was found that the back portion had left the rails owing to the leading axle of a trailing car having broken near its centre. The inspector attributes the fracture to an internal flaw such as could not have been detected by the ordinary methods of examination. Damage was done to the track, and a short circuit was caused, which blew out the circuit-breaker and cut the current off. The adjoining down road was not fouled, but the short circuit caused its signal to go to danger.

Mr. T. B. Goodyer (Tramways Manager, Croydon) has addressed a circular letter to a large number of Members of Parliament urging the necessity of legislation to place the Motor Omnibus Companies on terms of equality with regard to public obligations with the Municipal Tramway authorities in the Metropolitan area, and pointing out how seriously the matter affects the ratepayers.

We refer in another column to the Post Office tube railway which is now under consideration by a House of Commons Committee.

The bill of the City & South London Railway Co., which provides for its reconstruction in order to admit of rolling-stock from the other tube railways, has been passed by a House of Commons Committee. It has already passed the House of Lords.

The proposal of the Metropolitan Railway Co. to take over the Great Northern & City Tube Railway, which has already passed the House of Lords, has now passed the House of Commons.

The scheme of the Metropolitan Electric Tramways, Ltd., to run a service of trolley-buses from Wood Green to the boundary of Walthamstow has now been passed by both Houses of Parliament.

The revenue of the Glasgow Corporation Tramways for the year to May 31st exceeded for the first time in the history of the undertaking £1,000,000, the exact figure being £1,007,652. There is a net balance of £33,000 after setting aside £130,000 for depreciation and £85,000 for permanent-way renewals.

The House of Commons has rejected a clause inserted in the L.C.C. Tramways Bill by a committee, giving the London United Tramways Co. compulsory running powers over the Company's lines in London which have recently been purchased by the Council.



# ADAMS IGRANIC

MOTOR CONTROL GEAR FOR PRINTING MACHINERY.

ADAMS  
M<sup>C</sup> C<sup>O</sup> L<sup>D</sup>  
BEDFORD  
AND  
LONDON

## TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

The Canadian Government proposes to erect a wireless station on Mount Royal, Montreal, requiring land 800 ft. by 200 ft. According to the *Electrical News* (Toronto) the antenna will be supported on two wooden masts 180 ft. high and 450 ft. apart. The size of the operator's building will be 40 ft. by 20 ft. The station will be capable of communication with the Quebec station to the east and the Kingston, Ontario, station to the west, thus linking up the Government wireless stations on the Great Lakes with that on the east coast, and completing a chain of stations which will extend from Port Arthur, at the head of the lakes, to Cape Race and Belle Isle on the Atlantic. There is at present a station in Montreal, but it has a very limited range which cannot be increased owing to the position of the site. The National Battlefields' Commission have given the Government leave to erect a station on the battlefield at Quebec.

The Norwegian Government has sanctioned an agreement with Marconi's Wireless Telegraph Company for the establishment of a wireless service between Norway and America. According to a Reuter telegram, a sum of £111,100 has been voted for the construction of a wireless station near Stavanger. The American station will be situated in Massachusetts or Connecticut and divided into two parts for transmitting and receiving some twenty miles apart. These stations will form part of a world chain, which includes the stations at San Francisco, Honolulu, Yokohama, Bangalore, and Alexandria.

The announcement that wireless telegraphic communication has been established by means of the Goldschmidt system between Hanover, in Germany, and Tuckerton, near Atlantic City, a distance of 3,600 geographical miles, gave rise to a number of questions during the past week in the House of Commons bearing on the proposed Marconi contract for the Imperial Wireless Chain. The Postmaster-General, in reply, said that he had asked the company to allow demonstrations to be witnessed by the officers of the Post Office and the Admiralty, but the company stated that they were not in a position to give any demonstration until the first week in August. If the suggestion which had been made to invite tenders for the Imperial Wireless Chain, based on a guaranteed minimum standard of efficiency laid down by the Post Office and approved by the House of Commons, were adopted it would involve a delay of nine months or a year before work on the stations was begun. He was, however, he said, pointing out to the company that under certain conditions the erection of the second three stations of the chain would be transferred from the original contractors to others whose system might be proved more efficient or economical. With regard to Dr. Austin's report on the recent tests of the Poulsen system between Arlington and Gibraltar and the U.S. ship *Salem*, as a result of which it was said that the American Poulsen Company were awarded the contract for the Panama station, which was to have a range of 3,000 miles, he said that he had asked for a copy of the report, which, he believed, had not been published, but had not received one. He would not publish the correspondence between himself and the Postmaster-General of Canada relative to the agreement for the Transatlantic service between this country and Canada on the Poulsen system, as the agreements were wholly different in character. He had been asked last Saturday by the Universal Radio Syndicate, Ltd., for permission to be allowed to tender for the Poulsen system. There were a number of companies who wished to tender and who would give guarantees, but he wanted no guarantees, but stations which would work. Asked as to the nature of the agreement entered into between the Norwegian Government and the Marconi Company for the North Europe Transatlantic service, he said that the American Marconi Company

was a party to this agreement and undertook to erect in the United States a station similar to the one provided in Norway by the British Marconi Company. This was to be similar to those in the British Imperial Chain, but the purchase price was to be £70,000 for the one station, and the Norwegian Government had the option of commuting the royalty payments for a lump sum of £80,000 at any time. Under the contract with the British Government no work of any kind would be carried out by the American or Canadian Companies.

Mr. Justice Eve had before him last week an adjourned summons in the pending action between the Marconi Co. and the Helsby Wireless Telegraph Co., mentioned in our issue of April 10th, p. 207. The present hearing resulted from an order in chambers giving the Marconi Co. power to ask certain questions relating to the wireless system of the Helsby Co., after an inspection last May. The Helsby Co. argued that some of the questions asked would, if answered, disclose information of their apparatus prejudicial to the trial. It was held, however, that the Marconi Co. could ask that in the event of any apparatus shown to the Marconi Co. not being an infringement of the Marconi patents, what alterations had been made between the issue of the writ for infringement and the inspection. The case itself, which is an action alleging infringement of the famous Marconi patent 7777/1900, will probably come on for hearing to-day or to-morrow.

It is of some interest in connection with the recent agitation for additional telegraphic facilities to the north of Scotland that the Postmaster-General is said to be arranging for the erection of a wireless telegraph station near Stonehaven, a few miles south of Aberdeen.

It was stated in the House of Commons by Mr. Harcourt that a 5-kw. wireless station employing a French system is now being erected in the Bahamas, and contracts are being entered into for the erection of similar stations at Barbados, Mombasa, Singapore, Penang, and Hongkong. The Postmaster-General also stated, in reply to a question, that the erection of the emergency wireless station for St. Kilda would shortly be complete. It was a private undertaking erected under licence granted in January, and would communicate with Loch Boisdale at a charge of 3d. per word, with a minimum of 6d. per message.

A new wireless station, with a range of 200 miles by day and up to about 1,000 by night, has recently been opened at Balboa for ship-to-shore work on the Pacific side of the Isthmus of Panama. According to the *Electrical Review and Western Electrician* (Chicago), the plant is only of 2-kw. capacity, arranged on the "break" system, which allows a receiving station to break in on the transmission of a message, in order to ask for repetition or explanation. In the intervals when the sending key is released between dots and dashes it opens a relay in the receiving circuit, and the operator is able to hear calls from other stations. The antenna is horizontal, and about 110 ft. from the ground.

As already stated in these columns, telephonic communication will shortly be established by the American Telephone & Telegraph Co. between New York, Los Angeles, and San Francisco, over a distance exceeding 3,500 miles. According to the *Elektrotechnische Zeitschrift*, the conductor will be a copper wire 4.5 mm. in diameter, and Pupin coils will be installed every 8½ miles. On account of the difference in time between New York and San Francisco, the line will only be in use for a few hours out of the twenty-four, and consequently a very high tariff will be applied. The charge for a three-minute conversation will be between £3 and £4.

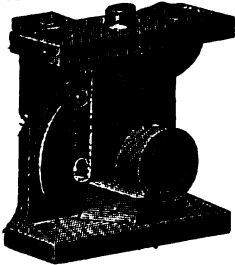
The Roumanian Administration wish it to be known that the prohibition regarding the use of secret language does not apply to telegrams other than those destined for their country, which means that telegrams in transit may be still sent in code.—Communication is down to the States of Morelos Durango and Coahuila in Mexico.

## Why waste time and money on machining

small intricate pieces when the most complicated  
parts can be cast in a finished state by

**"PRANA"**

## Die-finished Castings



HOLES, SLOTS, etc., CAST to  
PERFECT SIZE! ABSOLUTE  
ACCURACY GUARANTEED  
FOR ALL REPETITION WORK

Send for illustrated booklet, mentioning  
this paper; or send sample for quotation  
to

**AERATORS, Ltd**  
UPPER EDMONTON  
LONDON, N.

SEND TO-DAY TO

**THE BASTIAN METER CO., Ltd.,**  
KENTISH TOWN, N.W.

FOR A

**BASTIAN PORTABLE METER**

(MOUNSDON PATENT)

**YOU WILL FIND IT INDISPENSABLE.**

## "CALOR" ELECTRIC HEATING & COOKING APPLIANCES

Townshend's

System (patented).

Food Warmers,  
Kettles, Irons,  
Grillers, Toasters, &c.

Liberal Discount.

Write to-day for List,  
just published, from the  
Patentees and Makers:



Absolutely safe.  
Thoroughly reliable.  
Guaranteed for 12  
months.

**AGENTS WANTED**  
in many districts; also  
in Colonies and abroad.

Bright Glowing Electric Fire.

**TOWNSHEND'S ART METAL Co., Ltd.,** Works & Showroom—Ernest St., Birmingham  
London Showroom—42, Holborn Viaduct, E.C.

## ELECTRICAL PORCELAIN

OF

HIGHEST QUALITY

APPLY TO

**JAMES MACINTYRE & CO., LTD.,**  
BURSLEM.

MICA MICANITE FIBRE.  
OILED FABRICS LEATHEROID

## INSULATION

The Micanite & Insulators Co., Ltd.  
Walthamstow, London, E.

ONCE  
USED



ALWAYS  
USED

PRICE: ONE SHILLING PER STICK.

Sole  
manufacturer—**S. W. CUTTRISS,** Prudential Buildings, LEEDS.

**STEATITE  
INSULATORS**  
SUPPLIED  
FOR ALL KINDS OF  
ELECTRICAL WORK  
**WILLIAM SUGG & CO. LTD**  
WESTMINSTER.

# SILVERTOWN

## PRIMARY BATTERIES



**LECLANCHÉ**

(Original Manufacturers in Great Britain)

**DANIELL, POGGENDORFF,**  
**BUNSEN, MINOTTI,**

GROVE, Etc.

**FIRING CELLS & BATTERIES,**  
**MEDICAL BATTERIES,**  
**MEDICAL COILS, Etc.**

**HIGHEST GRADE ONLY**

SPECIAL TERMS FOR QUANTITIES.

List No. 31 on application.

**The India Rubber, Gutta Percha and  
Telegraph Works Co., Ltd.,**

Head Offices:—106, Cannon Street, London, E.C.

Works:—Silvertown, London, E.



When corresponding with Advertisers, please mention "Electrical Engineering."



## LOCAL NOTES

**Blackburn:** *Electric Car.*—Following the example of many other central station engineers, Mr. P. P. Wheelwright has now in use in the service of the Electricity Department an electric car fitted with an Edison battery.

**Edinburgh:** *Supply to Cinematograph Theatres.*—The Electric Lighting Committee last week received a deputation from cinematograph theatre owners on the question of the rates charged for electric current for projector purposes in cinematograph theatres. The request was that all current supplied for this purpose, especially where motor-generators are installed, should be charged for at power rates instead of lighting rates as at present. It was claimed that this concession has been granted in other towns in Scotland, including Glasgow. The Convener of the Committee promised to give the subject favourable consideration in view of the importance which this industry is assuming.

**Hull:** *Electricity Accounts.*—There was a net profit of £7,725 upon the electricity undertaking last year, which is an increase of £1,254 over that of the preceding twelve months. The City Electrical Engineer's report states that the motor-hiring scheme initiated in 1905 shows a steady increase, the total number of motors now out on hire being 203, representing a total horse power of 1,170. Mr. H. Bell, the City Electrical Engineer, has been congratulated by the Electricity Committee upon the results, especially having in mind the largely increased cost of coal during the past two years.

**Kingstown:** *Electric Lighting.*—The Dublin Southern District Electric Supply Co., Ltd., were successful before a House of Lords Committee last week in getting passed the preamble of their Bill providing for the electric lighting of Kingstown. There was considerable opposition from the Alliance and Dublin Consumers' Gas Co., who, it was stated, intend to apply to the Board of Trade for an order to supply electricity in all three neighbouring districts, Kingstown, Dalkey and Blackrock.

**London:** *Bethnal Green: Electricity Supply.*—The scheme for the supply of electrical energy in bulk by the Stepney Council is now taking a more definite shape, and the matter is being expedited in consequence of applications from possible consumers.

**Hammersmith.**—Mr. G. G. Bell (Borough Electrical Engineer) has devised a scheme for transporting coal from barges at the nearest wharf on the Thames direct to the electricity works, a distance of some 600 yards. The idea is to have a large tank at the wharf and one at the electricity works, connected by two pipes. A circulation of water would be maintained by powerful pumps sufficient to carry the coal from the first tank, into which it is dropped by grabs, to the tank at the station, whence it is removed again by grabs.

**Macclesfield:** *Electric Supply.*—The new Electricity Company of Macclesfield is now getting to work. A site has been obtained for a power station in which it is intended to instal Diesel-engine plant.

**Sheffield:** *Electricity Accounts.*—The total number of units sold last year was 21,671,978, against 16,902,360 in the preceding twelve months, the total connections having grown from 30,088 kw. to 33,835 kw. The working costs were 0.44d. per unit, against 0.52d. in the previous year. The net surplus was £11,515, which is increased to £18,490 by the balance brought forward. A further sum of £10,000 has been transferred to renewals account. The wiring and fittings department shows a net profit of £1,988, after meeting interest and working fund charges. The electricity department has been debited with £1,878 special law charges for the year.

**Stalybridge:** *Electricity Accounts.*—The accounts of the electricity undertaking of the Stalybridge, Hyde, Mossley, and Dukinfield Joint Tramways and Electricity Board show a loss for last year of £9,124, which has to be met equally by the four authorities concerned.

**Taunton:** *Electricity Accounts.*—The result of the past year's trading of the Municipal Electricity undertaking was a gross profit of £5,044. The whole of this is exhausted in meeting expenditure of a capital nature, transferring to renewals fund in respect of switchboard, machinery, mains and meters. £212, and transferring to free wiring purchase account £1,067 10s. This latter is in settlement of all claims of the National Electric Construction Co. in respect of free wired installations, and in order to pay the whole account off in one instalment. £510 has had to be withdrawn from the

reserve fund. Had it not been for this charge on the undertaking for the year, there would have been a net profit of £558.

**Wolverhampton:** *Electricity Accounts.*—The profits on the electricity undertaking for last year constitute a record, and the sum of £2,125 has been transferred to relief of rates. With the amount now added to reserve fund, the latter stands at £15,356.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

## Generating Stations, Sub-Stations, Mains, &amp;c.

**Christchurch (N.Z.).**—Thirteen panel E.H.T. switchboard and accessories for the Lake Coleridge scheme. Further particulars at 73 Basinghall Street, E.C.

**Heywood.**—A new battery is required for the Corporation.

**Kettering.**—Sanction has been received to a loan of £1,400 for cable.

**London:** *Shoreditch.*—An expenditure amounting to £98,850 is recommended in connection with extensions at the Whiston Street power station.

**Loughborough.**—The Council has sanctioned applications being made for loans of £11,000 for machinery, and £3,000 for cables, meters, &c. It is proposed to instal a 1,000-kw. turbo-alternator.

**St. Anne's.**—An inquiry was held last week concerning a loan of £3,000 for mains and services.

**Stalybridge, &c.**—A proposed loan of £22,550 for the Joint Tramways and Electricity Board was inquired into last week. The Hyde Property Owners Association opposed.

**Swansea.**—An inquiry concerning a loan of £40,000 for extensions at the electricity works was held last week.

**Todmorden.**—Converting plant, H.T. switchboards and cables, mechanical stokers, superheaters. Borough Electrical Engineer, July 26th.

**Wallasey.**—An inquiry was held last week concerning a loan of £13,500 for electrical extensions.

**Waterford.**—On the advice of Mr. Mark Ruddle, Chief Electrical Engineer to the Dublin Corporation, the Council has definitely decided to promote a municipal electric lighting scheme.

**West Hartlepool.**—Low-tension cables, also pilot and telephone cables. General Manager, July 21st.

## Wiring

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Alloa.**—Tenders are required for the electrical work in a new picture palace at 62 Mill Street. Architect, J. D. Swanston, Kirkealdy.

**Barnsley.**—Variety theatre. P. A. Hinchliffe, 14 Regent Street.

**Blackburn.**—New fire station.

**Derby.**—Secondary school. Education Committee.

**Edinburgh.**—Barracks. Director of Army Contracts, War Office, S.W.

**Greenock.**—New school. Clerk, School Board.

**Hereford.**—Secondary school. County Surveyor.

**Lincoln.**—Nurses' home and additional ward at County Hospital. Architect, W. G. Watkins, St. Edmonds Chambers, Silver Street.

**London:** *Bermondsey.*—Re-wiring of Infirmary, Lower Road, Rotherhithe. Architect, A. H. Newman.

**Paddington.**—Public baths. (£40,000.)

**Middleton.**—New town hall.

**Newcastle-on-Tyne.**—New elementary school. Architects, Harrison & Ash, Education Offices.

**Redditch.**—Shops in George Street.

**Seaton-Carew.**—New school.

**Sunderland.**—Proposed training college. (£15,000.)

**Walsall.**—New baths.

FOR  
STEAM JOINTS  
USE



JOHN HUDSON & CO.'S SUCCESSORS, Mansell St., London, E.

## Miscellaneous

**Bloemfontein.**—A complete installation of trolley vehicles including power plant is required. (See advertisement on another page.)

**Reading.**—A trolley-bus scheme at an estimated cost of £23,839 has been prepared by the Tramway Manager.

**South Africa.**—Three electric bed lifts are required for the new hospital at Port Elizabeth. Further particulars, 73 Basinghall Street, E.C.

## TENDERS RECEIVED AND ACCEPTED

**South Shields.**—Contracts have been placed with Siemens Bros. Dynamo Works for twelve months' supplies of "Wotan" lamps for car-shed and office lighting, and "Tantalum" traction lamps for trams.

**Sunderland.**—The following tenders have been accepted:—Oil switches and meters, Ferranti, Ltd.; L.T. cable, British Insulated & Helsby Cables; winding motor-generator, Phoenix Dynamo Co.

## APPOINTMENTS AND PERSONAL NOTES

Mr. W. J. H. Wood, at present Station Engineer at Bolton, has been appointed Chief Electrical Engineer in succession to Mr. A. A. Day, who was recently compelled to resign through ill-health.

A tramways manager is required by the Southampton Corporation. As we recently announced, Mr. H. F. Street, who has hitherto held the dual position of Borough Electrical Engineer and Tramways Manager, found the development of the electrical undertaking sufficiently rapid to occupy the whole of his attention.

The scheme recently mentioned in this column for the payment to Mr. W. A. Vignoles, Borough Electrical Engineer at Grimsby, of a commission of 5 per cent. on the net profits on the electrical undertaking, above the sum of £2,500 per annum, in addition to his salary of £550, has now passed the Grimsby Council.

## MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. George Smith & Son, of 5 Philpot Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night, was £65 to £65 15s. (Last week, £67 10s. to £68.)

**Books.**—Messrs. W. & G. Foyle, the well-known second-hand booksellers, inform us that they have opened a foreign book department at 5 Manette Street, adjacent to their premises in Charing Cross Road.

**Annual Outings.**—The office and works staff of the Linolite Co. (25 Victoria Street, S.W.) held their annual outing at Herne Bay on Saturday, 5th inst.

The Annual Outing of the White Electrical Instrument Co. (2 and 4 Gloucester Street, Camberwell) took place on Saturday last, and a most enjoyable day was spent at Burnham-on-Crouch.

**Works Holiday.**—Mawdsley's Ltd. (Zone Works, Dursley, Glos.), inform us that their works will be closed from August 1st to 11th, and that only urgent correspondence will be dealt with during this period.

A. P. Lundberg & Sons (477 to 489 Liverpool Road, N.) will be closing their works from August 2nd to 11th, when only urgent correspondence can be dealt with and goods which happen to be in stock despatched.

**Agency.**—Morris & Lister, Ltd. (Carlton Works, Lockhurst Lane, Coventry), in order to deal with the increased demand for their time element circuit breakers and transformers and other manufacturers, have placed their representation in the hands of Morris & Lister (London), Ltd. (3 and 4 Palace Chambers, Westminster; Tel.: Ken. 5164).

**Exhibition Award.**—Ferranti, Ltd., have been awarded a gold medal diploma for the switchboard which they are exhibiting at the Ghent Exhibition.

## COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &amp;c.

**General Electric Co.**—At the ordinary general meeting held on Thursday last week the Chairman, Mr. Hugo Hirst, said that the company was once more in the fortunate position of being able to place before its shareholders a report which showed satisfactory progress. Besides putting aside £30,000 to reserve, they proposed to create a new kind of reserve under the heading of "Staff Benevolence," for which they put aside conditionally this year £3,000. They proposed to study, within the next few years, whether something in the way of a contributory superannuation fund might not be started, and if found possible they wished to send it into existence with a sound start-off. They thought it only proper to provide a fund so that they would not be found unprepared and not be influenced in their grants during possible periods of depression. Now that loose plant, tools, patterns, and sundry utensils were written down to £1, fixtures and installations to £1, goodwill and patents to £1, freehold land and buildings £193,755 10s., fixed plant and machinery to £76,500, while by a recent valuation the last two figures had been shown to be over £100,000 less than actual value, they felt justified in returning to the dividend enjoyed before the big manufacturing enterprises were started. The item on the balance sheet appearing as "Investment" might be divided under four headings: (1) Investments in Sundry Works.—This referred to certain manufacturing departments producing specialities—especially telephones, conduits, and lamps—turned, for purposes of policy, into separate companies, entirely under the control of the General Electric Co. The company's investments under this head amounted to approximately £100,000. (2) Trading Companies Abroad.—These were the General Electric Companies of South Africa, Australia, India, China, Argentine, France, Spain, and Belgium. Some of these had started contributing towards the dividend, others still had very considerable establishment charges to their debit. The money invested in these companies was about £160,000. (3) Electrical Supply Companies.—Most of these were either under the control of the company or managed by it. They included the following undertakings: Madeira, Uitenhage, Bogota, Frinton, Barbadoes, and Macclesfield. A number of these undertakings were already paying satisfactory dividends. (4) Sundry Investments.—Some £10,000 or £12,000 represented small ventures found desirable in the course of trading, but whether they were dividend-earning or not, they all contributed in a lesser or greater degree towards the increased trading profits. The company had had to bear the first blunt of the National Insurance Tax, amounting to £3,000 to £4,000; it had suffered greatly through the effects of last year's coal and railway strikes. The report and accounts as given in our last issue were adopted, the election of Mr. Fred S. Sells to the Board was confirmed, Mr. L. G. Byng, who retired from the Board by rotation, was re-elected a director, and a vote of thanks to the Chairman and directors concluded the proceedings.

**Edmundsons' Electricity Corporation.**—A progressive improvement was reported by the Chairman at the annual meeting last week. The net result of the past year's trading was a balance of £18,899, compared with £16,114 in the previous year. The connections during the year have increased by the equivalent of 161,782 35-watt lamps, compared with 126,522 in the previous year.

**R. Waygood and Co.**—An issue of 15,000 each of preference and ordinary shares is to be made.

**Newcastle-on-Tyne Electric Supply Co.**—An interim dividend at the rate of 5 per cent. per annum is recommended on the ordinary shares for the half year.

## NEW COMPANIES

**ELECTRICAL ENGINEERING & MOTOR CO. (Carlisle).** Capital, £3,000. Suppliers of electricity, &c.

**WIRELESS ELECTRIC LIGHT CO.,** 6 Broad Street Place, E.C. Capital, £75,000. Electric lighting and general engineers and contractors.

**EASTERN SPAIN DEVELOPMENT SYNDICATE,** 101 Leadenhall Street, E.C. Capital £16,000. To acquire and work concessions for railway electricity supply, &c. First directors Sir Murland Evans, Baron von Horst, E. Parey, A. Ross, and J. Chapman. Private company.

**WIRELESS TELEPHONES, LTD.,** 62 London Wall, E.C. Capital £500. To acquire inventions relating to transmission of signals, &c.

**GALASHIELS & DISTRICT ELECTRIC SUPPLY CO.,** 23 Rutland Street, Edinburgh. Capital, £30,000.

# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 343 [Vol. IX., No. 30]  
*All rights reserved.*

THURSDAY, JULY 24, 1913.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*]

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES and TECHNICAL COLLEGE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

*Other Advertisement Rates on Application.*

#### Latest Time for Receiving

Letters for Insertion, Tuesday first post.

Small Advertisements and Official Announcements, Wednesday first post.

Displayed Advertisements, Tuesday first post.

Corrections in Standing Advertisements, Monday first post.

All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 208-206, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Circling, Fleet, London."

Telephone No.: 5509 Holborn.

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

NOTES on the arrangements for the next session at some of the Universities and Technical Colleges are given on page 430.

A DEMONSTRATION of two "truckers," and an explanation of the scheme proposed by the New Transport Co. for an electrically operated Goods Clearing House for London was given last week. (Page 431.)

AMONG interesting exhibits at the Olympia Commercial Vehicle Exhibition are the 40 h.p. Tilling Stevens omnibuses, &c., and the Delahaye military travelling workshop. (Page 431.)

THE opposition by Mr. W. P. Durnall to the grant of a patent to the Oerlikon Co. for multiphase current drive in self-contained vehicles has been successful. A report of the hearing before the Comptroller is given. (Page 432.)

A LETTER from Mr. Hope Jones points out that the new scheme of international wireless time signals is not yet completely in force. (Page 432.)

SOME electrical novelties are described on page 432.

THE routine testing of storage batteries is treated in our questions and answers columns. (Page 433.)

A REPORT of a Paper on automatic signalling is contained in our Electric Traction Notes, where reference is also made to the deficit on the West Ham Tramways, and the decision to use petrol electric trams at Oxford. (Page 434.)

A SHORT description is given under "Telephony and Telegraphy," of the Lorimer automatic telephone exchange which has been installed at Hereford.—It has been decided that the deferred shareholders of the National Telephone Co. are entitled to the whole of the surplus assets, but this decision may be appealed against. There has been considerable correspondence regarding the suitability of the Poulsen system of wireless telegraphy for long distance work. (Page 435.)

A SPECIFICATION for a new design of heat lagged horizontal cylindrical oven by Haydn T. Harrison, was published by the Patent Office last week. Among the other specifications were two dealing with the mounting of metal filaments by the Julius Pintsch A.-G. and the Austrian Westinghouse Co. respectively, while a system of combined steam flow and electrical meters for use in a generating station to see that each boiler contributes its share of the load is protected by the B. T.-H. Co. A patent covering diatriene insulated paper cables, by H. Edmunds, of W. T. Glover & Co., expires this week after a full life. (Page 436.)

THE Post Office tube railway has passed through the Committee stage of the House of Commons. A limitation has been placed upon the use of current for lighting post offices, and a modified electrolysis clause has also been inserted. (Page 434.)

AT a Board of Trade inquiry last week relating to the proposed transfer of the Cromer electricity undertaking to Edmundsons' Electricity Corporation, the inspector intimated that certain of the conditions proposed could not be included in the agreement.—The Diesel engine scheme at Bedford is not to be proceeded with at the present time, but experiments with oil-burners under the existing steam boilers are to be tried.—A Board of Trade inquiry has been held at Swanage, when objections to the proposed Diesel engine generating station were heard.—A proposal by the Cardiff Corporation to the effect that a balance of £5,962 standing to the credit of the Electricity Committee should be used for the erection of workmen's dwellings, was negatived.—A new switchboard has been constructed by the staff of the Taunton Electricity Works. (Page 437.)

A 3,000 kw. turbo-alternator, rotary converters, and E.H.T. switchgear are required at Norwich.—An E.H.T. feeder panel is required at Warrington, and switchboards at Middleton.—Mains extensions are

projected at Hastings, St. Anne's-on-Sea, Wolverhampton, and Southend.—Plant extensions and electric lighting schemes are being investigated at Bristol, Dungarvan, Hereford, Hamilton, and Southend. (Page 437.)

THE net profit for the half-year of the Yorkshire Electric Power Co. is £7,616. A six per cent. dividend on the cumulative preference shares is recommended, and the waste heat power station at Barrugh will soon be completed. An issue of  $4\frac{1}{2}$  per cent. mortgage debentures is being made by the Bristol Tramways and Carriage Co. (Page 438.)

**Electricity Supply in London.**—The Special Committee which was appointed by the L.C.C. some time ago to investigate the steps to be taken to co-ordinate the sources of electric supply in London, in view of the Council's ultimate acquisition of the electric companies' undertakings, has now reported its intention to make arrangements at an early date for obtaining reports which, *inter alia*, will (1) deal with the existing means for the supply of electricity in Greater London; (2) give an outline of a complete ultimate scheme for Greater London, and indicate what modifications would be required in any such scheme if it were limited to the County of London; (3) include a definite recommendation as to the initial steps to be taken in the direction of a complete scheme, bearing in mind the existing conditions and the general financial position. In this connection a recommendation is made to the Council to authorise an expenditure of £2,500 in obtaining expert assistance.

**The Ontario Hydro-electric Scheme.**—We learn from the *Electrical World* (New York) that several serious breakdowns have occurred recently on the Ontario Hydro-electric Commission's system. On June 16th the service on the Commission's Toronto system was interrupted for over seven hours, during which time the whole of the load was taken by the Toronto Electric Co., which provided an emergency supply within an hour. On July 2nd there was again a failure of the transmission line to Toronto, which necessitated the power being cut off again for seven hours. We also learn that from June 1st to 26th there were 13 interruptions, totalling 28 hours. Mr. H. H. Couzens, late chief electrical engineer, Hampstead, who has just taken charge of the Ontario Hydro-electric scheme, apparently has a busy time before him to devise arrangements for preserving continuity of supply, both internally and by arrangement with competing schemes.

## UNIVERSITY AND TECHNICAL COLLEGE ANNOUNCEMENTS

The 1913-14 session of the University of Liverpool, Faculty of Engineering, commences on October 7th, when very complete courses in engineering will start. The subjects embraced include electrical engineering, under the direction of Professor E. W. Marchant, civil and mechanical engineering, naval architecture, design and drawing, chemistry, &c. The Special Matriculation examination or the Entrance examination must be passed to secure admission to the courses of instruction. Full particulars may be obtained by application to the Registrar, Mr. P. Hebblethwaite.

The syllabus of the University of Birmingham, with details of University regulations, lecture and laboratory courses, fees, scholarships, &c., may be obtained on application to the Secretary. It may be noted that the full courses in one or other branch of engineering extend over four years, and students who enter after Matriculation and pass successfully the examinations at the end of each year will be entitled to the B.Sc. degree in the branch of engineering to which they have devoted themselves. Professor Gisbert Kapp is the head of the electrical engineering department, and Sir Oliver Lodge is the Principal of the University.

The next session at the University College, Nottingham, begins on September 29th, when courses preparing for the B.Sc. (Engineering) degree of the London University, and the B.Sc. (Mining) degrees, as well as for the College diplomas, may be taken. The usual courses extend over three years. For particulars and prospectus application should be made to the Registrar, Mr. T. P. Black.

In October a systematic course of instruction in electrical measurement and practical electricity will be commenced in the electrical department of the University College of North Wales (Bangor). The laboratory is well equipped with machinery and apparatus. The Secretary and Registrar, Mr. J. E. Lloyd, will be pleased to supply further information as to the course, which extends over two sessions.

Full particulars of the many courses embracing engineering, naval architecture, mining, metallurgy, agriculture, pure science and commerce, to be obtained at the Armstrong College (University of Durham), which is situated at Newcastle-upon-Tyne, may be obtained on application to the Secretary, Mr. F. H. Pruett. The next session commences on September 29th.

## THE COMING HALF-WATT LAMP.

(See article in last week's ELECTRICAL ENGINEERING, page 416.)



What will not happen next autumn at any rate.



What should happen next autumn.



## THE PROPOSED NEW ELECTRICALLY-OPERATED GOODS CLEARING HOUSE

ON Wednesday last week the New Transport Co., Ltd., entertained a number of people at a demonstration in their Battersea works of machinery and models relating to the goods clearing house (ELECTRICAL ENGINEERING, Vol. VI., p. 445; July 7th, 1910), which it is proposed should be established in Clerkenwell.

It was pointed out that there are in London eleven railway companies, owning seventy-four goods stations and receiving about 320 goods trains per twenty-four hours. These 320 trains require over 700 daily inter-goods-station trains merely to "sort" the various railway wagons into other London stations or shunting yards. At each of these stations each bale of goods in a railway wagon is then sorted into the various delivery vans by porters with hand-trucks. By substituting one central goods clearing house, as designed by the New Transport Co., for the seventy-four goods stations, the 700 daily inter-goods-station trains could be saved, London railway tracks could be relieved of these, and most of the land now occupied by the seventy-four goods stations could be redeemed. The sale of this land alone would, it was said, be sufficient to pay for several goods clearing houses. The area covered by the proposed clearing house is 30 acres. The main reasons which render this concentration possible and economical are:—(1) The clearing house has eight floors; (2) The unloading and re-loading of wagons is performed rapidly by cranes lifting whole wagonloads at one hoist, obviating the shunting of wagons in sidings; (3) The sorting of bales, &c., is performed by automatic machinery instead of by porters wheeling hand-trucks; (4) The street collection and delivery service is one organisation, and is frequent and regular.

Below street-level run twenty-four railway berths, parallel to each other, from end to end of the clearing house, each long enough to accommodate a seventy-wagon goods train, and connected with the railways serving London. Over these, on the street-level, twelve road bridges cross at intervals from side to side of the clearing house. A road vehicle can thus be brought over any desired rail vehicle, and a load can be transferred from the one to the other by an electric overhead crane. Below the rail level is a crypt, in which whole wagonloads are sorted, and, if necessary, temporarily stored until a train is ready to receive them. Above the road-bridge level are four sorting floors, and above these an eighth floor with offices and repair shops. Of the sorting floors, two are for bales up to 10 or 12 cwt., and two are for parcels up to about 15 lb. In order to save time in loading and unloading, a whole wagonload is dealt with at one lift by a crane, by using a "container." Each sorting floor is divided into compartments called "bays," at each of which goods for a particular town, &c., are delivered by the sorting machinery, consisting of endless trains of machines called "truckers"; these move continuously at three miles per hour, and trays bearing goods are automatically slid without concussion on to them at despatching stations, and off them at receiving stations. Transfers are also made to truckers running on an adjacent line of rails at six miles per hour to connect with the various systems of slow-speed truckers. An arrangement of hoists also connects the floors and automatically takes the goods. The "marching orders" are given to each trucker by dispatchers, of whom there may be any number working independently in different places. Each operation is controlled by circuits through push-buttons on the dispatchers' tables, which operate a contact ratchet wheel on the truckers. This wheel closes a control circuit in one position only, and is provided with one tooth for every station, and if in a case there were thirty stations, and it was wanted to stop at, say, the eleventh station from the dispatching station, the ratchet would be moved on nineteen teeth by closing the control circuit for that station through the push-button. Every time the trucker passed a station the controller would be moved on another tooth, until at the eleventh it would close the control circuit and stop itself. Similar arrangements apply as to the transfer of goods from one trucker to another while one is overtaking the other, and as it is provided for the control circuit of the first to be completed through the second, then, if the second one is already loaded, the circuit on this is not continuous, so that the circuit controlling the electro-magnetic rollers, which transmit the platform containing the goods from one trucker to the other, cannot be completed, and no transfer takes place. The rollers are set at an angle to the front of the truckers, so that at the standard

speed of progression there is no relative motion of the goods in the direction of travel of the truckers during the transfer. The rollers are kept out of contact with the goods container or platform, except when the circuit is complete for a transfer to take place, when they become energised and grip the tray by magnetic attraction. They rotate with uniform acceleration and retardation every time two truckers pass. This is done mechanically by means of cams and followers on the truckers themselves, which come into engagement.

Although the system is always talked of in relation to a goods clearing house for London, yet it is applicable to the handling of goods and parcels of all kinds, such as are dealt with by the Post Offices, large stores, &c., as well as smaller railway undertakings.

## THE COMMERCIAL VEHICLE EXHIBITION

IN view of the renewed interest in the electrically-propelled vehicle which has followed the introduction into this country on a commercial scale of the long-promised Edison battery, and the fact that it is the propulsion of a certain class of commercial vehicle that opens up one of the most promising fields for its use, it is regrettable that it has not been found possible to include a single battery-driven vehicle in the Exhibition of Commercial Motor Vehicles now being held by the Society of Motor Manufacturers and Traders at Olympia.

Electrical engineers will find the most interesting stand to be that of W. A. Stevens, Ltd. (26 Victoria Street, Westminster), which is devoted to examples of the latest patterns of the now well-known Tilling-Stevens petrol-electric omnibuses and other vehicles. The display includes, a 40-h.p. chassis, a complete double-decked bus, a char-a-banc and lorry with the same equipment. The 40-h.p. equipment is on the same lines as that of the 30-h.p. omnibuses running in London, except that the generator and electric motor are not in line (see ELECTRICAL ENGINEERING, Vol. VII., p. 41, Nov. 23rd, 1911), but the motor is placed lower down, and, owing to the greater length of chassis, further from the motor. This is done mainly to keep the platform level as low as possible. Each machine, as before, is provided with its own fan. The chassis shown is arranged so that the motor can be driven by a few Edison cells, and the action of the switch-gear demonstrated. The only differences in the control from former models are the situation of the reversing and field controllers on the front of the dash inside the bonnet worked by levers conveniently mounted on the steering column, and the provision of a motor field as well as a dynamo field resistance. These two resistances are worked by the same controller and give rather greater range than before. Some interesting records taken by a Wimpey Accelerometer show the great superiority of the electrical transmission system over the ordinary gear and clutch from the point of view of stresses to which the vehicle is subjected. Under identical conditions the peaks in the curve are much higher with the mechanical gear. The curves show that the intermittent accelerations on the gear-driven vehicle exceed 8 ft. per sec. per sec., resulting in a strain on the road wheels exceeding 560 lb. per ton in the gear-driven bus, while in the Tilling-Stevens omnibus in no place does the line show an acceleration of 3½ ft. per sec. per sec.; therefore the transmission strains on this vehicle are certainly less than 245 lb. per ton on the road wheels, although in the test on which the records were taken the Tilling-Stevens vehicle was driven considerably faster than the gear-driven omnibus. The braking strains are about the same on each vehicle. In the Tilling-Stevens vehicle it is impossible for the driver to accelerate beyond a certain limit, although, as the acceleration is continuous, the vehicle can attain a given speed more rapidly than any other omnibus of the same rating. It is, however, impossible to limit the shocks to which an ordinary gear-driven vehicle can be subjected by the operation of the clutch and gears. In addition to the saving in upkeep of chassis and body in the Tilling-Stevens petrol-electric omnibus, a great saving is made in tyre renewals. In the London service an average distance of 20,148 miles per tyre has been obtained.

Another exhibit to which attention may be drawn is the Delahaye military travelling workshop, shown by H. M. Hobson, Ltd. One of these has already been ordered for the Royal Flying Corps. The engine which drives the car is employed for driving a dynamo when the vehicle is stationary. The dynamo in its turn drives separate electric motors on each machine, such as lathe, drilling machine, grinder, shaping machine, bent and circular saws for woodwork. Besides this, the inside of the car is very completely fitted with fitter's and carpenter's bench and full complement of

tools for all work in connection with the repair and maintenance of military aeroplanes in service.

In the accessories section in the gallery several firms show car-lighting dynamo equipments, but no striking novelty in this direction makes its appearance.

### THE "PARAGON" TRANSMISSION SYSTEM PATENTS

AN interesting opposition case by Mr. W. P. Durnall against the grant of a Patent to the Maschinenfabrik Oerlikon was argued before the Comptroller-General of Patents on Friday last.

Mr. Durnall, it may be remembered, claims to hold the master-patents for the system of driving and control by polyphase current adjustable pressure and frequency in self-contained vehicles. This system has been given the name of the "Paragon" system. The claims in two of Mr. Durnall's specifications (Nos. 17,248 of 1905 and 23,396 of 1908) which he cited in the present case are given here, as well as the claim in the Oerlikon Co.'s specification No. 19,890 of 1912, which is the one opposed.

The claims in Patent No. 17,248 of 1905, granted to E. W. Hart and W. P. Durnall, read as follows:—"(1) In a method of propelling a vehicle or boat comprising the combination of a prime mover, an electric generator, a motor in electrical connection therewith, and appropriate transmission gear, the use of an electric generator having a revolving magnet or magnets and a stationary armature, the windings being arranged for polyphase alternating currents. (2) In a method of propelling a vehicle or boat, as claimed in Claim 1, adapting the exciter so that the excitation of the electric generator field-magnet or magnets may be varied, substantially as and for the purpose described."

In Patent No. 23,396 of 1908, granted to W. P. Durnall, there are 12 claims. The first claims "A plant for the generation of polyphase electric currents of varying periodicity by means of a prime mover or movers, which may run at a constant speed, said plant comprising a polyphase transformer-generator, which has its rotor coupled mechanically to a prime mover, and a polyphase alternator which serves to excite the primary of said transformer-generator, and is coupled to the same or to another prime-mover than that to which the said rotor is coupled, substantially as described." The remaining claims deal with constructional details. Corresponding to this specification is the German specification numbered 230,406 of 1911.

The claim in the Oerlikon Co.'s specification, No. 19,890, of 1912, which was only recently published (ELECTRICAL ENGINEERING, Feb. 6th, p. 80, and April 3rd, p. 192), is for "An electric locomotive, motor-boat, and the like in which the driving shaft motors are fed by a generator moving with the locomotive, or the like, coupled with a driving engine such as a steam turbine, Diesel engine, or the like, characterised by the fact that the generator supplies motors, having short-circuited armatures, with multiphase current, and the velocity of the motors is governed by regulating the velocity of the driving engine within its economical limits, while for starting, stopping, and reversing, the motors are governed by known controlling devices in their circuits."

Mr. Durnall claimed that Patent No. 17,248 of 1905 is a master-patent, but Mr. Bosshardt, jun., on behalf of the Oerlikon Co., maintained that this could not be, as the claims began by the words "In a method . . ." The Comptroller pointed out that the claims might have been made clearer, and that they would always be open to the objection that only the use of particular machines was implied. He thought, however, that, though the broad reading of the claims of specification No. 17,248 of 1905 might be old, yet even on the narrow reading the Oerlikon Co. were practically claiming what was claimed there over again with a slight modification. A direct reference to No. 17,248 of 1905, but not to No. 23,396 of 1908 would be necessary in specification No. 19,890 of 1912, and he would have to consider whether if, after that were done, there was sufficient invention left to justify the grant of a patent. He would notify his decision on this point later.

**Large Research Laboratory.**—An Electrical Research Laboratory and Bureau is to be established in connection with the Massachusetts Institute of Technology. Its official title will be "Division of Electrical Engineering Research," and taking into account the library an endowment of over 200,000 dollars (£42,000) is assured. The investigations will be carried out by trained experts, and will be of a practical character, and embrace illumination, telephony and telegraphy, and traction. The greatest distance a passenger can be economically carried on a tramcar for a given fare, is to be considered, as well as the handling of freight on railroads, and like questions.

### CORRESPONDENCE

#### INTERNATIONAL TIME SIGNALS.

To the Editor of ELECTRICAL ENGINEERING.

SIR,—Users of the "Hörphone" and others among your readers who have wireless installations have been puzzled by the time signals transmitted from Paris and Norddeich since July 1st. They are not in conformity either with the new or the old scheme, but appear to be a combination of both.

I therefore wrote to le Commandant Ferrié, of the Eiffel Tower Station, for an authoritative statement on the subject. He has kindly complied, and I have pleasure in communicating a translation of part of a letter just received from him:—

"I have the honour to inform you that the new International Signals established by la Conference de l'Heure in October last, and which were to have been employed commencing from the 1st July, could not be inaugurated at the date fixed, for the following reason: The German technical services have announced that certain material difficulties would prevent the time Station of Norddeich from being ready before the month of October at the earliest. As the Station of Norddeich now sends the time at midnight, and as according to the new conventions the Eiffel Tower ought also to send the time at midnight, there would result a jamming of the two emissions. So we have had to delay putting into operation the decisions of the Conference. Nevertheless, we send the new automatic time signals at 10 a.m., according to the new Conventions, in order to give practice to people who take the time. We continue, however, to send the time as formerly at 10.45 a.m., and 11.45 p.m. with the old signals. We were ready to operate on the 1st July, as is shown by the fact that we commenced the new morning signals on that date, but it is by courtesy that we have delayed putting into practice the whole of the new International arrangements."

It appears to be no one's duty to inform wireless telegraphists in this country as to international services of this kind, and we should therefore be grateful to Commandant Ferrié for this prompt but unofficial communication.

Yours faithfully,

F. HOPE-JONES.

32 and 34 Clerkenwell Road, E.C.

### ELECTRICAL NOVELTIES

WE are now able to illustrate the pocket lamp in the shape of a pistol being put on the market by the General Electric Co., Ltd. (67 Queen Victoria Street, E.C.). The "pistol" is very compact, and has no sharp edges to tear the pocket. The two-cell battery is contained in the stock, and the switch is worked by the trigger. Various new



OSRAM PISTOL.

designs in pocket lamps, torches and lanterns have also been recently introduced by the Company. Osram drawn-wire battery lamps are used in every case, and thus, even the smallest size lamp gives the maximum efficiency.

Another novelty consists of a small turbine, coupled direct to a magneto-generator giving 8–10 volts (about 12 watts). It can be coupled to a main water tap, and will be found suitable for lighting lamps, working small models, &c.

## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,348.

A double pole circuit-breaker is required for a 500 ampere, continuous-current, 100-volt supply circuit. The double-pole switches are to be operated by means of a solenoid (mounted vertically) through a toggle mechanism. The switches are to be jammed against the contacts in the "On" position. Give a suitable design for the toggle mechanism and switch contacts, &c., showing how the "holding on pressure," and the "initial pull" to operate the solenoid can be ascertained. No automatic safety devices are required in the circuit breaker.—"B. C."

(Replies must be received not later than first post, July 31st.)

### ANSWERS TO No. 1,346.

Describe a regular course of routine inspection and testing for a central station battery of about 250 cells of say 1,000 ampere hours' capacity at the five hour rate; (a) with end regulating cells, and (b) without end regulating cells.—"NASCENT HYDROGEN."

The first award (10s.) is given to "M.M." for the following reply:—

The method of procedure is practically the same in either case, allowance being made when taking the voltage of each individual cell; cells that are cut out of circuit are not subject to the C.R. drop. Regulating cells are often neglected in ordinary tests, and sometimes suffer through over-charging. It may happen that the end cells are rarely in use, and if not cut out early in the charge they run the risk, particularly with pasted plates, of being injured. Over-charging is by no means an unmixed blessing for pasted plates; with a heavy current flowing through charged cells, the paste tends to become loosened, and thus trouble is started. Each cell of a battery should be numbered, and notes taken, and a record kept of its condition and performance. The following points should receive careful attention:—

**Specific Gravity of Electrolyte.**—The usual density is 1.170 when the cell is empty and 1.200 when the cell is fully charged. All the cells of a battery should show a similar figure; where one or two differ from the rest it is certain that something is wrong. A cell that does not pick up by the next examination should be cut out of discharge and joined up again for the charge; this often puts things right. There should be sufficient electrolyte in the cell to reach about half an inch above the top of the plates. For filling up cells, or, as it is called, "topping," distilled water should be used.

**Electromotive Force.**—Each cell should never fall below 1.8, and when being charged should not reach a higher voltage than 2.65. There is sometimes a tendency for attendants to take the voltage of the battery as a whole, and from this calculate the volts per cell, but such a method should not be tolerated; each cell must be separately tested, as if there is one, or are even two, bad ones, they may easily be missed.

**General Conditions.**—When going round the battery, connections should be examined for evidence of corrosion, insulators examined, any tendency to buckling of the plates noted, and

careful watch kept for "sulphating." Where connections are corroded they should be repaired, and any doubtful contacts cleaned and overhauled. When plates show buckling they may often be straightened by means of a strip of hard wood pushed down between the plates; the plates are easily bent, and with the aid of a few wood packing pieces it will be found possible to work wonders. One of the surest indications of the condition of a cell is the colour of the plates. Good cells have the negatives lead colour, with positives a distinct chocolate; if the positives are losing their colour this points to incipient sulphating. To get rid of this white deposit is always a troublesome process, therefore it should be treated in its early stages; the only sure preventative is to charge fully and regularly. Any nostrums for the purpose are best left alone—simply employ volts.

Generally, it is most important to keep a record of the weekly test in order to satisfactorily diagnose the condition of a faulty cell; its previous history should be known before deciding on any definite treatment. Too much stress cannot be laid on the importance of thorough tests and examination; in many cases testing is little more than perfunctory.

The second award (5s.) is made to "SPARKO," who writes as follows:—

The regular course of inspection and testing for a central-station battery should be the same whether end regulating cells are used or not. But when end cells are used, they are specially liable to become unevenly discharged, and therefore require more attention than the remainder of the cells. They are successively cut into service on the discharge; hence, on the charge, they should be successively cut out in the reverse order, otherwise the ones that were last cut in will be overcharged. Special care should be taken in regard to this, as it is easy to forget that a number of the cells were not cut out into circuit until probably near the end of the discharge, and then require but a small proportion of the amount of charge required for the main battery. In order to secure satisfactory operation of a battery, each of the cells should be inspected at regular intervals. The voltage of individual cells may become low, the electrolyte may not be of the proper specific gravity, or foreign substances may become lodged between the plates, or in the bottom of the cells; and regular inspection is necessary to locate any such defects that may develop. Such readings as are taken from the cells should be recorded in such a way that consecutive readings may be easily compared; if a cell is acting irregularly, the fact will then be at once apparent. Each cell should be thoroughly inspected at least once a month. When examining a cell, great care should be taken to look between all the plates, and any accumulation of material should be removed at once, possibly by pushing same to the bottom of the containing vessel, by means of a stick of wood. A metal rod should never be used in a storage cell, as it would cause short circuits and do damage. In addition to the above examination of the cells, an inspection should be made near the end of each charge to see if all the cells are gassing freely, and readings of voltage and specific gravity of the electrolyte should be taken at the end of each prolonged charge, while the current is still flowing. If any of the cells show readings lower than the normal and do not gas freely at the end of the charge, they should be examined at once to determine the cause of the falling off. Very likely it is due to short circuiting between the plates, caused by a lodgment of material in the intervening space, or else by an accumulation of mud in the bottom of the cell. A cell that has become low will usually require more than the usual amount of charging to get it into condition again after the cause of the trouble has been removed. A simple method of doing this is to cut the low cells out of circuit over one or two discharges, and then cut them in on the charges. Before putting the defective cell into service again, care should be taken to see that all signs of a full charge are present. Care should also be taken with regard to the specific gravity of the electrolyte, which is indicated by the hydrometer. When the cells are fully charged, the specific gravity of the electrolyte should be from 1.2 to 1.24 at 60° F. The final density on discharge should not fall below 1.15, and from 1.185 to 1.195 is the usual practice.

**Restaurant Lighting.**—We have received from the British Thomson-Houston Co., Ltd. (Mazda House, 77 Upper Thames Street, E.C.) a photograph of the Eustace Miles Restaurant, where the lighting is scientifically carried out by means of Mazda drawn wire lamps, equipped with moulded prismatic glass diffusing reflectors, which almost completely hood the lamps. The units are suspended about nine feet from the floor, so that they are out of the direct field of vision, and give an efficient even distribution of the light, so that the effect is very pleasing.

## CATALOGUES, PAMPHLETS, &c., RECEIVED

**SILVERTOWN MANUFACTURES.**—An interesting illustrated pamphlet from the India-rubber, Gutta-percha & Telegraph Works Co., Ltd. (Silvertown, E.), gives some historical notes on the development of the works and its manufactures, and illustrates both the machinery employed and the articles turned out in the various departments. Thus in the rubber department the washing-machines, mixing-mills, &c., are described, and mention is made of the various waterproof articles, hose, belting, floor covering, &c., made, and a description is given of the manufacture of Palmer cord tyres; similarly ebonite articles, including fountain-pens, and gutta-percha articles, including golf-balls, are dealt with. Several pages are devoted to the submarine cable department, and examples of the dynamos, motors, electric vehicles, cables, instruments, batteries, searchlights, &c., made in the electrical department, are illustrated, and a good idea is given both of the extent and up-to-dateness of the company's operations.

**MOTOR CONVERTERS.**—The instructive pamphlet dealing with the well-known Peebles Motor Converter has just been revised and brought entirely up-to-date by Bruce Peebles & Co., Ltd. (Edinburgh), who are the manufacturers of these machines. Among the several fine illustrations is one showing the interior of one of the sub-stations of the Calcutta Electric Supply Corporation, where are seen six of the nineteen 475 kw. three bearing sets supplied. As well as illustrations showing individual machines, there are diagrams of connections, which enable one to appreciate the simplicity of the motor-converter, which may be used direct on high pressures, and characteristic curves proving the high efficiency over a wide range of load. The principle of the motor-converter is fully treated, and it is shown that these machines are equally suitable for traction, lighting, or combined loads, as well as for three-wire balancing. We are informed that during the past eighteen months orders have been received for over 60 sets, in sizes ranging from 1,500 kw. down to 100 kw.

*Readers desiring copies of catalogues or pamphlets should apply to the firms in question, referring to the notice in "Electrical Engineering."*

**SWITCHGEAR, &c.**—New lists have been issued by A. Reyrolle & Co., Ltd., Hebburn-on-Tyne, dealing with potential transformers in iron cases for oil filling, and with watertight plugs and sockets for mines, shipyards, &c., providing for a separate earth conductor in the flexible cable, as called for by the Home Office Regulations.

**MOTORS AND DYNAMOS.**—A well-arranged list is to hand from Wright & Wood, Ltd. (Century Works, Halifax), dealing with continuous-current motors and dynamos, two- and three-phase induction motors, starting gear for continuous- and alternating-current motors, motor-generators, rotary converters, &c., and portable polishers and saw benches.

**SILICA LAMPS.**—A revised sheet from the Westinghouse Cooper-Hewitt Co., Ltd., shows that a 2,500 c.p. unit for 110 volts has been added to the already comprehensive range of these lamps. The full range is now from 800 m.h. c.p. to 3,000 m.h. c.p. The burners have an average life of about 4,000 hours, and are renewable at a small cost.

**WEATHERPROOF LANTERNS.**—A sheet from Krupka & Jacoby, Ltd. (26 to 36 Chapter Street, Westminster, S.W.), brings to notice neat designs of single light weatherproof lanterns for round metal filament lamps of 100-1,000 c.p.

**The Post Office Tube Railway.**—The House of Commons Committee last week passed the preamble of the Bill which authorises the Postmaster-General to construct a tube railway, for the purposes of the mail service, from the East to West London. There was considerable discussion on clauses, and among the opponents were the electric lighting companies of London, as mentioned in our last issue. With regard to the objection taken to the Postmaster-General lighting post offices anywhere in London, a clause was inserted at the instance of the Post Office limiting the supply of electricity to the railway and to post offices on the line of route or within 50 yards of it. Another question discussed on clauses was in relation to electrolysis. Owing to the strong objection felt to placing one Government department under the control of another, it was not proposed to insert the model clauses dealing with electrolysis, under which the Board of Trade Regulations have to be complied with. Instead, a clause was proposed under which the Postmaster-General would be liable to pay compensation for any damage done if he had not taken reasonable precautions to obviate damage, there being, of course, an appeal to arbitration to settle the amount of any damage so alleged. The Committee decided that under the circumstances this clause should be inserted in the Bill.

## ELECTRIC TRACTION NOTES

Some interesting notes on the A.C. method of automatic track-circuit signalling for railways were contained in a recent Paper read before the Students' Section of the I.E.E. by Mr. T. J. Hornblower (Mackenzie Holland and Westinghouse Power Signalling Co., Ltd.). It will be remembered that this is the system installed on the East London Railway and now being installed on the Central London Railway. It is also extensively used in America and on some Continental lines, as the possibility of interference by stray currents is reduced to a minimum. The track is divided into insulated sections connected by impedance bonds as shown in Fig. 1 at  $S_1, S_2$ , so that the power current can pass while the signalling current cannot. The track pressure is usually between  $1\frac{1}{2}$  and 3 volts at 25 cycles if the traction current is direct, or 60 cycles if it is alternating. A relay controlling the signals is connected across the rails at the beginning of the section, and so long as the track is unoccupied the relay circuit is held open; but when shunted by a train being in the section, the relay circuit is closed. Some of the difficulties met with in practice are that the ballast resistance (insulation between the rails) may vary between 1 ohm and 10 ohms per

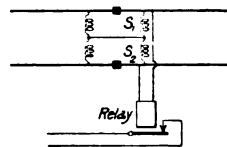


FIG. 1.

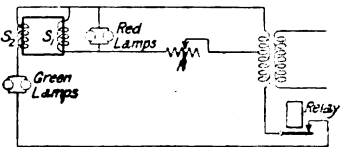


FIG. 2.

1,000 ft. The track is fed through a special transformer so as to obtain approximately constant current irrespective of the ballast resistance. A transformer with rapidly falling characteristic, or a transformer with an inductance, or thermal regulator in series may be used. The latter consists of iron wires in bulbs of hydrogen, which, as is well known, have a peculiar temperature-resistance characteristic which make them eminently suitable for this work. Three types of relay are in use: (1) the "vane" type, in which a pivoted aluminium vane moves between the poles of a shaded magnet; (2) the "galvanometer" type, which works on the same principle as the Siemens dynamometer and is useful for long block sections, and (3) the "centrifugal" type, which consists of a Pickering governor worked by a little squirrel-cage motor. Semaphores are usually worked by a small A.C. motor to the "clear" position and held there, with the motor current cut off, by an electromagnet until the control current is cut off, when the arm returns to "danger" by gravity. A diagram of the ingenious red and green lamp signal circuits used on the East London Railway (ELECTRICAL ENGINEERING, April 11th, 1912, p. 194, and March 20th, 1913, p. 165) is given in Fig. 2. It is usual for the supply-current for the green lamp to be taken off from a 100-volt tapping on the transformer, the red lamp being supplied at only 16 volts so as to eliminate all possibility of a short between the red and green leads causing the green lamp to light up. The green lamp is placed in series with one winding of a small transformer. The other winding is connected across the leads for the red lamp in series with an adjustable resistance  $R$ . The red lamp is put as a shunt across the coil as shown. The red circuit is left on continuously, and when the green circuit is open the impedance of  $S_1$  is so high that the red lamp lights up. When the relay closes the green circuit the magnetising force of  $S_2$  opposes that of  $S_1$ , so that there is no flux produced in the core. The impedance of  $S_1$  is then only very small, and the red lamp is extinguished. An adjustable resistance  $R$  allows the ampere-turns in  $S_1$  and  $S_2$  to be made equal.

*Elektrische Kraftbetriebe und Bahnen* for April 14th contains a long article by Herr G. Brecht, one of the chief engineers of the Prussian State Railway Department, on the traffic capacity of terminal stations. He concludes that the adoption of electric traction on city or suburban lines increases the capacity of terminal stations by at least 50 per cent. as compared with steam traction.

There was a deficit of £3,388 on the West Ham Corporation Tramways for the year ending March 31st. In the previous year there was a surplus of £4,082. In his evidence a short time ago, before the House of Commons Committee which is considering the question of motor traffic in London, Mr.



# ADAMS IGRANIC

MOTOR CONTROL GEAR FOR STEEL MILLS.

ADAMS  
MFG CO LTD  
BEDFORD  
AND  
LONDON

H. E. Blain, late General Manager of the West Ham Corporation Tramways, foreshadowed that there would be a considerable loss this year in consequence of motor-bus competition.

The Oxford Corporation has accepted the scheme proposed by the National Electric Construction Co. for the use of petrol-electric tramcars in the centre of the city, with overhead wires in the outskirts.

At the last meeting of the London County Council, attention was called to the fact that last year Parliamentary expenses amounting to £32,000 were involved in securing powers to construct 31½ miles of tramways, or roughly £1,000 per mile.

## TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

The July issue of the *Post Office Electrical Engineers' Journal* contains a detailed description of the automatic exchange equipment on the Lorimer system, manufactured by the Canadian Machine Telephone Co. of Toronto, which has been installed by the British Post Office at Hereford. The equipment is for 500 lines, and is arranged in five switching units. Provision is made for seven simultaneous outgoing and seven simultaneous incoming calls per 100 subscribers.

The Lorimer system has considerable differences from the Strowger system, which is used at the other automatic exchanges in this country, and unlike the latter involves continually rotating shafts. To make a call, the subscriber adjusts four levers to the correct figures, turns a handle, and lifts his receiver. The number thus set can be, so to speak, stored up if all the switches are engaged, and connected up automatically in proper sequence. The caller always has before him the number he has set his apparatus to, so that a mistake can be detected. Other special features are that the line of the calling subscriber is searched for and found by the wipers of the "A" or line-finding switch; the calling line does not directly find a disengaged switching apparatus, but a disengaged switching apparatus is brought into action to find the calling line; there is no up and down movement of the switches as a separate wiper is provided for each level of contacts. Also a time-limiting device is provided, which can be adjusted to limit conversations to a definite length of time, and to prevent one subscriber holding up another by failing to restore his receiver. In the earlier Lorimer equipments, a continuously running "decimal indicator" was used as well as the other moving switches described below, but in the Hereford equipment this has been replaced by line and cut-off relays. When a call is received, the action of the line relays and the "division starter," and "decimal controller," is to find the calling line and connect it to a pilot switch. This then brings the signal controller switch into action to ascertain the numbers set up at the calling telephone, and to adjust the ringing and inter-connector registers. During the passage of the wiper over the first part of the signal controller cylinder, impulses are sent over line 2 of the calling subscriber's circuit, and these operate his mechanism. While the impulses are passing, a feed relay tests the second wire connected to the subscriber's moving brush, and the ringing register records the number of impulses sent out before the position of the thousands lever is found by the brush. The ringing register thus joins up the particular ringing commutator for ringing up the called subscriber. The inter-connector register is next brought into circuit, and on the operation being repeated records the number of impulses sent out before the position of the hundreds is found. The inter-connector switch then finds a junction line to the required hundreds group. The pilot switch is then signalled, and moves on, causing the signal controller and test relay to repeat their operation to ascertain the tens and units, and the wipers of the B switch come to rest on the required contacts. The signal controller pauses while the pilot makes the busy test, and when signalled by the busy test relay, the signal controller signals to the pilot to move after a brief pause to the ringing position. Finally the pilot switch moves to the talk position, and on

the subscriber hanging up it passes to the release position, and the various switches are brought to normal.

In reply to further questions in the House of Commons last week, the Postmaster-General explained how, when the Advisory Committee on the Marconi contract had investigated the various systems, difficulty was at first experienced by the Universal Radio Syndicate (Ltd.) in obtaining the use of the Eiffel Tower, which they had hoped to do. On application by the British Government, the French Government had eventually allowed the use of the Eiffel Tower, but difficulty was experienced in accommodating the apparatus, so that the tests were never carried out. The Postmaster-General also stated that he had received a telegram from the British Consul-General at San Francisco, informing him that the Company were not yet able to conduct any daylight service at all to Honolulu. The cost of the twelve masts for each of the proposed Marconi wireless stations would be about £33,000, but he did not know the cost of masts for the Goldschmidt system. A letter in *The Times* of July 19th, by Mr. A. S. Baxendale, managing director of the Universal Radio Syndicate, points out, among other things, that a regular daylight service is being conducted from San Francisco to Honolulu, but the non-completion of the Honolulu end has so far prevented a similar service being given in the opposite direction. The Postmaster-General has replied at length, and disclaims all responsibility for the Poulsen Syndicate not being able to secure the opportunities for demonstration which they desired. He had, he says, now received a copy of Dr. Austin's report, but it was not such as to cause him to reject the advice given by Lord Parker's Committee. Sir Joseph Larmor, in a letter, remarks that it seems unreasonable to assign some of the stations in the wireless chain to one company and the remainder to another, and he asks how is it to be decided whether a station is using a patent belonging to a special system, and therefore liable to pay royalty? He also advocates that the Advisory Committee be made permanent like the Advisory Committee for Aeronautics.

Mr. Justice Sargent decided last week that the deferred stockholders in the National Telephone Co. are entitled to the whole of the Company's surplus assets, which amount to about £200,000. This decision was given on an originating summons taken out by the liquidator in the voluntary winding-up of the Company, to determine what construction was to be placed on old and new articles and resolutions passed on the creation of the various classes of the Company's stock. Mr. Justice Sargent held that the first, second and third preference shareholders were only entitled to the return of paid-up capital, and the preferred stockholders were not entitled to any interest. Mr. George Franklin, the liquidator, has since pointed out that pending the result of a possible appeal against Mr. Justice Sargent's decision, he has been authorised to make early distribution to the deferred stockholders of a further payment of 4s. 4d. in the £. This will account for approximately £820,000 of the remaining assets, amounting to some £1,131,250.

An improved wireless installation is being installed at Port of Spain, Trinidad, the old plant having been found insufficient to deal with growing requirements. The new plant consists of a 5-kw. Marconi apparatus, and is designed for a working range of about 400 miles by day and 1,000 miles by night.

The Administration of Montenegro has closed the telegraph office at St. Jean-de-Medova.—On the 17th inst the Sebastopol-Varna cable failed, cutting communication between Russia and Bulgaria, and was restored on the 18th inst.—The Roumanian Administration notifies the control of offices at Turtucaia and Silistria by them, and the renaming of the stations as Turtucaja and Silistria. They further say that the prohibition of code and cypher only applies to private telegrams, and not to those between Legations.—On the 22nd inst, communication was down with Capelongo, Cassinga, Gambos, Cahama, Humbe, Cuamato, Ancongo, Damequero, Donguena, Cafu, Evale, Quiteve, and Mulondoin Angola.

# "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

## Specifications Published July 17th, 1913

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

Names in *italics> indicate communicators of inventions from abroad.*

15,065/12. **Ovens.** HAYDN T. HARRISON. A horizontal cylindrical vessel is surrounded by another, and the space between the two is heat lagged. The sides and top of the inner vessel merge gradually so as to present no surface which abruptly deflects ascending currents of heated air. The shelves, framework, and heating elements are removable *en bloc*, and they may be turned so as to alter the relative position of the elements in the oven. An opening is made in the top of the oven, and provided with a cover, so that cooking utensils may be heated if desired. Seven figures.

15,404/12. **Storage Batteries.** E. SOKAL. An improved construction for storage batteries where the electrolyte circulates under pressure is described. Hollow and partly hollow electrodes are so arranged that the length of the edge which is to be secured against leakage is materially decreased. A single pump without reservoirs is all that is required to keep up the circulation. The electrodes are arranged concentrically so that the inner and outer surfaces may be used.

15,485/12. **Incandescent Lamp Filament Supports.** JULIUS PINTSCH. At the ends of the spider arms transverse cross-pieces are provided so that the filaments may be loosely held in place without fastening. Ten figures.

17,247/12. **Floor Lamps.** G. MAURICE and L. G. BYNG. (G. E. Co.) The lamps are arranged entirely within an opaque reflector, which conceals them, and throws the light upward. Flower or plant holders are arranged sloping outwardly round the reflector. Three figures.

18,747/12. **Vibrating Rectifier.** B. T.-H. Co. (G. E. Co., U.S.A.). The armature is provided with a damper consisting of a spring which prevents its being operated by current from the battery (being charged through the rectifier), and a second spring to bring the armature to rest near one of the poles of the A.C. magnet. One figure.

21,725/12. **Telephone Holder.** G. J. STERN. A two-armed pivotted lever of such design as to actuate the hook switch of the set by a slight movement which also brings the receiver into the exact position for hearing, is provided. The lever is made in two parts, and is attached to the pillar of the set by a clip bracket. Four figures.

22,262/12. **Boiler Output Indicators.** B. T.-H. Co. (G. E. Co., U.S.A.). Where there are a number of boilers feeding into a common header which is supplying steam to a number of generating sets, a steam flow meter shows the output of each boiler, and a second meter shows the total output of the generators, while others situated near each boiler indicate the share of the total load each boiler should carry. To this end an ammeter is connected to one of the busbars. This ammeter is shunted by another through an adjustable resistance, and is the master ammeter in series with other auxiliary ammeters adjacent to the respective steam flow meters. One figure.

26,288/12. **Incandescent Lamp Filament Supports.** WESTINGHOUSE METALLFADEN GLÜHLAMPENFABRIK. Some of the resilient arms which radiate from the central stem are longer and stronger than the remainder, or else a disc, ring, star, or similar contrivance may be fixed on the stem near the radiating arms. This is made of greater diameter than the arms. By either of these methods the danger of breakage of the spider during its introduction into the bulb is reduced. Two figures.

2,136/13. **Control of Motors Driving Screw Propellers.** SIEMENS-SCHUCKERT. Shunt or compound motors are used, and the armatures are switched direct into circuit. The series winding may be fed direct or through a transformer. In the former case a self-induction is used in series with the armature. The shunt winding is always energised.

4,197/13. **Buzzers or Hooters.** E. A. GRAHAM. To obtain a distinctive sound of a sharp or snappy character from a vibrating diaphragm, impacts are transmitted from an electromagnetically operated striker to it indirectly through a hammer lever by a spring, which tends to separate the striker from the lever, and the lever from the companion anvil on the diaphragm. Thus, by the mutual reaction, very abrupt movements are obtained. Two figures.

## Petition for Extension of Term of Patent

24,048/99. **Telautographs.** F. RITCHIE. Mr. Justice Warrington has fixed October 27th as the earliest day on which the petition by the National Telewriter Co., Ltd., shall be in the paper for hearing.

## Specifications Published To-day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free.

Summaries of some of the more important of these patents will appear in our next issue.

**Dynamos, Motors, and Transformers:** E. C. Co. and PENSABENE [Dynamos and motors] 7,651/12; CLAUDIUS ASH, SONS, & Co., JONES and LEE [Transformers] 2,697/13; SIEMENS BROS. (*Siemens & Halske*) [Arrangement of current transformers for high pressures] 8,027/13.

**Electrometallurgy and Electrochemistry:** THE GOLDSCHMIDT A.G. [Alumino-thermic rail bonding] 218/13.

**Heating and Cooking:** MARKS (*Landers, Frary and Clark*) [Toasters] 15,961/12.

**Incandescent Lamps:** JULIUS PINTSCH [Filament supports] 15,486/12; TRUSS, 23,453/12; PAKENHAM, 24,361/12.

**Instruments and Meters:** NORTH [Instrument testing] 16,730/12; BECKMANN [Polyphase movement indicator] 130/13.

**Switchgear, Fuses and Fittings:** B. I. Co. and ALLWOOD [Junction boxes] 15,706/12; MCPHERSON [Thermal switches] 20,464/12; LONGFORD and CLARK [Terminals] 20,775/12; SIEMENS BROS. and LE CORNEY [Submersible watertight insulating plugs] 28,646/12; GILL [Automatic control of artificial illumination] 29,928/12.

**Telephony and Telegraphy:** CLAUSEN [Telephony] 15,057/12; AITKEN [Telephone exchanges] 15,292/12; BLACKWELL and ANDEREGG [Reducing telephonic disturbances] 2,508/13; SIEMENS BROS. and PETTITHORY [Electro-magnetic telephone service meter] 2,752/13; GRISSINGER [Telephone repeater systems] 2,930/13; KESSELS [Keyboard telegraph transmitter] 3,582/13.

**Traction:** KREBS [Lighting vehicles] 16,024/12.

**Miscellaneous:** HAILWOOD [Miners' safety lamps] 3,903/12; ARON and WIENER [Clock winding] 9,154/12; HADDON (*Stewart & Clark Mfg. Co.*) [Speedometers] 23,597/12; MASCHINENBAU-ANSTALT HUMBOLDT [Electro-magnetic separators] 24,643/12; BARLOW [Locking gates of electrically-controlled lifts, &c.] 25,258/12; ENGLE [Primary batteries] 3,861/13.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Dynamos and Motors:** SIEMENS-SCHUCKERT., 14,390/13; OERLIKON Co. [Apparatus for winding] 14,633/13.

**Telephony and Telegraphy:** SIEMENS & HALSKE [Selectors for automatic or semi-automatic telephony] 13,748/13; SIGNAL GEN. [Submarine electric leakage telegraphy] 13,919/13.

**Miscellaneous:** HARLÉ ET CIE [Submarine mines] 13,807/13.

The following Amended Specification may now be obtained.

2,325/12. **Automatic Railways.** J. J. DESCHAMPS.

## Expiring and Expired Patents

The following Patent expires during the current week, after a life of fourteen years:—

15,418 of July 27th, 1899. **Paper Insulated Cables.** H. EDMUNDS (Glover & Co.). The object of the invention is to lessen the weight of paper-insulated cables, and to do away with the necessity for the lead sheath. To this end the paper is saturated with a mixture of resinous matter and oxidised oils of a sealing and waterproof character, e.g., the material known as a "diatrine." Alternating with this paper is paper treated with an oily matter or a lubricant. The whole is taped or braided, and again treated with "diatrine" or its equivalent.

The following are the more important Patents that have become void through non-payment of renewal fees.

**Dynamos and Motors:** J. E. NOEGGERATH [Construction of homopolar machines] 6,752/05; [Current collecting and lubrication of homopolar machines] 7,045/08; E. S. G. REES [Frame construction for high-speed three-bearing machines] 7,725/06.

**Ignition:** D. E. BROWN and C. A. VANDERVELL [Rotary contact breaker] 20,897/08.

**Incandescent Lamps:** G. T. HOLLOWAY and H. W. LAKE [Tungsten and alloys] 6,045/00; A. G. BLOXAM (*J. Lux, Vienna*) [Sintered tungsten filaments] 7,803/06; A.E.G. [Squirted colloidal tungsten filaments] 7,407/07.

**Instruments:** S. EVERSHED [Cell-testing voltmeter] 7,955/02.

**Storage Batteries:** T. A. EDISON [Manufacture of negative electrodes for alkaline cells] 1,926/06; [Nickel hydroxide electrodes for alkaline cells] 1,927/06.

**Telephony and Telegraphy:** I. KITSEE [Submarine and long-distance telegraphy, using a special relay and sounder] 7,586/04.

**Miscellaneous:** G. E. GAFFE [Rotary mercury interrupter] 19,477/07; A. SCHIESS [Automatic fire extingisher] 7,384/08.

## LOCAL NOTES

**Bedford: Diesel Engine Inquiry.**—Judging from a report of the Electricity Committee submitted to the last meeting of the Corporation, the Diesel engine scheme is not now to be proceeded with, at any rate for the present, and the Engineer has received permission to experiment with oil burners for the boilers with a view to increasing the emergency output. Alderman Kilpin, Chairman of the Electricity Committee, pointed out that, even if the loan were granted, the Diesel engine could not be obtained in time for the coming winter, and the course above suggested had been hit upon to carry the undertaking over the winter.

**Gardiff: Electricity Profits.**—An extraordinary proposal was made at the last meeting of the Corporation by one of the Councillors to the effect that the balance of £5,962 standing to the credit of the Electricity Committee should be used for the erection of workmen's dwellings. We are pleased that the Committee's recommendation that the sum should be retained and carried forward as a working balance was agreed to.

**Cromer: Proposed Transfer of Electricity Undertaking.**—The Hon. T. H. Pelham held an inquiry last week at Cromer on behalf of the Board of Trade with regard to the proposed transfer of the electricity undertaking to Edmundsons' Electricity Corporation. At present the Company runs the works under an agreement with the Corporation, which is for a term of twenty-five years, under which the Company meets the repayment and interest on a loan of £25,000, and undertakes to keep the plant and machinery in a good state of repair. Under the proposed transfer now, the Company will purchase the undertaking on a cash basis, paying off the balance of the loan for which the Council is responsible. The inspector intimated that any conditions as to street lighting, as was suggested, could not be included in an agreement for the transfer of the undertaking. Evidence was given by a number of Councillors and others against the proposed transfer, but it came out that the real opposition was not so much to the transfer as to the obtaining of a sum of money apart from the amount to be paid to the Council in return for the release from the existing agreement. The inspector, however, pointed out that this was a policy which was not allowed by the Board of Trade.

**London: Poplar: Electrolytic Disinfectant.**—Since the electrolytic disinfectant plant was installed by the Council in connection with the electricity works about seven years ago, nearly a quarter of a million gallons have been manufactured, at a cost for electricity and materials of about £480. Last year the output was 54,388 gallons, and the average cost was slightly less than ½d. per gallon.

**St. Pancras: Electricity Accounts.**—The net profit on the last year's working of the electrical undertaking was £10,686, which is a decrease of £1,752 from the previous year, and £2,518 less than 1910-11. To this profit the balance of £6,307 from last year is added, bringing the balance to the credit of net revenue account to £16,992.

**Mansfield: Electricity Profits.**—A sum of £600 is to be taken from the profits of the electricity undertaking last year for the relief of rates.

**Norwich: Electricity Accounts.**—A satisfactory year's working of the electricity undertaking was reported at the last meeting of the Corporation, there being a net profit of £6,353 for the year to March 31st. The average price obtained was 1.78d. per unit, which is just half the figure of ten years ago.

**Nuneaton: New Plant.**—A new 700-kw. B.T.-H. turbo-generator was started up last week.

**South Shields: Electricity Accounts.**—The net result on the past year's working was a surplus of £3,163, compared with £2,195 in the previous year.

**Swanage: Electricity Works.**—A Board of Trade inquiry has been held in regard to objections raised to the proposed site of a generating station by the Swanage Electricity Supply Co. Mr. A. P. Trotter, Electrical Adviser to the Board of Trade, acted as inspector, and Dr. J. A. Purves, Consulting Engineer to the Company, explained that Diesel engines would be installer, and that there was no possibility of annoyance to anyone from vibration. Mr. Sydney Morse, who appeared on behalf of the Company, said he would give an undertaking to use every effort to make the station so perfect that there could not be any complaint whatever from any of the residents.

**Taunton: New Switchboard.**—In presenting the electricity accounts at the last meeting of the Corporation, the Chairman of the Electricity Committee drew special attention to the fact that a new switchboard had been constructed completely by the staff at the works. It was in all respects similar to one which he had seen at Kingston-on-Thames, for which the contract price was £2,000.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

## Generating Stations, Sub-Stations, Mains, &amp;c.

**Aberdare.**—An inquiry has been held concerning a loan of £2,453 for extensions at the power station.

**Bristol.**—A Local Government Board inquiry has been held concerning a loan of £25,000 for the electricity undertaking. Of this, £18,000 are required for mains; £2,500 for sub-stations, and £4,500 for house services. There was some opposition by the Ratepayers' Association, but the inspector, towards the end of the inquiry, said that most undertakings had gone through hard times in recent years, and Bristol was no exception. The best thing to do was to reduce capital charges by increasing the output, or by using the profits so as to avoid further borrowings.

**Dungarvan.**—An electric lighting scheme, at an estimated cost of £2,600, is under consideration.

**Hamilton.**—Extensions at the electricity works at an estimated cost of £2,190 have been approved by the Council.

**Hastings.**—Mains extensions are to be carried out at an estimated cost of £120.

**Hereford.**—The Rural District Council has consented to the Corporation supplying electricity in the district of Holmer.

**London: Bermondsey.**—The Finance Committee of the L.C.C. recommend sanction to a loan of £8,682 for electrical extensions.

**Middleton.**—Lighting switchboard and renewal of traction switchboard. Borough Electrical Engineer. July 28th.

**Norwich.**—One 3,000-kw. turbo-alternator, condensing plant, rotary-converter, and E.H.T. switchgear. (See an advertisement on another page.)

**St. Anne's-on-Sea.**—A loan of £3,000 for mains and services has been inquired into. There was no opposition.

**Southend.**—Mains extensions are to be carried out at an estimated cost of £176. A loan of £365 is to be applied for to purchase an additional economiser for use in connection with the two Niclausse boilers which it is proposed to instal at the power station.

**Warrington.**—E.H.T. feeder panel. August 6th. Borough Electrical Engineer.

**Wolverhampton.**—Mains extensions at an estimated cost of £254 are to be carried out.

## Wiring

The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.

**Aberdeen.**—Baths scheme to cost £25,000.

**Barnes.**—New covered swimming bath.

**Cardiff.**—New technical institute, Cathays Park. Architects, I. Jones and P. Thomas, 18 St. Mary's Street.

**Cheltenham.**—New municipal offices.

**Dundalk.**—Rebuilding of Great Northern Railway Co.'s carriage shops.

**Eastbourne.**—New cinematograph theatre.

**Glasgow.**—Shops and business premises in High Street area. Town Clerk.

**Heckmondwike.**—Electric wiring of new slaughter-house. July 28th. Architect, H. Stead.

**Hull.**—Wiring and fitting of school for fishermen. City Architect.

## THE RECORD ELECTRICAL Co., Ltd.

LONDON OFFICE:  
CAXTON HOUSE,  
WESTMINSTER, S.W.

Telephone:  
3007 Victoria.  
Telegrams & Cablegrams:  
"Infusion,"  
London.

MEASURING  
INSTRUMENTS.

RECORD'S PATENT.

Write for Prices & Particulars.

WORKS:  
BROADHEATH,  
MANCHESTER.

Telephone:  
164 Altrincham.  
Telegrams & Cablegrams:  
"Infusion,"  
Altrincham.

**Lewisham.**—A loan of £1,750 is to be asked for in connection with the electric lighting of the workhouse and infirmary.

**Pontefract.**—Block of shops and arcade. Architects, Garside & Pennington.—New cinematograph theatre. Architect, W. J. Tennant.

**Sheffield.**—New Infants' Department at Morley Street school. Secretary, Education Department.

**Weybridge.**—New fire station.

## TENDERS RECEIVED AND ACCEPTED

Messrs. Johnson & Phillips have secured the following orders for their standard type oil-cooled transformers during the last few weeks:—Two 625-k.v.a. 6,600-volt for Dundee Corporation; one 500-k.v.a. 6,600 volt for Oldham Corporation; two 150-k.v.a. 6,000-volt for Wigan Corporation; three 100-k.v.a. 2,000-volt for H.M. Admiralty; fifty-one 50-k.v.a. and three 300-k.v.a. 13,200-volt for Canada; four 400-k.v.a. 10,000-volt for Japan; two 350-k.v.a. 6,000-volt for Brazil. They have also secured upwards of 5,000-k.v.a. in transformers for English machinery makers in connection with converting plants, &c.

## APPOINTMENTS AND PERSONAL NOTES

Mr. E. P. Grove, Chief Engineer of the Central London Railway until its absorption into the London Underground Combine, was presented on Tuesday last with a cup by some eighty friends, most of whom had assembled at the Trocadero to give him a farewell prior to his departure to Australia. Mr. Grove is going out as the Australian representative of Mr. C. H. Merz, Consulting Engineer to the Victorian Government for the Melbourne electrifications, and in that capacity will superintend the electrification of the Melbourne suburban system. Mr. H. N. May will accompany him to deal particularly with rolling stock. The gathering on Tuesday was presided over by Dr. H. F. Parshall, Consulting Engineer to the London Underground Combine. Mr. A. L. C. Fell, Mr. Frank Baily, Mr. C. P. Sparks, and Mr. D. Hay were among those present.

A number of friends having expressed a wish to celebrate Mr. Wyld's appointment as Chief Electrical Engineer to the Borough of Hampstead, and to welcome both Mr. and Mrs. Wyld to London, a dinner will be held on Friday, October 3rd, at Oddenino's Imperial Restaurant, Regent Street, W. As the dinner is to welcome both Mr. and Mrs. Wyld, single tickets will be issued for gentlemen only, and double tickets for lady and gentleman. Early applications for tickets should be made to Mr. C. Newton Russell, 29 Southwood Avenue, Highgate, Chairman of Committee, or to the Hon. Secretary and Treasurer, Mr. E. P. Barfield, "Porlock," Athenaeum Road, Whetstone, N.

The salary of Mr. A. W. Blake, Electrical Engineer to the Willesden Urban District Council, has been increased from £300 to £350 per annum, with a further increase of £50 on April 1st, 1914.

The salary of Mr. J. A. Robertson, Burgh Electrical Engineer at Greenock, has been increased from £500 to £550 per annum, with an additional increase of £50 when Port Glasgow is linked up with the Corporation's supply.

Mr. R. H. Schofield, who has been with Messrs. Ferranti, Ltd., for nearly eighteen years, has been appointed Sales Manager. His headquarters are Central House, Kingsway, London, W.C.

An electrical engineer is required by the Waterford Council for the preparation of an electric lighting scheme. (See advertisement on another page.)

An assistant lecturer is required in the Electrotechnics Department of the Borough Polytechnic, London. (See advertisement on another page.)

A demonstrator in Electrical Engineering is wanted at the City and Guilds (Engineering) College. (See an advertisement.)

## John E. Raworth,

Queen Anne's Chambers, Chartered Patent Agent.  
30, Broadway, Westminster, London, S.W.

## MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. G. Smith & Son, of 5 Philpot Lane, E.C., inform us that the price of copper, c.i.f. port of arrival, quoted on Tuesday night, was £66 5s. to £66 15s. (last week the same).

**New Showrooms.**—Customers and friends of Ferranti, Ltd., are invited to visit the firm's new showroom at Central House, Kingsway, London, W.C., which contains a representative display of meters, detail switchgear, oil switches and electrical heating and cooking apparatus, including the new domestic oven.

**Switching Competition.**—A. P. Lundberg & Sons (477-487 Liverpool Road, Islington) write us that their switching competition, to which we referred on page 404 of ELECTRICAL ENGINEERING of July 10th, is not only limited to wiremen and students, but is open to all, including users of electric light.

**A Prize Van.**—The General Electric Co. has sent us an illustration of one of their motor vans with decorations, including a tableau of "Aladdin and the wonderful Osram Lamp," which won a prize at a recent carnival at Ilford.

Following on its success last week at the Ilford Hospital carnival, the decorated Osram van secured the first prize for decorated vehicles at Willesden on Thursday at the annual carnival in aid of the local hospitals.

**Works Holidays.**—The works of T. W. Broadbent, Ltd. (Victoria Electrical Works, Huddersfield), will be closed from Friday night next till Tuesday morning. No goods can be despatched between these dates.

The works of the London Electric Firm will be closed from Saturday, Aug. 2nd, till Monday, Aug. 11th. A small staff, however, will deal with urgent business.

The Trafford Park Works of the British Westinghouse Electric & Manufacturing Co., Manchester, will be closed from Friday evening next to Tuesday morning, August 5th. No goods can be despatched between these dates, but a small staff will attend to matters of extreme urgency.

The works of Cryselco, Ltd. (Bedford) will be closed from Saturday, August 2nd, until Monday, August 11th.

**Canadian Agency.**—A Midlands company manufacturing electrical appliances wishes to arrange for a Canadian agency. Further particulars, 73 Basinghall Street, E.C.

**Bankruptcies.**—A receiving order has been entered against F. Johnson, Electrical Engineer, 60 Eltisley Avenue, Newnham, Cambridge.

## COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &c.

**Yorkshire Electric Power Co.**—The net profit for the June half year, including £644 brought forward, was £7,616. The half year's dividend on the 6 per cent. cumulative preference shares is recommended, carrying forward £4,308. The waste heat power station at Barrugh will shortly be at work, and will when completed add a further 5,000 kilowatts to the company's generating station.

**Electric Construction Co.**—At the annual meeting last week the chairman of the company spoke in very optimistic terms as to the future of the electrical industry in general, and to the Electric Construction Co. in particular.

**Bristol Tramways & Carriage Co.**—An issue of £250,000 4½ per cent. mortgage debenture stock at 92½ is being made.

## NEW COMPANIES

**ELECTRICAL APPARATUS CO., (1913),** Vauxhall Works, South Lambeth Road, S.W. Capital, £90,000. To take over the existing business of the Electric Apparatus Co., Ltd.

**JACKSON ELECTRIC STOVE CO.,** 38 Blandford Street, Baker Street, W. Capital, £10,000.

**MACINTOSH CABLE CO.**—Registered by Jordan & Son, 116 Chancery Lane, W.C. Capital £25,000.



# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 344 [Vol. IX., No. 31]  
*All rights reserved.*

THURSDAY, JULY 31, 1913.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES and TECHNICAL COLLEGE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

### Other Advertisement Rates on Application.

#### Latest Time for Receiving

Letters for Insertion, Tuesday first post.

Small Advertisements and Official Announcements, Wednesday first post.

Displayed Advertisements, Tuesday first post.

Corrections in Standing Advertisements, Monday first post.

All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 208-206, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Circling, Fleet, London." Telephone No.: 5509 Holborn.

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

REPORTS have been issued by Committees of the Illuminating Engineering Society on the lighting of schools and libraries. (Page 440.)

NOTES on the arrangements for the next session, &c., at some of the Universities and Technical Colleges are given on page 440.

THE programme of the meetings of the International Electrotechnical Commission to be held in Berlin at the beginning of September, has been issued. The special committees on nomenclature, rating, and prime movers will submit their recommendations to the working session of the whole commission, whose resolutions will afterwards be ratified at a plenary meeting. (Page 440.)

MUCH useful and interesting information is contained in an article on the experience in connection with a comparatively new single-phase railway in Norway. What practically amounted to systematic experimental research as to the methods of preventing or neutralising

the disturbance to telephones was carried out on the line itself, with successful results. The article also relates how certain vibration troubles on the conductors, due to the low frequency ( $16\frac{2}{3}$  cycles per sec.), were overcome. (Page 441.)

A NEW pattern of oil-immersed, drum-type, star delta starter, which is fitted with no voltage and overload releases, and a handle arranged so that it cannot be held on when the releases act, nor be left in the star position, is described and illustrated. (Page 442.)

FULL particulars are given of the construction of a form of wet air filter for use with turbo-generators. The air is thoroughly washed by a fine spray, but an elaborate system of baffle plates removes all suspended water. (Page 442.)

VERY considerable extensions to the electricity works are proposed at Bradford by the City Electrical Engineer, Mr. T. Roles. They have been approved and adopted by the City Council. The immediate installation of a 3,000-kw. turbo-alternator and the abolition of the obsolete steam sets will be carried out. Additional rotary converters and a large storage battery are included in the programme, while in a few years larger turbo-alternators will be installed. By this means there is sufficient space for extensions in the Valley Road works to avoid building a new generating station for some ten years. (Page 443.)

AN outline of the successful visit of the I.E.E. Students' Section to the Newcastle district a short time ago is given. (Page 443.)

A SOMEWHAT novel lighting installation exemplifying a combination of several systems of illumination is referred to on page 444.

A NEW spacing saddle for supporting conduit tube clear of the wall has been introduced. (Page 444.)

A PUBLICATION relating to wireless telegraphy is reviewed. (Page 444.)

THE procedure to be adopted in a central station case of a feeder fault in particular circumstances is discussed in our Questions and Answers columns. (Page 445.)

A PATENT by A. Swan relating to the manufacture of incandescent lamps expires this week after a full life.—A. M. Taylor is seeking leave to amend his specification relating to frequency changing by static transformers.—J. Stone & Co. also desire to make considerable amendments to a specification by H. D. Earl, in which an automatic regulator for variable speed dynamos is described.—The grant of two patents to J. B. Le Maitre for cinematograph targets, which was opposed, has been allowed, subject to the specifications

being amended.—Several specifications relating to incandescent lamps and one to rotary converters having more than one armature winding were published by the Patent Office on Thursday last. (Page 446.)

An important decision has been made by the House of Lords regarding the rating of tramway undertakings, which are held not to be entitled to be rated as railways, even when authorised under the Light Railways Act. This is referred to under Electric Traction Notes, where particulars are given of a 2,400 volt continuous-current railway in America, and the proposed conversion of the Brussels suburban railways to high-voltage continuous-current traction. (Page 447.)

MR. W. DUDELL is to be retained permanently by the Government in an advisory capacity regarding wireless telegraphy. Some modifications have been made in the scheme of royalties in connection with the Marconi contract.—Other matters referred to under Telephony and Telegraphy are the new selective or heterodyne receiver developed by Prof. Fessenden, a new French system of wireless telegraphy by waves of very great length, and some successful results in long-distance wireless telephony. (Page 447.)

ADDITIONAL protective gear is to be installed in the L.C.C. Greenwich power station, in view of the recent breakdowns.—The results of the financial working of the past year of several electricity undertakings are now available. Profits have been made at West Ham, Burslem, Hanley, and Stoke, but the accounts of Kingston-on-Thames and Longton show losses.—The surplus at Edinburgh is to be devoted to reduction of capital account and not to relief of rates. (Page 449.)

A TURBO-ALTERNATOR is required at Bury. Extensions are projected at Long Eaton and Doncaster, and the Local Government Board has now sanctioned the loan for the new power station at Bolton. Tenders are invited at Dublin for pumps, pipe-work, &c. (Page 449.)

FIVE per cent. dividends have been declared by the County of London and Charing Cross Supply Co.'s., and a four per cent. dividend by the Metropolitan Electric Supply Co.—The Brush Electrical Engineering Co. has made a considerable loss on the year's working. (Page 450.)

### LIGHTING OF SCHOOLS AND LIBRARIES

THE Joint Committees appointed in 1911 by the Illuminating Engineering Society to investigate both daylight and artificial lighting of schools and libraries have just issued preliminary reports dealing with artificial lighting. The Committee dealing with school lighting heard evidence on the systems of direct, indirect, and semi-indirect lighting and suggests that the following standards of illumination should be provisionally adopted irrespective of the method of lighting:—(a) for ordinary clerical work (reading and writing, &c.), the minimum illumination measured at any desk where the light is required, should not fall below 2 foot-candles; (b) for special work (art classes, drawing offices, workshops, and stitching with dark materials, &c.), a minimum of 4 foot-candles is desirable; (c) for assembly rooms, &c., and for general illumination a minimum of 1 foot-candle measured on a horizontal plane 3 ft. 3 in. from the ground. The question of the permissible diversity factor remains to be considered. For small class-rooms where no student is more than 20 ft. from the blackboard, and if white chalk is mainly used, an illumination of 2 foot-candles may be sufficient, but the Committee recommend that, in general, an illumination on the blackboard 60 per cent. in excess of that prevailing in the rest of the room is desirable. Attention is also drawn to the advisability of the avoidance of glare and of inconvenient shadows.

The Committee dealing with the lighting of libraries finds that table, desk, or newspaper stand lighting should in no case be less than 2 foot-candles where ordinary type on white paper is being read. Where small type or where the reflecting power of the paper is low a tentative value of 5 foot-candles is suggested. For bookcase and shelf lighting a

minimum vertical illumination of  $\frac{1}{2}$  foot-candle is advocated. This value is also suggested as adequate for the general illumination—read on a horizontal plane 3 ft. 3 in. above the floor. No definite system of lighting is advocated, but screening of bright light sources is recommended, as well as the avoidance of reflection from the surface of paper or tables, and the avoidance of shadows. It is proposed to supplement these reports by a series of more detailed recommendations, and also by some suggestions as regards daylight illumination.

### UNIVERSITY AND TECHNICAL COLLEGE ANNOUNCEMENTS

THE programme of the City and Guilds Technical College, Finsbury, shows that the next session will commence on October 7th, and that the entrance examination will be held on September 16th. The subjects of this examination are English and mathematics, and there are several scholarships and free studentships awarded on the result. The Principal of the College and Professor of the Electrical Department is Dr. S. P. Thompson, while Dr. E. G. Coker is Professor of Civil and Mechanical Engineering, and Dr. Raphael Meldola is Professor of Applied Chemistry. All the departments have recently been considerably enlarged, and facilities for numerous experiments and original researches are afforded, while for students desiring to carry out special investigations a third or fourth year's course in electrical or mechanical engineering was recently started. Certificates are awarded to students who have satisfactorily worked in either department for the minimum period of two years, while the award of a diploma or higher certificate to students who have attended courses for three years are under consideration. All communications on the subject of the educational work of the College, and the admission of students, should be addressed to the Principal, City and Guilds Technical College, Finsbury, Leonard Street, London, E.C.

The International Correspondence Schools have opened an exhibit of their new series of technical pocket-books at their headquarters, International Buildings, Kingsway, W.C. These handy little works of reference, published at 5s. each, may be obtained for a limited period by those interested in technical or business matters at 1s. 6d. each, at the exhibition only.

The hundred and twenty-second award of certificates to students of the Crystal Palace School of Practical Engineering will be made in the school to-day at noon by Mr. W. B. Bryan (Chief Engineer to the Metropolitan Water Board).

We understand that the Royal Commissioners for the Exhibition of 1857 have awarded an Industrial Bursary to Mr. J. Y. Rudd, who has just completed a course of study in the Engineering Department of the University of Bristol. A similar Bursary, awarded to Mr. S. L. Hall in 1912, has been renewed for a further year, and the Bursary awarded to Mr. A. J. S. Pippard in 1911 has been continued for a further period of two months.

### INTERNATIONAL ELECTROTECHNICAL COMMISSION

THE preliminary programme of the meeting which is to be held in Berlin from September 1st to September 6th, under the presidency of Dr. Budde, has been issued. The Special Committees on Nomenclature, Symbols of Electrical Machinery, and Prime Movers, which have been working continuously since the Turin meeting of 1911, are to hold meetings prior to those of the full Commission. In order to have an opportunity of discussing the latest modifications to their reports, suggested by the National Committees, these meetings will be held on Monday, September 1st, and the following day. The results of these meetings will be embodied in reports which will be considered at the working sessions of the whole Commission on the Wednesday and Thursday. The formal opening and presidential address will take place on Wednesday, September 3rd, and a distinguished German official will present the address and welcome to the foreign delegates. A banquet is to be given by the German Committee in the evening. The plenary meeting will be held on Friday, September 5th, when the various resolutions drawn up by the working sessions of the whole Commission will be submitted for ratification. In the afternoon a meeting of the Council will be held, and it is probable that the presidency of the Commission, which would have been conferred on M. Mascart if he had lived, will be offered to an eminent French electrical engineer. An all-day excursion is to be arranged for the Saturday.

## OPERATING EXPERIENCES AND TELEPHONE TROUBLES ON THE RJUKAN SINGLE-PHASE RAILWAY

THE Rjukan railway was constructed in 1907 by the Norwegian Nitrate Company to connect their large factories at Rjukan with the shipping station of Notodden. It is a full-gauge, single-track goods line, 28½ miles long, divided into two sections by a lake, over which the trains are carried by a steam ferry service.

On the longer section from Notodden to Tinoset there is a length of 2½ miles with a gradient of 2·7 per cent., and there are numerous sharp curves. A comparatively light rail of 50·5 lb. per yard was adopted, the maximum axle load being limited to 11 tons. At present the traffic consists of only three to five trains per day in each direction. The maximum train weight is about 260 tons, and the maximum speed only 20 miles per hour.

Electric working was commenced in January, 1910, after two years of steam operation, the reasons for electrification being the extremely low cost of electric power, the heavy gradients and the possibility of reducing the train staff. The line was equipped by the A.E.G., of Berlin, on the single-phase system at 10,000 volts, 16½ cycles, with similar equipment to that supplied for the London Brighton & South Coast Suburban electrification, and the operating experiences have therefore a particular interest for British engineers.

The Nitrate Company's power stations generate at three-phase, 10,000 volts, 50 cycles, and two substations were therefore put down for the railway supply at Notodden and Rjukan respectively. The former contains three and the latter two 350-kw. motor-generator sets, the single-phase machines generating direct at the trolley pressure of 10,000 volts. The overall efficiency of these sets at full load and 0·85 power factor is 0·83, including losses in the transformers on the three-phase side, but the average overall efficiency of these substations would not be more than 50 per cent. As it is calculated that the power supplied to the substations costs only 0·13d. per unit, this low efficiency is not so serious as it looks at first sight.

The overhead equipment is carried out with a single catenary and single insulation, and there are no positive or negative feeders except the connections between the substations and the trolley wire and rails respectively. The trolley wire has a section of 0·1 sq. in. The cost of this equipment, covering steel masts, brackets, catenary, trolley wire, and span wire construction at the stations, is said to have been only £400 per mile of line (copper at £65 per ton).

The present rolling stock consists of five locomotives, three of 500 h.p., each with four 125-h.p. motors, and two of 250 h.p. with two motors. One transformer is provided for each pair of motors. The latter are of the Winter-Eichberg type, operated at 220 volts, and have a power-factor of 0·8 when running at full load and 15 miles per hour. They are arranged two on each bogie, and are geared to the driving axles with a ratio of one to 4·22. A more detailed and well-illustrated description of the equipment is given by Dr. Marguerre in *Elektrische Kraftbetriebe u. Bahnen* of December 4th, 1912.

No working costs have as yet been made public, but some interesting operating experiences have been published. On opening the line in January, 1910, considerable trouble was experienced through telephone and telegraph disturbances, in spite of the fact that these had been foreseen and various special precautions taken. The effects produced and the methods adopted for overcoming them are described at length in the *Elektrotechnische Zeitschrift* of November 21st, 1912. As a rule there is only one train running on one section of the line and the current in the trolley wire is about 40 amperes. On the heavy gradient it is about 60 amperes, while at starting it may be 70 or 80 amperes. The calculated pressure drop with 60 amperes over a distance of 15½ miles is 580 volts, consisting of 380 volts in the trolley wire and 200 volts in the heavily bonded rails. It was realised that this would result in a considerable earth current, and as a precaution all the single telegraph or telephone lines in the neighbourhood of the railway were provided with a metal return. In spite of this, however, the 16-cycle current caused numerous call-bells within a wide zone to ring continuously. Trouble was also experienced from electromagnetic and electrostatic induction, and it was found necessary to alter slightly the run of some sixty miles of telephone and telegraph circuits so as to make them parallel to the trolley wire; to ensure that all were transposed at frequent intervals; and to insert cross-connected inductive resistances earthed at their mid-points (four or five in every mile of line) to lead the unbalanced induced currents to earth. To avoid any trouble from higher harmonics in the single-phase pressure and current waves, it was specified that the amplitude of any harmonic in the pressure wave of the single-phase generators should not exceed 4 per cent.

of the fundamental, and the locomotive motors were constructed with "skewed" slots. In spite of this, however, there was a steady noise to be heard in the telephones when no locomotive was working, and this increased to a serious extent when a train was started or was running. As the tone remained the same always it was clear that neither the motor slots nor commutation were responsible for this noise, and later, with the aid of an oscillograph, it was traced to the generator slots. It was found that these were responsible, on inductive load, for a harmonic with an amplitude 17 per cent. of the fundamental, which affected the telephone lines both by electromagnetic and electrostatic induction. It was not possible to alter the pole shoes of the generator to eliminate this, but the trouble has been practically overcome by the use of cross-connected inductances of lower resistance and larger inductance than is usual, and by the partial absorption of the harmonic in a resonance circuit, formed by connecting across the terminals of the single-phase generator a combined capacity and inductance, thus short-circuiting the machine for the high slot frequency of about 560 cycles. This latter device has been so successful that now only the starting of the locomotives is heard on the telephones, and that not to any serious degree.

Besides these difficulties with telephone lines, a great deal of trouble was experienced with the rolling stock after a few months of working, chiefly from mechanical causes. The motor pinions and gear wheels were found to be of too soft a material, and this, coupled with the pulsating torque resulting from the low electrical frequency, caused them to wear down very rapidly. This wear was accelerated by the breaking of the welded gear cases and oiling devices, due to the severe vibration. The vibration was also the cause of numerous electrical troubles. The transformer coils rubbed against each other until the insulation was chafed through, and this necessitated the reconstruction of all the transformers so as to ensure rigidity. Again, the breakages of the pipes conducting the oil to the bearings resulted in the bearings heating until the rotors came into contact with the stators and produced faults in the windings. The motors have been strengthened and reconstructed in certain respects to ensure greater rigidity, and are now giving better satisfaction. The pinions now in use are of chrom-nickel steel, lubricated with a mixture of grease and graphite, and are wearing satisfactorily. It should be mentioned that the commutation of the motors is excellent and that the brush consumption is comparable with standard direct-current practice. No exact measurements of current consumption have as yet been made, but meter readings for a month's working show the consumption to be in the neighbourhood of 145 watt-hours per ton-mile on the three-phase side of the substations, or about 70 watt-hours per ton-mile at the single-phase side.

Some slight troubles were at first experienced with the overhead equipment, but these have now been overcome. The disc-type strain insulators, which were strung up with solid steel wire, broke frequently until stranded flexible steel cable was substituted. The iron-capped insulators at the pull-offs, &c., also broke frequently, and it was found necessary to replace these entirely with insulators of a different design, as the breakages were due to the difference in expansion between the insulator body and the iron cap cemented over it. The railway runs through a valley subject to severe wind-storms, and the climate is very severe, there often being several feet of snow and considerable variation of temperature, so that the present satisfactory state of the overhead equipment is very gratifying, considering its comparative lightness and low cost of construction.

**Shooting Match.**—On Thursday last the Siemens Dalston Works' Miniature Rifle Club tried conclusions with the Poplar Electricity Works' team, who are members of the Electrical League, the result being a win for the Siemens team. The average score of the "Drawn Wires" was 95·5 out of a possible 100. Mr. Horace Bowden opened the shoot for Poplar, and secured several bulls, which he evidently preferred to "Point Fives."

**Fire at G.E.C. Witton Works.**—A fire broke out last week in one of the various pattern stores adjoining the foundry of the works of the General Electric Co. at Witton. Although these stores were burnt down, none of the separate factories for the manufacture of all electrical plant, including carbons, conduits, small motors, switchgear, arc lamps, &c., were in any way affected. We also understand that the company's manufacturing arrangements are in no way interfered with, and that the factories are proceeding with work as usual. No inconvenience will therefore be caused to customers.

## A LOOSE HANDLE OIL IMMERSED STAR DELTA STARTER

A NEW design of star-delta starter has been placed on the market by the British Westinghouse Electric & Manufacturing Co., Ltd. (Trafford Park, Manchester), embodying some interesting features and advantages in its construction. The internal parts are mounted in a cast-iron frame with a cover having a suitable vent for gases. The oil-tank is below, forming the lower half of the starter, and can easily be lowered away when necessary. The contact drum is made on the metal and mica principle, and consists of a mica-insulated square steel shaft, on which are securely clamped spider castings carrying renewable segmental copper contact strips. The contact fingers are of the same type as those employed in standard Westinghouse controllers. Each finger has a large, cheaply and easily renewable arcing tip for taking all spark wear. All circuits are broken under oil. Adjustable phosphor-bronze springs are fitted to each individual finger, giving good constant and firm pressure. The no-volt and overload releases are fitted in the starter above the oil tank. The no-volt coil is connected across one phase, and is so arranged that the circuit to the motor can only be closed when there is voltage on the line. This release is worked by gravity, and acts quite independently of the overload



OIL-IMMERSED LOOSE-HANDLE STAR-DELTA STARTER.

release. The overload coil is connected in two phases, and is cut out in the star position, and can be set between approximately full-load current to 100 per cent. overload. The setting is effected by means of a screw on the top of the coil.

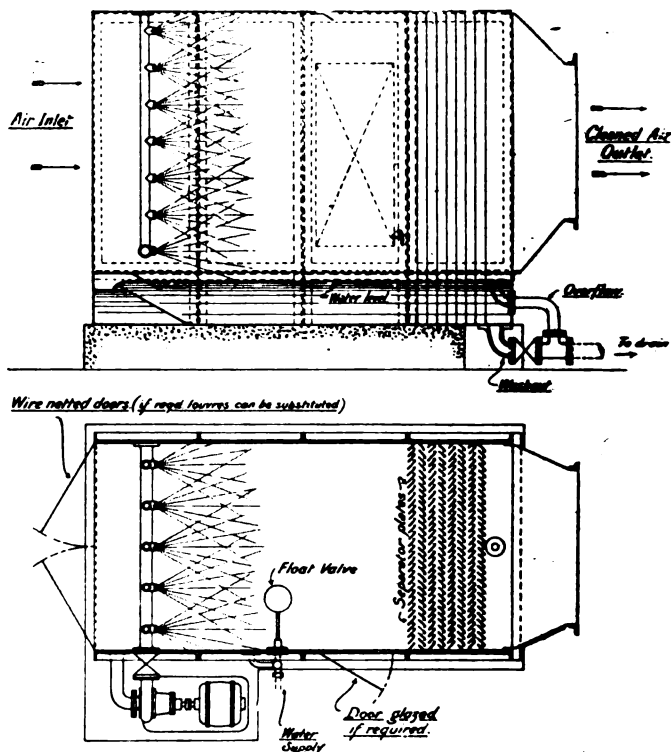
The operating handle is of the "loose" crank handle type, and the mechanical operation from the off to the star position and thence to the delta position is so designed with interlocks that the starter can be operated in no other way. A device is fitted making a slight pause necessary at the star position before it is possible to move the handle through to the delta position. The handle cannot be left in the star position, since, when it is released, it flies back to the off. The contact drum is returned to the off position (thus stopping the motor) in the event of an overload or failure of voltage, and cannot be held either in the star or delta position in such a case. A trigger release is also conveniently provided on the outside of the case. Ammeters can be mounted on these starters when desired, the instruments being of the moving-iron type, and are not in circuit when the drum is in the star position. Trifurcating boxes can be fitted if required, in which case the starter fully conforms with the new Mining Rules. Finally, following the well-known Westinghouse control-gear practice, this new starter is constructed on the metal and mica principle throughout.

## THE BALCKE WET AIR FILTER

SINCE the discussion on the subject at the I.M.E.A. Smeeing, considerable interest has centred around filtration and cleansing of the air supplied for cooling turbo-generators, and the advantages of washing the air rather than passing it through cloth are pretty generally admitted. We give here an illustration of the wet-air filter which has been designed for the purpose by Balcke & Co. (Broadway Court, Westminster) from experience with similar apparatus used

in connection with the ventilation of large buildings. The filter casing is of galvanised sheet-steel, the lower portion forming a water tank and the upper portion the filter proper, each being provided with facings for the water inlet and outlet connections. The air inlet is closed with wire-netted doors, which could, if required, be replaced by louvred doors. Immediately behind them a system of sprayers is arranged, which breaks up the water into fine spray, and thoroughly atomises it. The air is thereby brought into intimate contact with the water, so that the impurities are thoroughly moistened, and either fall by gravity into the tank, or are separated from the air by the baffle plates. The atomised spray is thrown in the direction of the air flow so that, instead of presenting a resistance to the air, as in the case of filters where the direction of the spray is opposed to the air flow, they will assist the flow of the air, thereby reducing the labour thrown on the fan and generator. The nozzles are made of gun-metal, and are of such construction that they cannot easily choke; the piping of the sprayers is all galvanised. The same water is used over and over again, being circulated by means of a motor-driven centrifugal pump.

To dry the air thoroughly, and to retain any impurities



SECTIONAL ELEVATION AND PLAN OF BALCKE WET AIR FILTER.

carried by the spray, a system of baffle plates is arranged at the air outlet of the filter, consisting of galvanised sheet metal strips, arranged at 45° to the longitudinal centre line of the filter; alternate rows being inclined in opposite directions. Each baffle is provided with an upright channel at the outlet edge, into which the particles of moisture and impurities are thrown and drained to the bottom of the filter, preventing any deposit being carried through from one row of baffles to the next. At the upper end of the spraying system a few special nozzles are arranged to throw water on to the top of the first row of baffles to assist in washing down any impurities retained. The tank at the air outlet end of the filter is provided with a large wash-out connection with overflow, with suitable valve leading into one common drain pipe, as at this end most of the impurities will settle. The pump suction is arranged at the opposite (the air inlet) end, separated from the main tank by a sloping partition protected with a removable cover. The flow of water towards this suction is exceedingly small, so that all the impurities, with the exception of the most minute, will settle in the bottom of the tank without getting to the suction chamber. The tank is provided with a make-up water-ball cock and separate connection for quickly filling the tank after it has been washed out, from the same source: one three-way cock operates the two inlets. A further connection is made from this make-up water pipe to the inlet end of the filter, to which a short piece of hose-pipe can be connected to wash out the tank when it is being periodically cleaned.



## PROPOSED EXTENSIONS AT THE BRADFORD ELECTRICITY WORKS

THE City Council of the Bradford Corporation has just approved and adopted a report by Mr. T. Roles (City Electrical Engineer and Manager), in which he points out the advisability for the immediate installation of a further 3,000-kw. turbo-alternator, converting plant, and a large storage battery, with the requisite accessories. It may be recollected that the present capacity of the generating station at Valley Road (*ELECTRICAL ENGINEERING*, Vol. VIII., p. 555, Oct. 10th, 1912) is about 15,800 kw., made up of twelve small D.C. sets aggregating 2,800 kw., four slow-speed D.C. sets of 1,000 kw., each making 4,000 kw., and three 3,000-kw. turbo-alternators making 9,000 kw. Owing to the very rapid increase in the demand for electric power, especially for textile mill driving by polyphase motors, it is estimated that the maximum load for the winter of 1913-14 will be not less than 11,500 kw., rising to 13,500 kw. in 1915-16, and as each turbo-alternator accounts for 20 per cent. of the works capacity, the margin of spare plant is very small. Mr. Roles suggests that the best course to pursue would be to instal a 3,000-kw. turbo-alternator complete with exciter and condensing plant at an estimated cost of £10,000 as soon as delivery can be effected, which is in about eighteen months from this time. He would wait two or three years before installing another turbo-generator, as he anticipates that prices will be closer when more experience has been obtained with 50-cycle machines up to 6,000-kw. run at 3,000 r.p.m. He also advocates the installation of two cooling towers and complete induced draught plant for the twelve boilers already in use, so that they can be forced, if necessary, and kept steaming at their maximum efficiency, as the existing arrangements are not always satisfactory in this respect. Two additional 1,500-kw. rotary-converters and switchgear at about £14,110, and a storage battery capable of discharging 5,000 amperes for one hour at about £16,756 are also contemplated. This battery would serve instead of an extra rotary-converter as a standby, as well as taking up the extra load occasioned by a storm in summer, or to take the load while extra boilers were got under steam when a prolonged abnormal load was coming on; while continuity of supply would be furthered. By the abolition of the small steam sets, ample space would be available for this battery.

The total cost of the extensions is estimated at £86,250, in which is included a sum of over £2,000 for suction ash handling plant to supersede the present somewhat primitive arrangements.

In order to provide for the ultimate use of the Valley Road Works as a sub-station, it is proposed that all additions to the generating plant be made in the engine-room, where the existing Curtis turbo-alternators are installed. To make room for the additional plant the 1,000-kw. slow-speed sets would be removed as necessary. All the obsolete small sets in the other part of the generating station could then be got rid of, and the space so set free used for extensions of the converting machinery and switchgear, &c., still leaving the large space for coal storage untouched. It will probably not be necessary to erect a new generating station for at least ten years, and it is unlikely that a suitable site could be found within four miles of the City; nor is it economically sound to erect a new generating station at the present time, because (1) the present plant capacity would not suffice during the time necessary for construction, and (2) the increased economies resulting would not nearly compensate for the additional financial burden. Mr. Roles further suggests the creation of a substantial reserve fund—10 per cent. of the capital expended is allowed by the provisional order—as a considerably reduced net profit for a number of years after the new plant is put into operation is to be expected.

**The Magnet Magazine.**—The current number of this interesting General Electric Co. publication puts on record the pleasant features of the famous "At Home" which the company gave last March at Covent Garden Theatre, and reproduces some representative photographs from the excellent series of films that were shown. There are also technical articles on electric labour-saving devices, and practical hints for motor attendants. The latest special pattern of carbon for cinematograph arcs made at Witton is described, and an article is given dealing with the Weichert electrolytic pleading apparatus. Mr. Barclay Gammon's clever G.E.C. alphabet is published, and the doings both of the firm and many persons connected therewith are chronicled and illustrated in an attractive way.

## I.E.E. STUDENTS' TOUR, 1913

AFTER several years of tours abroad, it was decided this year to hold the annual students' tour of the Institution of Electrical Engineers in this country, and Newcastle, the home of the most recently formed students' section, was selected. The party left London on Thursday, July 3rd, by the night train, arriving with the early dawn in Newcastle. The first visit was made the same morning to the Elswick works of Armstrong, Whitworth & Co., Ltd., where much of interest in the ordnance and electrical departments was seen. The electrical shop is devoted mainly to small work. Amongst other things were noticed a pistol-like switch for firing guns, and a neat little device whereby firing practice can be obtained with a stationary gun. A diagram of a ship is carried up and down a varying distance, and the closing of the firing switch causes a small pin to be projected to mark the diagram at the place the shot would hit. In the afternoon a visit was made to the works of A. Reyrolle & Co., Ltd., of Hebburn-on-Tyne, where their distinctive type of switchgear was seen in all stages of manufacture and completion. The method of assembling many of the parts on a jig, then turning the jig upside down and assembling another lot on it is ingenious and economical. An explosion-proof box, with the now well-known rough machined flanges, was arranged for demonstration. A high-pressure testing set was next exhibited, working up to 100,000 volts, together with its safety switches. Another interesting feature was the starting rheostats, where the elements are made up of metal and compressed carbon powder. The latter, having a negative temperature-coefficient, allows the current to grow at a steady predetermined rate, and prevents any excessive rushes. The visitors were hospitably entertained at tea by Mr. H. W. Clothier, who is the Honorary Secretary of the Newcastle Section, and several of his staff.

Next morning saw the party early astir to visit the turbine works of C. A. Parsons & Co., Ltd., at Heaton. Here the outstanding object was the 25,000-kw. set for Chicago, and the machines ranged downward in size from this to a 15-kw. set. The rolling of the blades to their finished section in long strips was interesting, and the skill exhibited in the hand-work of straightening the strips was striking. Two or three taps and it was done. A cable-making machine which wound the wires into a flat strip was also seen here. It was of the same general type as the ordinary machine, but was provided with a flat blade as the core-piece, off which the finished cable was drawn. This arrangement obviates the flattening of the cable to fit it into the slots, thereby preventing damage to the insulation. In the afternoon, Harton Colliery, which has a completely electrical equipment, was visited. Mr. Georgi, the consulting engineer, conducted the party around the gear at the pit head. The supply is taken from "The" Power Co. (there is only one in that part of the world) at 5,700 volts direct to the winding motors, the most noticeable of these being the large Siemens motor at the New Pit. The working face is two miles from the shaft. The loaded trucks from the various parts of the mine all come together at a large junction, and all underground haulage is by cable and electric motor.

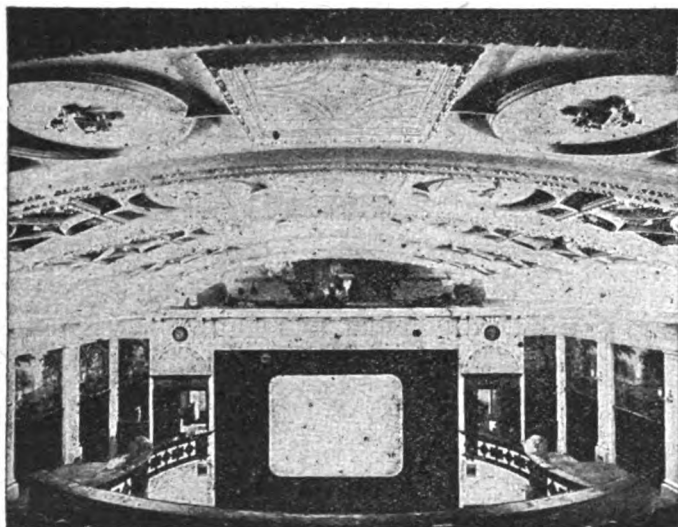
Next morning the party visited the generating station at Carville. Of particular interest was the control room, where the whole system is laid out diagrammatically, and indicators are provided showing how all the feeders, switches, &c., are connected up, whether alive, and so on. This provides for the complete control of the whole system, extending over 1,400 sq. miles, being in the hands of one man. In the afternoon the Newcastle Section had arranged for a sail down the River Tyne to Tynemouth, where a brief visit was made to the lighthouse. Here vaporised oil and mantles to the tune of 1,000 c.p. hold sway, with a 200-c.p. electric lamp as stand-by and oil lamps as a further stand-by. An electric motor, however, is normally used to compress the air for the foghorn and oil feed, there being an oil engine as stand-by. After tea there followed a smoking concert, and the official visit ended, but on Sunday morning a visit was arranged by Mr. Cusworth, of Carville, to the Dunston Power Station (*ELECTRICAL ENGINEERING*, Vol. VII., p. 395, July 13th, 1911). In the yard were seen some under-running live-rail shields on test, ultimately destined for South America, and so the tour was finished.

The welcome and assistance given by the local section, especially by Mr. Henniker, the Hon. Sec. of the Newcastle Students' Section, were thoroughly appreciated, and it is believed that the system of visiting a local section, or for visiting London, for that matter, is well worth continuing.

## THE LIGHTING OF A CINEMA THEATRE

THE lighting of the Cinema House, Sheffield, represents a combination of several different systems. The scheme was prepared by the Illuminating Engineers of the British Thomson-Houston Co., Ltd., along lines suggested by Mr. Ravenscroft, the Managing Director of the theatre. The B.T.-H. Co. also supplied the Mazda drawn-wire lamps, fittings and other lighting equipment.

The chief considerations were that the lighting should be comfortable and restful, and should at the same time show up the decorative details of the interior. The auditorium is lighted by trough reflectors containing Mazdalite tubular lamps concealed in the cornice. The light is projected on to the curved ceiling, and from there reflected downwards into the auditorium. This cornice lighting is supplemented in a rather novel way. There are six domes in the roof of the auditorium, and each of these domes is covered on the under side by beautifully tinted amber glass. Above the glass around the bottom edge of each dome is arranged a row of upturned



AUDITORIUM WITH CONCEALED LIGHTING.

Mazdalux reflectors containing Mazda drawn-wire lamps, and the light is first projected on to the white dome, and a mellow radiance proceeds downwards into the auditorium via the stained glass. The illustration gives an idea of the excellent effect produced. The foyer and entrance are illuminated by "eye-rest" indirect and Alba semi-indirect fittings, while in the tea-room, B.T.-H. Holophane reflector bowls are used, supplemented by wall brackets.

## CATALOGUES, PAMPHLETS, &c., RECEIVED

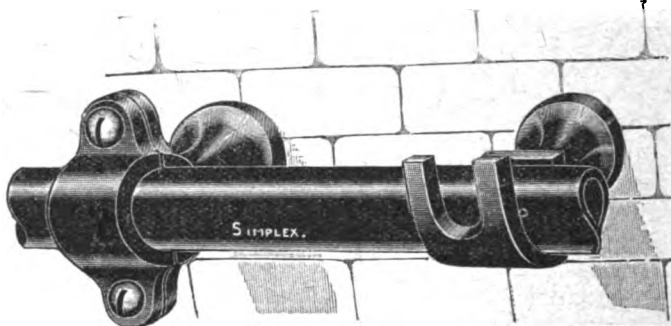
**SWITCHGEAR.**—Substantial interlocked ironclad switch units for pressures up to 6,000 volts have recently been designed by J. H. Holmes & Co. (Newcastle-on-Tyne) for colliery and factory work. They are described in a new leaflet, which shows that the switchgear is of the carriage type travelling on steel channelways, so that isolating may be rapidly carried out. Another leaflet from the same firm brings to notice a design for remote operated clapper switches, which may conveniently be used in automatic starting on control gears for compressor or printing machinery, &c. The switches have auxiliary carbon contacts and magnetic blow-out coils.

*Readers desiring copies of catalogues or pamphlets should apply to the firms in question, referring to the notice in "Electrical Engineering."*

**WIRELESS RECEIVERS.**—A folder from the Eclipse Electric Co. (6 Cambridge Road, Great Crosby) illustrates "Sterling" receiving head sets for wireless.

## CONDUIT SPACING SADDLES

SIMPLEX CONDUITS, LTD. (116 Charing Cross Road, S.W.C.) are introducing some new forms of "spacing saddles," which are the subject of a supplementary leaflet just received. These improved forms of holdfasts have been



NEW PATTERNS OF CONDUIT SPACING SADDLES.

designed for use where the conduit is installed on the surface, such as in damp situations, &c. They are so constructed that the conduit is installed with the clearance from the wall, thereby guarding the conduit against the effect of surface moisture or sweating. They are made in two forms. One pattern (illustrated on the right) is so constructed that the tube is simply dropped in position. It is made in two sizes, to take exactly the size of the tube which is being used.

There is also an improved pattern (illustrated on the left) in which the conduit is firmly held, as the fitting is made in two halves held together by means of two brass screws. The ordinary wood screws may be used for fixing, and considerable saving in labour effected by screwing direct between the bricks, although the wall should preferably be first plugged. They will be found quite the best type of holdfast for conduit installations in works, &c., where there is considerable moisture present.

## REVIEWS OF BOOKS

**The Year-Book of Wireless Telegraphy and Telephony, 1913.** 563 pp. 8½ in. by 5½ in.; about 46 figures. Portraits and Map. (London: St. Catherine Press.) 2s. 6d. net; by post, 2s. 11d.; abroad, 3s. 4d.

This useful handbook contains much information on wireless telegraph matters which has hitherto only been obtainable from scattered sources, and its completeness reflects great credit on the Marconi Press Agency, by whom it was drawn up. After calendars and a short record of the history of wireless telegraphy, the International Convention is set out in full, and the wireless telegraph laws and regulations of various countries are given, followed by lists of land and ship stations of the world, with their call signals. The more technical part of the book consists of the following series of articles:—Electric measurement in wireless telegraphy, by Prof. J. A. Fleming; Wireless time signals, by A. R. Hinks; The wireless direction finder, by C. E. Prince; Distress signalling, by G. E. Turnbull; The Marconi system of wireless telegraphy, by Andrew Gray; Principles of wireless telegraphy explained by mechanical analogies, by Capt. H. R. Sankey; Syntony, the technical situation in radiotelegraphy, by J. Erskine-Murray; The wireless telegraph receiver, by R. G. Kindersley; Wireless telegraphy for military purposes, by Major J. E. Cochrane; Facts and theories of long-distance signalling, by Dr. W. H. Eccles; and Methods of producing continuous waves, by C. E. Prince. There is also a useful glossary of terms and a quantity of general data relating to all parts of the world. A list of wireless patents also appears, particulars are given of the various associated Marconi companies, and there are biographical notes of some of the leading men connected with the movement. A list of books on the subject is also included, and after one or two other articles the volume concludes with a large map showing the principal wireless stations of the world open to public correspondence.

**Logarithms for Beginners.** By C. N. Pickworth. 49 pp. 7½ in. by 4½ in. (Manchester: Emmott and Co., Ltd.) 4th edition. 1s. net; by post, 1s. 2d.

This clearly written little manual on the use of logarithms has now reached its fourth edition, and in addition to the tables of four-figure common logarithms and antilogarithms, now contains a table of hyperbolic logarithms. The explanations are sound and straightforward, and are illustrated by plenty of examples.

## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,349.

State the theory of and advantages derived by using a loose-coupled inductance in wireless telegraphic receiving apparatus. Give the outline of construction of a suitable loose-coupled inductance for such work. Why is the iron core omitted in these, seeing that the two windings are quite independent, and apparently depend on transformer action.—F.

(Replies must be received not later than first post, Aug. 7th.)

### ANSWER TO No. 1,347.

In a 2,000-volt A.C. generating station of 3,000-kw. plant capacity (2 units of 1,000 kw., 1 unit of 500 kw., and 2 units of 250 kw.), a 1,000-kw. set and a 500-kw. set are running at nearly full load about 2 hours before peak time. The peak load expected is 2,500 kw. The ammeters on one of the feeder panels and on the panel of the 1,000-kw. set suddenly go hard over, and the switches on these two panels trip. State, in chronological sequence, what you would do if you were in charge at the time.

The first award (10s.) is made to E. C. PINCOTT, for the following reply:—

Exactly what to do in such a case of course depends very largely upon the circumstances under which the station is running at the time in question, viz., with regard to the load on the different feeders, &c., but as very little detail is supplied, the circumstances under which the station is running can only be assumed. In all probability the cause of the feeder switch tripping and also bringing out the 1,000-kw. set is a temporary short or complete breakdown of feeder. In any case it seems very strange that the 500-kw. set should remain in when the 1,000-kw. set came out, if all the protective gear was in order, unless the regulation was so bad at the time that this set could take a larger portion of the momentary heavy overload before tripping than the larger set, and it must be carrying a heavy overload.

Proceed as follows:—

Leave the feeder alone for the present. If the 1,000-kw. set is still showing about the correct pressure on the machine voltmeter, a hurried inspection will reveal whether it is all right or not.

If everything appears in order on this set, and having signalled the driver to "stand-by," proceed to synchronise it on to the bars to pick up the load. If, on the other hand, this machine (a) appears out of order, have the other 1,000-kw. set (b) run up as quickly as permissible, and put it on load. This 1,000-kw. set (b) should already be warmed up and ready for running, as in the ordinary course of events it would be required on load in about an hour's time. Of course, if any serious mechanical or electrical defect is detected in 1,000 kw. (a), it should be shut down immediately.

When a set has been got on load again, and up to that time no message has been received giving cause of the feeder tripping, close the feeder switch, but trip out if an abnormal current is picked up. Or better still, if the board has a set of duplicate bus-bars, arrange to isolate this feeder on a 250-kw. set to ascertain that the feeder is O.K., thus avoiding the risk of another disturbance of the supply if anything should be wrong with the feeder. If in case (b) feeder is O.K., if possible couple up the two sets of bars and shut down the 250-kw. set.

The second award (5s.) is given to E. H., who writes as follows:—

It is very difficult to say what one would have actually done under the circumstances related in the question. However, should he have kept a cool head, the following is the manner in which the writer would have proceeded. The switches on the alternator panel would be opened, its circuit-breaker put in, and the machine synchronised as quickly as possible. The act of synchronising with the breaker in affords sufficient protection should a fault have developed in the alternator either before or at the instant the breaker opened. Should this be the case, the breaker will come out a second time, probably bringing out the breaker of the 500-kw. set at the same time. The latter machine would then be switched back immediately, and the other 1,000-kw. set run up and synchronised without further loss of time. During these few minutes the 500-kw. alternator would probably have to be doing about 100 per cent. overload, which it ought to be able to cope with for that short interval of time.

In the meantime, however, the switches on the feeder panel affected should be kept open, as it is evident that the trouble must have originated on this, and switching this feeder on to the 500-kw. set would in all probability shut down the station temporarily.

However, since both feeder and machine breakers came out, it seems almost certain that the alternator is sound, and that its breaker merely tripped because the heavy current taken by the feeder was chiefly supplied by the bigger set on account of its superior regulation, as they were already running at nearly full load. Hence, after synchronising, the next thing would have been to open the switches on the feeder panel affected, close the circuit-breaker and then the switches. If this brings out the breaker again, wait for an interval of about a minute, and try switching the feeder on a second time. Should this fail, then the best thing is to ring up the main's engineer to investigate the cause of the trouble. It is quite possible that the short or earth on the feeder was only temporary, and would have been cleared by the time the feeder was switched on. In that case, nothing further would have to be done.

After proceeding so far, one could start thinking of how to face the peak-load. Should the first 1,000-kw. set have proved sound, all well and good; but there is the possibility of a fault having developed sufficient to put the machine out of commission, then the writer would have risked the 25 per cent. overload on the remaining alternators (assuming that the faulty feeder had by this time been put right), if the overload would not last for more than an hour; otherwise the only thing to do would be to request some of the customers to take off their loads during the peak.

### ANSWER TO CORRESPONDENT

**ACCUMULATOR.**—It is certainly possible to discharge the battery in question through an artificial load consisting of a water resistance, but we do not quite see your object in so doing.

**The Batti-Wallahs.**—Mr. Riggs (Past President) has again kindly placed at the disposal of the Society his sailing barge *Alda* from August 1st to August 11th. Comfortable cabin beds are provided, and this year, in addition to the advantages of electric light, a complete range of electric cooking apparatus has been installed. A number of members have signified their intention of joining the outing, but there are still vacancies. The number is limited to 16, and those who are desirous of joining the party should apply at once. Members can come for the whole of the time, or for one or two week-ends, namely, August 1st to 4th, or from August 8th to 11th. The inclusive cost of the trip will not exceed £3 10s. or 45s. for the week-end.

# "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

## Specifications Published July 24th, 1913

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

Names in italics indicate communicators of inventions from abroad.

7,651/12. **Rotary Converters.** E. C. Co. and N. PENSABENE. Each pole consists of a group of polar projections, and the armature is wound with at least two separate windings arranged for different numbers of poles. An adjustable iron core between adjacent polar projections in the same group enables a leakage flux to induce a back E.M.F. in the winding for the larger number of poles, and a direct E.M.F. in the others. Two figures.

15,279/12. **Incandescent Lamp Filament Supports.** JULIUS PINTSCH A.-G. To mount the filaments rapidly and accurately, the supporting arms are arranged in pairs in two tiers so that each arm of each pair is at an angle to the plane of the complementary arm. Five figures.

15,486/12. **Railway Signalling.** R. H. STOCKDALE. A lock and block system for single-line working is described. A single needle instrument is used in conjunction with electro-mechanical locks in the signal box and on the signal posts. On failure of the batteries no "clear" signal can be given. Four figures.

23,453/12. **Incandescent Lamps.** T. F. J. TRUSS. A prismatic reflector on the central stem is made hollow with its inner surface reflecting, and is provided with longitudinal prismatic ribs which have their apices projecting between the filaments. Two figures.

24,361/12. **Incandescent Lamps.** W. L. PAKENHAM ("Z" Lamp Manufacturing Co.) Phosphor is painted on the stem of drawn-wire lamps to prevent blackening.

530/13. **Control of Heating Apparatus.** G. SMITH. Circuits are arranged so that when started a liquid is boiled and a predetermined quantity poured into an adjacent receptacle. This operation opens the main circuit and closes an alarm circuit. Four figures.

8,027/13. **Current Transformers for High Pressure.** SIEMENS BROS. (*Siemens & Halske*). The iron cores are arranged with their respective secondaries upon a common co-axial insulated primary winding. Two figures.

## Specifications Published To-day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free.

Summaries of some of the more important of these patents will appear in our next issue.

**Arc Lamps:** HERWIG [Electrodes and holders] 15,927/12.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** BECKER [Reducing energy loss in variable current lines] 27,535/12; FORSTER [Pole caps and insular supports] 10,085/13.

**Dynamos and Motors:** LUNGSTROM [Rotating field magnet windings] 24,484/12.

**Electrometallurgy and Electrochemistry:** STOBIE [Improving physical nature of pig-iron] 16,001/12; SCOTT [Nitrogen fixation furnace] 16,014/12; LEE and BRAINE [Anodes for electrolytic apparatus] 16,475/12; MICHAUD and DELASSON [Recovery and refining of tin] 20,557/12; NODON [Cold electrolytic process for the recovery of tin from waste tinned metals and alloys] 24,203/12; ALLEN and ALLEN [Electrolytic cells] 26,169/12.

**Heating and Cooking:** GRUNDY [Heaters] 18,017/12.

**Ignition:** NEHMER, 18,799/12.

**Incandescent Lamps:** CERVENKA [Repairing] 16,885/12; GODIN [Lamps for automobiles] 29,149/12.

**Storage Batteries:** CLARK and HART ACCUMULATOR Co. [Portable] 2,908/13.

**Switchgear, Fuses, and Fittings:** PRIM and ROPER [Thermostats] 16,317/12; ELLISON and MUELLER [Motor controllers] 22,959/12; GORTON [Automatic S.P. switch] 608/13; WHIPP, BOURNE and WHIPP [Remote-controlled circuit-breaker] 2,233/13; SIEMENS-SCHUCKERT [Lamp and fuse-plug sockets] 5,903/13; UNITED MOTOR INDUSTRIES and DE RODAKOWSKI [Bayonet-socket holders] 7,477/13.

**Telephony and Telegraphy:** DUBILIER [High-frequency currents] 8,197/12; PLECHER [Telephone receivers] 13,157/12; W.E. Co. (*W. E. Co., U.S.A.*) [Telephone machine switching] 15,952/12; 12,425/13; 12,424/13; 12,425/13; and 12,426/13; CONNER [Telephone indicator] 23,812/12; SIGNAL GES. [Leakage telephony and telegraphy] 3,853/13.

**Traction:** LEKKERKERKER and BECKX [Drawing-up and securing broken ends of trolley wires, &c.] 9,547/13.

**Miscellaneous:** DAMEY, ESCORÉ and ESCORÉ [Imitation candle lamps] 15,456/13; HUNTE [Battery lamps] 16,126/12; B.T.-H. Co. (*G. E. Co., U.S.A.*) [Vapour electric devices] 18,372/12; EREDE [Gyroscopically-controlled cabin for ships] 20,985/12;

BURBURY, HILLIER and THOMPSON [Packing incandescent lamps] 24,596/12; LILIENTHAL [Röntgen rays] 1,843/13.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** DATTA [Covering conductors] 1,343/13; FRANZ [Series-connected apparatus] 15,502/13.

**Telephony:** TELEPHON APPARAT FABRIK E. ZWIETUSCH [Exchanges] 14,229/13; REEVES [Automatic exchanges] 15,579/13.

**Traction:** PIEPER [Vehicle driving] 15,138/13.

**Miscellaneous:** GRAEMIGER [Suspension devices] 24,541/12; CAHUCITWERKE NÜRNBERG [Blasting machine] 14,870/13.

The following Amended Specification may now be obtained.

3,549/12. VAN RADEN & Co., and M. METZ [Multiple-circuit distributing switch for motor-car circuits].

## Applications for Amendment

8,853/11. **Frequency Changing.** A. M. TAYLOR. The patentee wishes to amend this specification (*ELECTRICAL ENGINEERING*, Vol. VIII., p. 448, August 8th, 1912), as part of claim 1 is incorrect, and there is an ambiguity in claim 6.

11,871/12. **Automatic Regulator for Variable Speed Dynamos.** H. D. EARL. A shunt field regulator controlled by a series and a shunt coil is described. The resistance between the regulator contacts gradually alters as they are separated, and the controlling windings are so proportioned that the shunt winding is operative independently of the current in the series coil. Application is being made by J. Stone & Co. to correct certain clerical errors in the specification, and to more clearly define the scope of the invention. It is proposed to describe more fully the regulator, which consists of successive pairs of contacts whose resistance varies directly as the pressure applied. They open successively. Claims 1, 2, and 3 are to be struck out, and a new claim substituted.

## Amendments Made and Allowed

1,950/08. **Telephone Switch Hooks.** J. E. KINGSBURY (*Bell Telephone Mfg. Co., Antwerp*). Some of the desired amendments (*ELECTRICAL ENGINEERING*, May 29th, p. 310) have been allowed.

## Grant of Patents Allowed

27,521/11 and 28,260/12. **Cinematograph Targets.** J. B. LE MAITRE. The opposition to the grant of these patents (*ELECTRICAL ENGINEERING*, March 6th, p. 136, and March 20th, p. 166) has resulted in the Comptroller requiring some amendments to be made.

## Grant of Patent Refused

19,890/12. **Self-contained Vehicles.** OERLIKON Co. The opposition to the grant on this application (*ELECTRICAL ENGINEERING*, July 24th, p. 432) by Mr. W. P. Durnall has resulted in the grant being refused. Mr. Durnall was also allowed £3 3s. costs.

## Expiring and Expired Patents

The following Patent expires during the current week, after a life of fourteen years:—

16,005 of August 5th, 1899. **Incandescent Lamp Manufacture.** A. SWAN. The stem is fused to the inner wall of the neck of the lamp, and simultaneously definite shape is given to the neck by air pressure, so that it accurately fits the lamp cap, to which it is at the same time secured.

The following are the more important Patents that have become void through non-payment of renewal fees.

**Distributing Systems, &c.:** M. BÜTTNER [Train-lighting system in which aluminium cells and iron regulating resistances are used] 8,121/02; B. T.-H. Co. (*G. E. Co., U.S.A.*) [Control system for two motors running at different speeds] 8,153/07.

**Electrochemistry and Electrometallurgy:** H. M. GRANIER [Production of caustic alkali, copper sulphate, &c., by electrolysis] 4,487/04; A. M. DOUILLET [Water sterilising by electrolysis] 8,332/06 and 14,248/08.

**Ignition:** H. HOLZWARTH and E. JUNGHAUS [Gas turbine] 8,578/07.

**Instruments:** C. E. FOSTER ["Null" galvanometers] 8,205/07.

**Miscellaneous:** P. M. JUSTICE (*Rowland Teleg. Co., U.S.A.*) [Maintaining synchronous rotation of a motor and a shaft by periodically varying the duration of a shunt across its field or armature] 8,488/02; E. ALBERT [Electrotypes] 8,117/04; D. K. MORRIS and G. A. LISTER [Eddy current brake] 7,448/05; T. L. JONES and AUTO-ELECTRIC RIFLE AND TARGET Co. [Target practice] 7,755/05; A. J. BOULT (*Goldman and Co., U.S.A.*) [Pasteurising] 8,084/08; W. J. BRENNAN [Waxing thread] 20,356/08.



# ADAMS IGRANIC

MOTOR CONTROL GEAR FOR AIR COMPRESSORS.

ADAMS  
M<sup>o</sup>C<sup>o</sup>L<sup>o</sup>  
BEDFORD  
AND  
LONDON

## TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

Following on the letter by Sir Joseph Larmor, in which he urged the necessity of the State seeking and using the best scientific knowledge in the country bearing on the Imperial wireless scheme, the Postmaster-General has announced that, on the advice of the Advisory Committee and others, Mr. W. Duddell has been retained for a number of years in this connection. Mr. Duddell will be in touch with the leading experts in wireless telegraphy from the various Government departments, and when occasions arise it is intended that advisory committees similar to the one recently formed shall be invited to consider particular aspects of the problem. The Postmaster-General also stated in the House of Commons on Monday that the terms of the Marconi contract had been modified to the advantage of the Government. The new contract provided for the payment of royalties in respect of each station, and not of the Chain as a whole. The Company had agreed to this, but later they found that they are not protected by patents in British East Africa, where the largest of the stations is to be situated. In return for royalty payments being made in connection with this station, the Marconi Co. have agreed to the 10 per cent. royalty payable for each station being subdivided thus:—4 per cent. in respect of internal transmitting apparatus, 2 per cent. in respect of internal receiving apparatus, and 2 per cent. each in respect of external transmitting and receiving apparatus. Thus full liberty is retained to discard Marconi apparatus in respect of one part of a station, while retaining it in the others, and securing a proportionate reduction in the royalty by so doing.

At a recent meeting of the Institute of Radio Engineers, held in New York, a Paper was presented by Mr. J. L. Hogan, jun. (National Electric Signalling Co.), in which the principle and apparatus involved in the heterodyne receiver, invented by Prof. R. A. Fessenden, and used for the long-distance communications in the recent wireless tests between Arlington and the *Salem*, were discussed. The heterodyne receiver is a selective receiver which will amplify persistent waves, but will not increase effects due to highly damped discharges, e.g., atmospherics. The author described five types of heterodyne receiver. In the first two, wave trains having slightly different frequencies are received on two separate antennae. The currents set up are passed through a non-polarised magnetic telephone, and react on the diaphragm. In the second, only one antenna is used, as the second of the interacting currents is produced by an alternator, arc or other oscillator. The third form has its sensitiveness increased by the use of a dynamometer telephone, and the fourth employs a static telephone receiver. With this arrangement signals are said to have been received up to 3,000 miles. In the fifth type heterodyne excitation is added to the modern combination of sensitive rectifier and telephone. In this case, receiving from sustained wave or spark transmitters, it is possible to read signals so weak that they cannot be heard in the ordinary receiver. On spark signals the improvement is from five to fifteen times, and with sustained waves is greater. This receiver was used for all the long-distance signal tests between Arlington and the *Salem*. Two stations of the Arlington type could, it is estimated, exchange messages regularly by day or night over 2,800 miles.

The French Post Office authorities are investigating a system of wireless telegraphy for long-distance transmission, invented by M. Bouthillon. According to the *Elektrotechnische Zeitschrift*, long waves several hundred kilometres in length, corresponding to a frequency of about 1,000 cycles per second, are employed. An antenna about sixty miles long, supplied from an ordinary alternator generating at the above frequency, is used, and at the receiving end no detector is required as the waves produce oscillations in the receiving circuit which

are audible in the telephone. A very high efficiency is claimed for the system.

According to the *Elektrotechnische Zeitschrift*, wireless telephony has been effected between the Nauen station, and several others, including one at Vienna, over distances of 400 miles and more. A "Telefunken" high-frequency machine was used at Nauen, and the conversation was received at Vienna loud, clear, and perfectly intelligible.

Wireless communication between St. Kilda and the mainland was established on Tuesday.

The Radiotelegraphic Convention, which came into force in the 1st inst., has so far been ratified by Belgium, Belgian Congo, Denmark, Egypt, United States of North America, Monaco, Holland, Curaçao, Netherland Indies, Russia, Portugal, Newfoundland and Great Britain.—Communication with all stations in Angola is restored.

## ELECTRIC TRACTION NOTES

The point which has been so long disputed between the Tottenham Urban District Council and the Metropolitan Electric Tramways, Ltd., as to whether certain tramways authorised under the Light Railways Act could come within the definition of a railway for the purposes of rating, i.e., should be rated upon one-fourth the assessment value, has been finally settled by the House of Lords. The local justices and subsequently the Divisional Court held that tramways so authorised did not come within the definition as contended by the Company, but the Court of Appeal subsequently gave a decision against this and in favour of the Company. The House of Lords, however, have reversed the decision of the Court of Appeal. In giving judgment, Lord Justice Moulton expressed the opinion that it was an abuse of the Light Railways Act of 1896 to make use of it for the purpose of constructing lines which were purely tramways, as distinct from light railways in agricultural districts, which was the main purport of the Act.

The electrification of the Butte, Anaconda & Pacific Railway is now practically complete. It is the first railway in America to adopt the high direct-current pressure of 2,400 volts. For both freight and passenger work the motors are wound for 1,200 volts and insulated for 2,400 volts; the gear reductions are 4.84 and 3.2. There are four motors per unit, and two units form one locomotive for freight work. Each unit weighs about 80 tons, and the two units will haul a 3,400-ton train at 21 m.p.h. on the level or 15 m.p.h. against the ruling grade of 0.3 per cent. Each motor is rated at 190 amperes at 1,200 volts under forced ventilation on continuous rating; thus, for the double unit the output is equivalent to about 2,100 h.p. The control is on the Sprague multiple-unit series-parallel system, and a dynamotor is employed to furnish 600 volts for the operation of the contactors, lights and air compressor. The resistance units number twenty and twenty-six for the passenger and freight locomotives respectively. The passenger locomotives have two pantograph trolley collectors, and each freight unit has one. Single units are used for making up trains and for spotting cars. The wheels have a diameter of 46 in.; the total wheel-base is 26 ft. and the rigid wheel-base only 8 ft. 8 in. The maximum tractive effort per locomotive, continuous rating, is about 11 tons., one hour rating about 13.5 tons, and 30 per cent. coefficient about 21 tons.

According to *Elektrotechnik und Maschinenbau*, a scheme has been prepared by M. Carlier for the electrification of the Brussels suburban railway system, including the underground connection through the city between the north and south stations, which would be the first section to be electrified. The high-tension direct-current system is proposed, with third-rail current collection at from 1,200 to 1,500 volts. Three-phase power would be supplied to substations at intervals of from six to eight miles, at 15,000 volts. Locomotives of from 1,500 to 2,000 h.p., capable of handling the heaviest

## PHOENIX ASSURANCE COMPANY, LIMITED.

ESTABLISHED 1782.

Head Offices: 19 & 70, LOMBARD STREET, LONDON, E.C.

TOTAL FUNDS EXCEED	CLAIMS PAID EXCEED
£15,000,000	£90,000,000

CHAIRMAN: RT. HON. LORD GEORGE HAMILTON, P.C., G.C.S.I.

### FIRE - LIFE - ACCIDENT - MARINE

Loss of Profits following Fire, Workmen's Compensation, Fidelity Guarantee, Burglary, Trustee and Executor, &c.

#### ELECTRIC LIGHTING.

The Company has always encouraged the development of Electricity, and the well-known "Phoenix Fire Office" Rules for Electrical Installations are in use throughout the world. Copies will be supplied free on application to Head Offices.

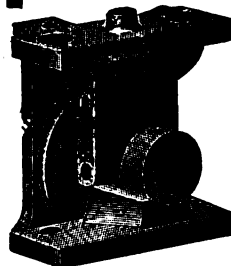
General Manager: SIR GERALD H. RYAN.

### Why waste time and money on machining

small intricate pieces when the most complicated parts can be cast in a finished state by

"PRANA"

### Die-finished Castings



HOLES, SLOTS, etc., CAST to PERFECT SIZE! ABSOLUTE ACCURACY GUARANTEED FOR ALL REPETITION WORK

Send for illustrated booklet, mentioning this paper; or send sample for quotation to

**AERATORS, Ltd**  
UPPER EDMONTON  
LONDON, N.

### ELECTRICAL PORCELAIN

OF  
HIGHEST QUALITY

APPLY TO

**JAMES MACINTYRE & CO., LTD.,**  
BURSLEM.

The Micanite & Insulators Co., Ltd  
WALTHAMSTOW,  
London, E.

FOR **FIBRE**  
SHEETS, RODS  
AND  
TUBES.

## BLAKE & INSULATING STAPLES

Write for Samples and Prices.

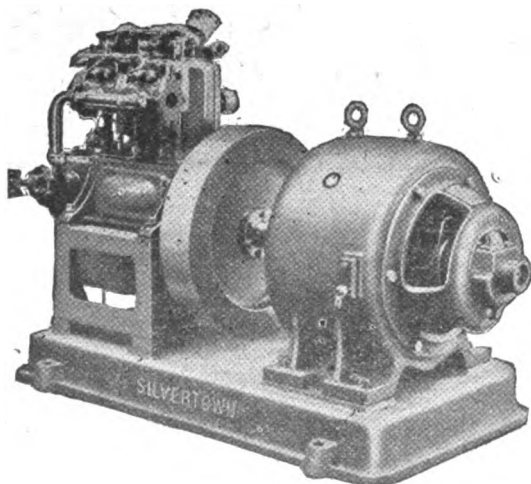
**MOSSÉS & MITCHELL,**

Chiswell Works, 122-124, GOLDEN LANE, E.C.

**STEATITE  
INSULATORS**  
SUPPLIED  
FOR ALL KINDS OF  
ELECTRICAL WORK  
**WILLIAM SUGG & CO. LTD.**  
WESTMINSTER.

# SILVERTOWN

## PETROL-ELECTRIC & PARAFFIN-ELECTRIC PLANT



Specially designed for PRIVATE  
HOUSE, HOTEL, and SHIP  
LIGHTING and POWER.

FURTHER PARTICULARS and  
PRICES ON APPLICATION.

THE  
**INDIA RUBBER, GUTTA PERCHA**  
AND  
**TELEGRAPH WORKS CO., Ltd.**

Head Offices:  
106, CANNON ST., LONDON, E.C.

Works:  
SILVERTOWN, LONDON, E.

trains would be employed. It is also proposed to join the two main stations by a new loop-line, which would greatly increase the capacity of both by partly eliminating the terminal nature of the traffic.

According to the *Elektrotechnische Zeitschrift*, an order for 300 electrically-equipped motor-coaches for the St. Petersburg suburban railway system has been placed with the Russian Allgemeine Elektrizitäts Gesellschaft and Siemens & Halske conjointly. The new Russian Dynamo Co. has received an order for a further twenty coaches. No particulars of the equipments are yet to hand.

## LOCAL NOTES

**Bradford: Electricity Extensions.**—The large scheme of extensions to the electricity undertaking prepared by the City Electrical Engineer, Mr. T. Roles, and referred to at length on page 443, has been passed by the City Council.

**Chester: Electricity Output.**—The output of electrical energy during the past year exceeded that of the previous year by nearly a quarter million units. In spite of the price of coal having gone up considerably, the generating costs per unit have been reduced to 0.889d., which is less than in the previous twelve months.

**Edinburgh: Electric Lighting Profits.**—The Electric Lighting Committee has recommended that the surplus of £2,169 in hand upon the electricity undertaking should be devoted to the reduction of the capital account, and not to the relief of rates as is the opinion of a number of members of Council.

**Kingston-on-Thames: Electricity Accounts.**—The accounts of the electricity undertaking for the past year show a net loss of £1,255. This is mainly attributable to the increased cost of coal, which represented an additional outlay of £1,094 during the year. Public street lamps in the main roads have been changed from the open type of arc lamps to clusters of high power metal-filament lamps, and this change has brought about a marked improvement in the lighting. It has also enabled the shutting down of special high-tension continuous-current arc lighters at the power station, as the supply for the new clusters is taken from the low-tension distribution system. In spite of the unsatisfactory financial result, over which, as mentioned above, the Committee or the staff had very little control, the efficiency in the running of the undertaking has been increased as compared with previous years.

**London: L.C.C.: Protective Devices.**—Since the recent serious breakdown of plant at the Greenwich Power Station, consideration has been given by the Highways Committee to the question of arranging for the installation of protective devices with a view to guarding against breakdowns in the future, and localising them when they occur. The Chief Officer of Tramways, Mr. A. L. C. Fell, has conferred on the subject with Mr. G. W. Partridge, Chief Engineer to the London Electric Supply Corporation, and a scheme has been submitted, estimated to cost £25,000, for dealing with the two 8,000-kw. generators recently ordered from the British Westinghouse Co. This has been approved by the Highways Committee.

**Middlesbrough: Electric Lighting Tariff.**—Mr. H. M. Taylor, the Borough Electrical Engineer, has presented a report with regard to systems of charging for electricity supply. This report, which is to be printed and considered later, is, it is stated, against the adoption of the rateable value system.

**Nuneaton: New Plant.**—Reference was made in this column last week to a new turbo-generator which has lately been started up. The plant, however, was incorrectly described, and should be a 500-kw. Willans-Siemens mixed-pressure turbo-generator.

**Stoke-on-Trent: Electricity Accounts.**—The net profits upon the various power stations owned by the Corporation for the past year were as follows:—Burslem, £838; Hanley, £222; and Stoke, £299. On the Longton undertaking there was a loss of £141.

**West Ham: Electricity Accounts.**—The figures of the electricity undertaking for the past year show a steady advance in the number of units sold for private houses, shops, and particularly for factories. The report points out that, owing to recent improvements in lamps and fittings, and the increased attention which is being given to the question of good lighting and pure air in factories and workshops, this latter class of business is now comparatively easy to obtain.

With heating and cooking, also, there has been a considerable advance, which it is anticipated will be considerably improved upon next year in consequence of the new tariff recently passed by the Corporation. The net surplus for the year was £495, but in considering this, allowance must be made for the fact that extra charges in respect of coal amounting to £1,400 had to be made, that there was a loss of £3,700 from the traction supply, owing to reduction in price, and that new meters to the value of £192 have been purchased out of revenue, and also an expenditure of £500 has been made out of revenue upon the enlargement of central office buildings, alterations to switchboard, cables, &c.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

### Generating Stations, Sub-Stations, Mains, &c.

**Bolton.**—The Local Government Board has sanctioned loans amounting to £26,897 in connection with a new power station at the Back-of-th'-Bank.

**Bury.**—Tenders are invited for a 2,000-kw. turbo-alternator with exciter and condenser. August 25th. (See advertisement on another page.)

Sanction to loans amounting to £55,000 for electrical extensions is to be sought.

**Doncaster.**—A loan of £12,500 for electrical extensions has been inquired into. These extensions are mostly in consequence of additions to the Corporation's limits of supply, and the development which is anticipated in the new colliery district of Brodsworth.

**Dublin.**—Tenders are invited for feed pump, pipework, steel-work, &c. August 26th. (See advertisement on another page.)

**Felixstowe.**—A Local Government Board inquiry is to be held regarding a loan of £4,729 for the electricity undertaking.

**London: Hammersmith.**—Tenders will shortly be invited for a twelve-months' supply of cables and high and low-tension switchgear.

**Long Eaton.**—A loan of £10,000 for electrical extensions has been inquired into, and the extensions include a 500-kw. generating set.

**Willesden.**—A Local Government Board inquiry is to be held regarding a loan of £4,667 for the electricity undertaking.

### Wiring

The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.

**Barnet.**—New infirmary.

**Barrow-in-Furness.**—New public baths (£15,900).

**Belfast.**—Cinematograph theatre, Falls Road. Architect, W. Y. Moore, 35 Royal Avenue.

**Cheltenham.**—New municipal offices (£9,500).

**Eastbourne.**—New workhouse buildings.

**Hull.**—Picture theatre.

**London: Greenwich.**—Elementary school, Charlton Road.

**Port Talbot.**—Offices, &c., for the Port Talbot Steel Co. Architect, G. Moxham, 18 Castle Street, Swansea.

**St. Marychurch (Torquay).**—Electric lighting is to be installed in the parish church.

**Stalham (Norwich).**—Enlargement of town hall.

**Sunderland.**—Extensions to the eye infirmary (£20,000).

### Miscellaneous

**Bradford.**—After having received reports upon electrical and gas lighting for street purposes, a Special Finance Committee has recommended the adoption of electricity for certain streets in the town.

**London: L.C.C.**—Tenders are invited for the provision of

FOR  
**STEAM JOINTS**  
USE



JOHN HUDSON & CO.'S SUCCESSORS, Mansell St., London, E.

testing plant for polyphase electricity meters. An offer by Dr. C. V. Drysdale to prepare the specification and superintend the installation of the plant for ten guineas, and make tests for a further ten guineas, has been accepted.

**Hammersmith.**—The Works Committee recommends that fifty existing gas lamps in side streets be converted to incandescent electric lighting.

**South Africa.**—A supply of 36,000 metal-filament lamps is required by the South African Railways Administration. Further particulars, 73 Basinghall Street, E.C.

### TENDERS RECEIVED AND ACCEPTED

**Belfast.**—The tender of Bertram Thomas for a switchboard panel has been accepted.

**Falkirk.**—The contract for A.C. meters has been given to Chamberlain & Hookham, Ltd.

**London: L.C.C.**—The following tenders have been received for the electric lighting of the new fire station at Hackney: G. E. Taylor & Co., £162; Tredegar & Co., £196; H. J. Cash, & Co., £238 7s.; Finch & Wheeler, £254 7s.; Cox-Walkers, £357. The first-named tender is recommended for acceptance.

The following tenders have been received for switchgear at the Shoreditch, Camberwell and Woolwich sub-stations, and the central car repair depot: Spagnoletti, Ltd., £999 14s.; Johnson & Phillips, £1,068; Ferranti, Ltd., £1,100 5s.; Switchgear & Cowans, £1,140 18s.; Eckstein, Heap & Co., £1,330 15s.; A. Reyrolle & Co., £1,387 11s. The tender of Messrs. Spagnoletti, Ltd., has been recommended for acceptance.

The Port of London Authority, which recently authorised an expenditure of £104,000 upon the electrical equipment of its docks, has received tenders for the supply to the Albert Docks of forty-three electric luffing cranes of 60 ft. radius, with a lifting capacity of 30 cwt. at ordinary speed, and 3 tons at a slower speed.

**Northwood.**—The tender of the Northwood Electric Light & Power Co. has been accepted for street lighting.

We learn from the British Thomson-Houston Co., Ltd. (Mazda House, 77 Upper Thames Street, E.C.), that the United States Government has issued instructions that Mazda lamps shall be exclusively used in future in all Government installations. The lamps have to pass stringent tests before acceptance, and conform to a strict specification.

### APPOINTMENTS AND PERSONAL NOTES

We learn that Mr. E. P. Barfield, who for the past six years has been Manager to Messrs. Siemens Bros. Dynamo Works, Ltd., incandescent lamp and fittings department, has accepted an important position with the Edison & Swan United Electric Light Co., Ltd., with whom he was connected at the outset of his career. We understand, however, that Mr. Barfield will not actually be leaving Dalston Works for some little time.

Acting under medical advice, Mr. Alfred Clough has resigned his position as Consulting Electrical Engineer to the Liverpool Corporation. The Electricity Committee has passed a resolution placing on record their appreciation of the services rendered by Mr. Clough in his past management of the electricity undertaking.

The Leicester Electric Lighting Committee recommend that the salary of the Chief Electrical Engineer, Mr. T. R. Smith, be increased from £600 to £900 per annum by annual increases of £100.

In consequence of Mr. R. N. Mayne being appointed Borough Electrical Engineer at Redditch, Mr. L. H. Saynor has been appointed Chief Assistant Electrical Engineer at Erith, at a salary of £160 per annum, rising to £200. An additional shift engineer is to be appointed.

Partner required for electrical contracting business in London. (See an advertisement on another page.)

An assistant electrical engineer is required by the Port Elizabeth (S.A.) Council. Salary, £500 per annum. Applications to Davis & Soper, 54 St. Mary Axe, London, E.C.

Plumber-jointers required by British Insulated & Helsby Cables, Ltd. (See an advertisement on another page.)

A Clerk of the Works to supervise the construction of a refuse destructor, generating plant, sub-station and laying of mains is required at Rhondda. (See advertisement on another page.)

### MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. George Smith & Son of 5 Philpot Lane, E.C., inform us that the price of electrolytic copper bars c.i.f. port of arrival, quoted on Tuesday night, was £69 to £69 10s. (Last week, £66 5s. to £66 15s.)

**Works Holidays.**—The Electrical Power Storage Co., Ltd. (Millwall, E.), will be closing their works from Friday evening next to Monday morning, August 11th, but a small staff will be at the offices to deal with urgent correspondence.

The Union Electric Co., Ltd., will close their offices and stores on Monday and Tuesday next, and their works from Monday the 4th until Saturday the 9th, re-opening on Wednesday the 6th and Monday the 11th respectively.

**Annual Picnic.**—Some thirty members of the staff of the Synchronous Co. (32 and 34 Clerkenwell Road) made a launch excursion from Kingston to Windsor and back on July 19th.

**Electrical Novelties.**—We are asked by the General Electric Co., Ltd., to state that the new pocket lamp in the shape of a pistol, which we illustrated on page 492 of last week's ELECTRICAL ENGINEERING, is to be known under the trade name of the "Defiance."

**Liquidations.**—A meeting of the creditors of the Miners' Lamp Electric Lighting Co., Ltd., will be held at the office of the liquidator, James Blakey, 42 Spring Gardens, Manchester, on August 12th, at 12 noon.

### COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &c.

**London Electric Supply Companies.**—The County of London Electric Supply Co. has announced an interim dividend of 5 per cent. per annum on the ordinary shares. A 5 per cent. interim dividend has also been declared on the ordinary shares of the West-End undertakings of the Charing Cross, West End & City Electricity Supply Co. £17,747 is carried forward. On the City undertaking £10,401 is carried forward after debenture interest, and preference dividends are provided for. A 4 per cent. interim dividend has been declared by the Metropolitan Electric Supply Co.

**Bombay Electric Supply.**—At the meeting recently a total increase of revenue of 13.28 per cent. was reported. After deducting debenture and preference interest, and placing £22,000 to depreciation, an available balance of £35,072 remained, including £7,385 brought forward from last year. A 5 per cent. dividend is to be paid, with £5,072 carried forward. The total energy supplied has increased by 30 per cent., but the generating costs show a decline due mainly to the better efficiency of the new Kussara station which replaces that at Wari Bunder.

**Brush Electrical Engineering Co.**—The accounts for 1912 show a deficit of £7,710. After paying debenture interest this increases the debit balance to £243,442.

### NEW COMPANIES

**HYDRAULIC POWER CO. OF SCANDINAVIA.**—Capital, £425,000. To acquire and work water-power concessions and adopt an agreement with the Hydraulic Power & Smelting Co. The first directors are R. Blakstad, S. Hultdt, A. List, E. Rael, and J. A. Stirling.

**SEVENOAKS & DISTRICT ELECTRICITY CO.**—Capital, £140,000. In order to meet the requests for an early supply, the directors are establishing a temporary generating station.

**CENTRAL ARGENTINE LIGHT & POWER CO.,** 3 London Wall Buildings, E.C. Capital, £100,000. To erect generating stations on the San Juan River and elsewhere.



# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 345 [Vol. IX., No. 32]  
*All rights reserved.*

THURSDAY, AUGUST 7, 1913.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

*The Engineering Journal of the Electrical Industry*

**PUBLISHED EVERY THURSDAY. Price 1d.**

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES and TECHNICAL COLLEGE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

### Other Advertisement Rates on Application.

#### Latest Time for Receiving

Letters for Insertion, *Tuesday first post.*

Small Advertisements and Official Announcements, *Wednesday first post.*

Displayed Advertisements, *Tuesday first post.*

Corrections in Standing Advertisements, *Monday first post.*

All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 208-206, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Circling, Fleet, London." Telephone No.: 5509 Holborn.

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

THE annual report of the City Engineer to the Corporation of London contains notes on the street lighting in the City and other matters of interest. (Page 452.)

THE conversion of a mill in the Birmingham district where brass, copper, and white metal is rolled, to electric drive is described in an illustrated article. The space gained by the removal of the old steam plant has enabled a considerable amount of new machinery to be added to the mill. (Page 453.)

WE are able to give from notes sent us by a correspondent some particulars of a 4,800-kw. power transmission projected in connection with the Mount Lyell Mines, Tasmania. (Page 454.)

A MOTOR-DRIVEN centrifugal disintegrator for foundry sand is illustrated and described. (Page 455.)

THE patent specifications of particular interest to mining electrical engineers and electro-metallurgists published during the preceding month include some dealing with miners' safety lamps and electric furnaces

for the production of sulphur-free iron, and some covering electrolytic refining processes. (Page 456.)

A NEW design of commutating pole motor giving good ventilation and high efficiency has been introduced. (Page 456.)

DESIGNS for a solenoid-operated circuit breaker are given in our Questions and Answers columns. (Page 457.)

THE specifications published last Thursday include one for a water-cooled, three-phase furnace for fixing nitrogen, by E. Kilburn Scott; one for a construction of salient pole high-speed rotor, by F. Ljungström; and one dealing with the improvement of speech over long telephone lines by the use of shunts at intervals, by F. A. Becker. The patent for electric clocks, by T. J. Murday, which was allowed to lapse, has been restored. (Page 458.)

A CONVENIENT machine for crushing coal and taking samples for testing has been introduced. (Page 459.)

IN consequence of the decision in the Tottenham tramway rating case, the Accrington Corporation has had to refund certain sums deducted on the strength of the Appeal Court's judgment which has now been reversed.—Owing to the extraordinary diminution in receipts on the L.C.C. tramways in different parts of London, many Borough Councils have agreed to a re-valuation for rating purposes. The Islington Council, however, refused, but the High Courts have ordered a revaluation to be made in this case also.—Owing to the influx of water in the Loetschberg Tunnel the full service of electric trains has had to be postponed. (Page 459.)

WE refer to the latest edition of the Post Office Wireless Telegraph Handbook.—For the protection of wireless aeriads against lightning risks it has been suggested that a double pole, two-way switch should be used for earthing both the aerial and the metal guy ropes. (Page 459.)

INTERESTING revisions in tariffs for domestic supplies, other than lighting, have been made at Glasgow and Beckenham.—There was a net profit of £7,520 on the Glasgow electricity undertaking last year, after providing £50,000 for depreciation.—The Lytham Council is considering taking a supply in bulk instead of erecting its own power station.—A large electric supply scheme in Bavaria is referred to.—A curious position has arisen in regard to the Kingstown electric lighting Order, the Board of Trade having abandoned the Order owing to opposition in the House of Commons. The promoters, however, are taking steps in the matter. (Page 461.)

AN expenditure of £9,500 is contemplated at Limerick and £21,500 at Tauranga (N.Z.).—Switchgear

is required at Burton-on-Trent, and at Canberra (Australia).—Estimates are being prepared for mains and services extensions at Accrington, and electric lighting schemes are under consideration for Ballater, Lurgan, and Egypt. (Page 461.)

THE Brush Electrical Engineering Company's report for last year explains the deficit of £7,710 as being due to the coal and other strikes, the extra expenditure incurred by the Workmen's Compensation and the Health and Unemployment Insurance Acts, and the fact that many contracts completed during the year were undertaken when lower prices prevailed a few years ago against which the cost of materials has risen since. The scheme of capital reorganisation has been postponed until the publication of the current year's accounts. (Page 462.)

### STREET LIGHTING AND OVERHEAD WIRES IN THE CITY OF LONDON

THE annual report of the City Engineer, Mr. Frank Sumner, to the Improvements and Finance Committee of the Corporation of London, states that at the end of 1912 there were 329 open-type arc lamps in use. These were maintained by the City of London Electric Lighting Co. at £26 per lamp. There were also 94 Oliver and Excello flame arcs maintained at £17 10s., and 45 metal filament lamps (21 of these were of 75 c.p., 12 of 100 c.p., 9 of 200 c.p., 1 of 300 c.p., and 2 of 600 c.p.) in use during the year. Last year there were 332 open arcs, 92 flame lamps, and 46 metal filament lamps. The number of defective lamps reported was 63, for which deductions from the accounts amounting to £13 5s. 2d. were made.

As a result of 69 notifications by the Corporation 2 miles 1,893 yards of disused overhead wires were removed by the owners. During the year the number of private owners and companies owning overhead lines was 190 and 12 respectively

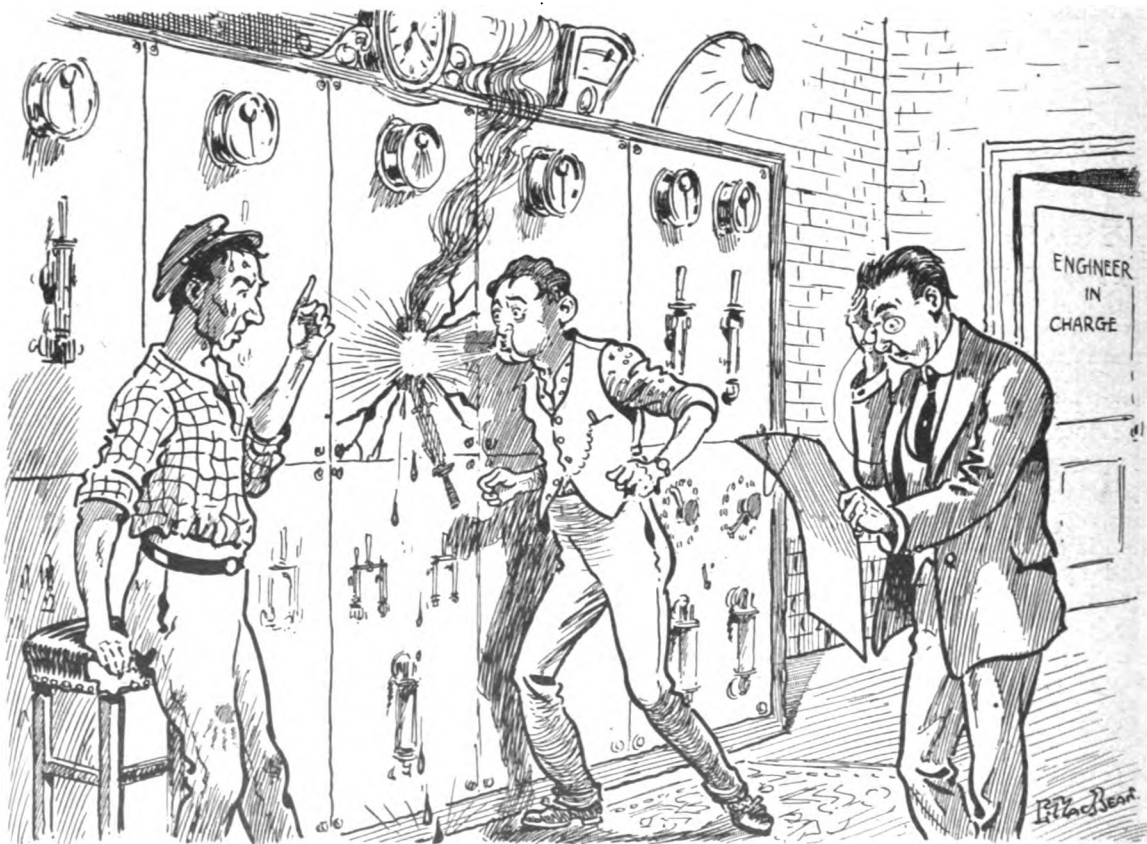
compared with 135 and 13 last year. Special attention has been given to the question of lines crossing roofs at a less distance than 6 ft., and as a result many removals have been ordered. There were given 429 notifications of defective materials, 125 of broken wires, and 168 of other contraventions of the bye-laws. The report also states:—

"Although the exchange telephone systems of the Post Office have been greatly extended, there is still a small demand for private 'direct' lines. The necessity of an immediate connection for business purposes is one cause of this increase, and there is nothing to prevent such lines being erected by wiring contractors for firms having premises in more than one part of the City, or between one or more different firms, subject, in the latter case, to license from H.M. Postmaster-General."

No less than 4,493 notices were given during the year by the Post Office to open manholes for repairs, exclusive of inspection, whilst 335 new services were laid, and several new boxes constructed. The City of London Electric Lighting Co. gave notices for laying 200 services, and for the construction of 9 new boxes. The Charing Cross, West End, & City Electricity Supply Co. gave 118 notices for laying services.

**The "Northampton" Magazine.**—The most recent issue of the Northampton Polytechnic Institute Day Students' Union Magazine contains a biography of Professor R. Mullineux Walmsley, abstracts of several engineering papers contributed by past and present students, as well as some miscellaneous information relating to the doings of the Students' Union. The latter is a particularly active body in the matter of entertainments.

**Defrauding a Supply Company.**—At Hebburn Police Court last week George Hunter, a labourer, was fined 40s. and costs or one month in default for short-circuiting a slot meter. The fraud had been going on for about two months, and the Northern Counties Electricity Supply Company has lost about 7s. 6d. When the meter inspector called he noticed pins being removed from the wires by another person who was also charged, but was unable to attend at the Court, on account of illness. The case against this defendant, Margaret Bruce, was adjourned for two weeks.



**NEW ASSISTANT** (reading out instructions in absence of engineer):—"If a feeder circuit-breaker blows out within five minutes of its being replaced, something serious is the matter and —"

**SWITCHBOARD ATTENDANT** (trying to blow arc out):—"We have been trying to blow this out for four minutes, so if it will hold out another minute we shall be all right."

## ELECTRICAL ENGINEERING IN THE MINING AND METAL INDUSTRIES

Correspondence on any of the subjects dealt with in this Section is cordially invited from our Readers.

The Editor is willing to insert letters over a *nom de plume*, but Correspondents should send their full names and addresses in all cases.

Letters should be addressed, "THE EDITOR, ELECTRICAL ENGINEERING, 203-206 Temple Chambers, London, E.C.," and should reach this office by the 21st of the month.

Correspondents are requested to write on one side of the paper only.

### ELECTRICAL DRIVING IN A METAL MILL

WE are enabled, by the courtesy of Messrs. George Johnson & Co., to give an account of the conversion to electric drive of their mills in the Birmingham district, where brass, copper and white metal is rolled cold in non-reversing rolls.

The mills were originally driven by two main steam engines. One, of 250 I.H.P., was used to drive the brass and copper mill, which contained nine pairs of rolls varying in size from 15 in. by 10 in. to 80 in. by 22 in., while the white-metal mill, which contains thirteen pairs of rolls varying in size from 12 in. by 18 in. to 20 in. by 72 in., was driven by a 150 I.H.P. engine. In both cases heavy flywheels were mounted on the main shafts of the roll train, and the drive was through spur gearing. Energy is now taken from the H.T. mains of the Birmingham Corporation Electric Supply Department at 5,000 volts 25 cycles, three phase. To guard, as far as possible, against failure of supply, H.T. feeders are brought into the works sub-station from two of the Corporation's sub-stations.

From the consumers' panel, which, together with the two feeder panels, is the property of the Corporation, three H.T. cables are carried on porcelain insulators to three oil-immersed switches controlling three transformers of the British Westinghouse Co.'s make; two of these are of 250 and 150 k.v.a.

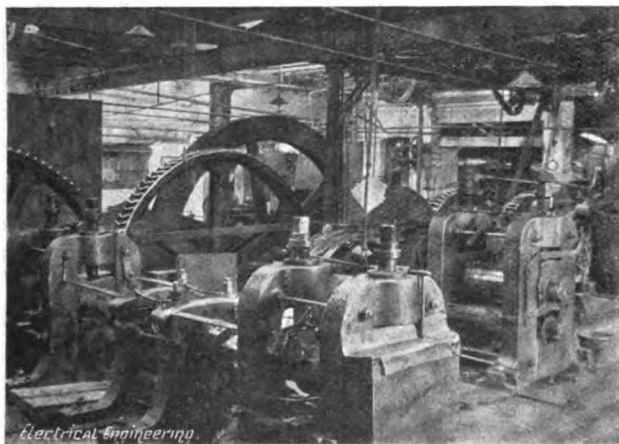


FIG. 1.—BRASS AND COPPER MILL DRIVEN BY MOTOR BELOW THE FLOOR.

capacity for power purposes, the ratio being 5,000/440 volts, and the third of 6 k.v.a. capacity for lighting, with a ratio of 5,000/110 volts. All the transformers are three-phase. The secondaries of the power transformers are connected through switches to the bus bars of the L.T. switchboard. From this board cables are run to the large motors and distributing fuse boards. Mounted on the switchboard and in circuit with each of the outgoing cables is a Dorman & Smith "handle" type choking-tube fuse, also ammeters and integrating energy meters. Where the distributing cables are of large section, and the length of runs considerable, they are three-core, paper insulated and lead covered. In all other cases

the cables are V.I.R., either wire armoured or taped and braided, and carried in galvanised steel tubes.

The conversion was commenced by taking out the steam engine in the brass and copper mill, driving instead by means of a 250-B.H.P. Westinghouse motor, placed in a specially constructed chamber below the floor-level of the mill. This motor is of the three-phase slip-ring type, the synchronous speed being 250 r.p.m. The drive on to the roll train is by means of a spur wheel and pinion, the latter being mounted on a short shaft connected to the motor through a Bandy flexible coupling. Three grid-type resistance units which are connected in series with the rotor cables, are designed so

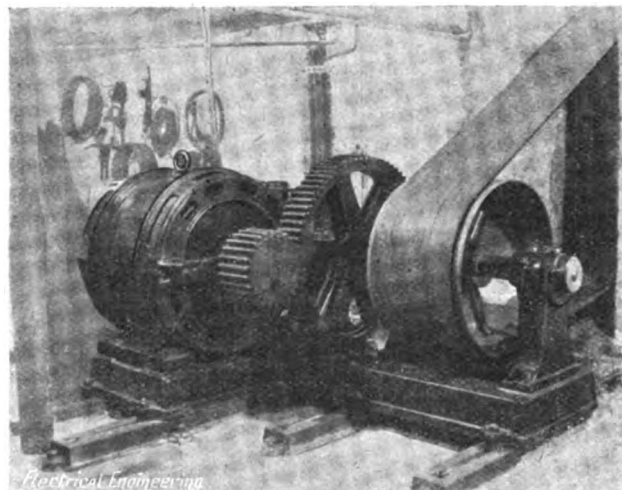


FIG. 2.—100-H.P. MOTOR DRIVING WHITE METAL MILL.

as to give a slip of 10 per cent. at full load of the motor, and thereby make use of the energy stored up in the flywheel. A three-pole oil-immersed stator switch fitted with overload releases and an ammeter, also a liquid-type rotor rheostat are fixed in convenient positions on the wall of the mill. The slip resistances were not fitted until the motor had been in operation for some time, and it is interesting to note that since their installation not only have the peaks in the load been less pronounced, but the drive has been much sweeter, and this without any appreciable increase in the consumption of energy.

Fig. 1 is a view of this mill, the motor chamber being below the floor, at the extreme right of the picture. The flywheel can be clearly seen.

After having thoroughly convinced themselves of the advantages of electric driving, Messrs. Johnson decided to take out the steam engine in the white-metal mill and replace it with a motor. Floor space being valuable, it was decided that the space occupied by the engine should be available for manufacturing purposes. The motor was therefore placed in a cellar adjoining the mill and driven up diagonally on to the flywheel of the main roll train. A 100-B.H.P., three-phase, slip-ring motor of the Phoenix Dynamo Manufacturing Co.'s make was installed. This machine runs at 750 r.p.m. and is fitted with roller bearings.

Mounted on the extended motor bed plate is a second motion shaft running at 243 r.p.m. and driven through a paper pinion and machine-cut cast-iron spur wheel. The drive on to the flywheel is by a heavy laminated Hendry belt. The rim of the flywheel was upwards of an inch out of truth radially, and was, moreover, only 12 in. wide. This was too narrow for a belt to transmit the required power. Both these difficulties were got over by building up a steel rim in two halves of boiler plate 22 in. wide by 1 in. thick. The plate was secured to the wheel by angle brackets bolted to the side of the rim by 1-in. through-bolts. The rim of the wheel was drilled and tapped, and fitted with set pins, by means of which the built-up rim was centred and given

additional security, the ends of the set pins being rivetted over flush with the face of the new rim. This arrangement has proved quite satisfactory.

Grid-type slip resistances which give 10 per cent. drop in speed at full load are connected in the rotor circuit of the motor.

Owing to the combined operation of the slip resistance and the "give" of the belt, a very smooth drive free from shocks to the motor is obtained. The change over from the steam to the electric drive was effected in a few hours without any time being lost in the mill. Fig. 2 is a photograph of the 100-B.H.P. motor in the cellar with the belt going up to the flywheel in the mill above. Fig. 3 shows one corner of the mill; the flywheel, with belt, can be clearly seen, and also the motor control gear on the wall, comprising reversing switch, ammeter, oil-immersed stator switch with automatic releases, and rotor rheostat. It may be mentioned that the reversing switch fitted to this motor and also to the 250-h.p. motor previously described have proved of great convenience when dealing with a "sticker" in the rolls.

On the removal of the steam engine mentioned above there was no further need for the boilers, so they were taken out and in their place was erected a two-storey building with cellar in which the following new machinery for dealing with tin foil was installed, consisting of one pair of breaking-down rolls, 12 in. diameter by 20 in., driven by a 50-h.p. slipping motor; one pair of intermediate rolls, 12 in. by 18 in., driven by a 15-h.p. squirrel-cage motor; three pairs of finishing rolls, 9 in. by 18 in. One of these is driven by a 25-h.p.

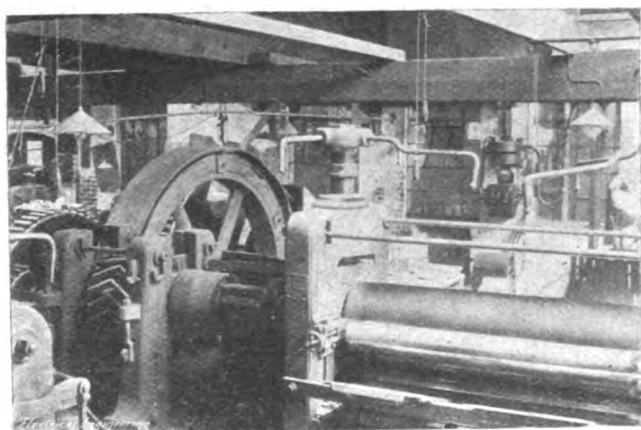


FIG. 3.—WHITE METAL MILL SHOWING RECONSTRUCTED FLYWHEEL DRIVEN FROM BELOW.

motor, and the other two by variable-speed, squirrel-cage machines, each having outputs of 13,  $8\frac{1}{2}$ ,  $6\frac{1}{2}$ , B.H.P., at 715, 480, 365 r.p.m. full-load speed. Nine cables are brought out from each variable-speed motor to a special pedal-operated tramway-type controller having a ratchet motion, so arranged that on depressing the pedal the motor starts up on the lowest speed, successive depressions of the controller raising the speed. A hand-operated lever enables the reverse series of operations to be effected. As these two pairs of rolls are used for very fine work it was found by experience to be necessary to have variable-speed motors, because what is a reasonable speed for rolling when once the metal is started in the rolls is altogether too fast for starting. This point will be appreciated when it is stated that Messrs. Johnson can roll down to 0.00075 in. in lead foil and 13,000 sq. in. to the lb. in pure tin; tin or lead foil of this thickness being exceedingly fragile. With the three speeds above mentioned any thickness of metal can be dealt with expeditiously and with ease. In addition to the motors already described, there are five machines varying from 5 to 15 B.H.P. installed in different parts of the works and used to drive embossing and tinning rolls, pumps, and fitting shops, &c.; these are all squirrel-cage machines having star-delta starters.

As in the event of an accident occurring it may be a matter of vital importance to bring the rolls to rest in the shortest possible time, an emergency switch has been provided at each pair of rolls connected to each of the two large motors. These switches are connected up in series with the no-volts release coils on the starters by means of two No. 18 S.W.G., V.I.R. cables run in G.T. conduit; the switches are placed on the roof trusses, and are operated through two cords with a red handle at the end of one and a black handle at the end of

the other. The red handle, which hangs lowest, and is the most obvious to a man in a hurry, has to be pulled to stop the motor.

The whole of the premises are electrically lighted by metal-filament lamps of 100, 50 and 25 watt capacity, those of the largest size being used for general lighting in the large mills. When a high-tension power supply is taken from the Birmingham Corporation mains they allow energy for lighting to be taken at the same rate as for power; as Messrs. Johnson obtain their energy at 0.8d. per unit, this obviously puts all rival methods of illumination out of court.

As regards economy, Messrs. Johnson state that the cost of electrical energy is considerably less than was the cost of coal alone, apart from the cost of coal and ash handling, stoker's wages, oil and water, &c.

On the score of convenience, the installation above described has fully justified itself. As current is obtained from the Corporation supply mains, energy is available at any moment day or night. The saving in space has been so considerable that a large addition to the revenue earning plant has been made, which could not otherwise have been done owing to the cramped position of the works. Also the annoyance caused by dirt and dust due to coal and ash handling, and the obstruction caused by carts and barrows has been got rid of.

In conclusion, we wish to express our thanks to Messrs. G. Johnson & Co. for permission to describe their interesting installation, and to Messrs. Moffett and Rosher, the Consulting Engineers, who designed and supervised the scheme, for furnishing us with the technical particulars.

## WATER POWER SCHEME FOR THE MOUNT LYELL MINES

WE have received from Mr. G. W. D. Moffat, of Sydney, some interesting notes on the large water-power scheme projected by the Mount Lyell Mining and Railway Co. of Tasmania, who have decided to instal generating plant and transmission lines at a cost of some £100,000 for utilising the power resources of Lake Margaret. This lake, in Southern Tasmania, is about eight miles from Queenstown, which is the mining town for Mount Lyell, at an altitude of 2,140 feet, and is 140 feet deep in places. The catchment area is 7.2 square miles. The rainfall recorded last year was 150 in., and was evenly distributed throughout the year. The lake has never been known to freeze. It is the intention of the Company to convey water from this lake from a depth of 20 feet for a distance of about three miles to a site where a high-tension three-phase power station will be erected, and current will be conveyed from this point for a distance of five miles, where a sub-station will be situated in the immediate vicinity of the now existing power house at Queenstown. The water will be conveyed for a distance of 108 chains by means of substantial wooden pipes, along fairly level country, until the pressure is increased by a steep gradient, and here steel pipes will lead to the power house at the foot of the incline down a gradient of 1 in 14. The static head available will be 1,152 feet. The discharge from the turbines will flow into a stream some 3 chains away. The work of clearing away the forest for the transmission conductors and pipeline is almost complete; an extra haulage plant is in the course of construction for the purpose of laying the pipes, and the site for the power station is almost cleared.

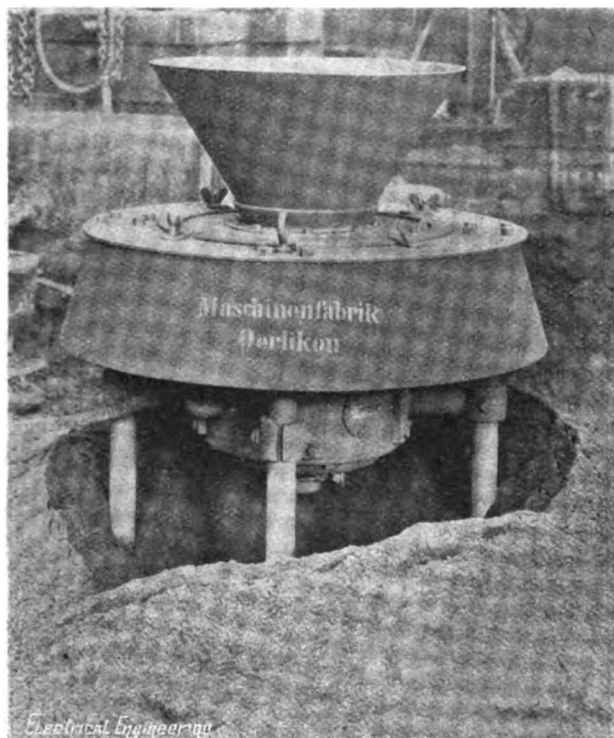
The power plant will consist of four 1,750 b.h.p. water turbines or Pelton wheels direct coupled to four 1,200 kw. alternators. Current will be transmitted at 6,600 volts to the sub-station, where by means of eight 700 kw. transformers the pressure will be converted to 500 volts 50 cycles. Motor generators will also be installed for obtaining D.C. for driving some of the machinery, which requires a flexibility of speed control. Two of the alternators are to be used as spares, although the transmission line is to be of ample capacity to carry the full output of the station.

It is interesting to note that in the last twenty years roughly  $1\frac{1}{2}$  million tons of timber obtained from the neighbouring forests has been consumed as fuel, and the Company's fuel bill per annum exceeds £50,000. Mr. Wright, the Company's Chief Engineer, has estimated that under present conditions they are paying between £24 and £25 per b.h.p. per annum, and that by the installation of the new power plant, power will cost the Company slightly under £8 per b.h.p. per annum. These figures include all such items as depreciation, interest on capital outlay, wages, maintenance, &c.



### A CENTRIFUGAL DISINTEGRATOR

A MOTOR-DRIVEN centrifugal disintegrator, especially intended for moulding sand for foundry purposes, has



CENTRIFUGAL DISINTEGRATOR.

recently been put on the market by the Maschinenfabrik Oerlikon (Oswaldstre House, 34-35 Norfolk Street, Strand,

W.C.). As may be seen from the accompanying illustration, the machine is compact and rigidly constructed. The frame is formed of four pillars bolted on to an iron base ring; and these pillars support the outer casing, which consists of a circular cover plate, carrying a feed hopper and supporting a wide conical flange, which extends downwards and acts as a shield to prevent dispersion of the sand treated in the machine. Below this hood, which is easily detachable, is mounted a vertical electro-motor, completely enclosed in a dust-proof casing and secured on the pillars by bolted cross arms. Keyed on to the upper end of the motor shaft is a horizontal disc, provided in the neighbourhood of its periphery with three concentric rows of staggered pins of circular cross-section. The sand shovelled into the feed hopper is flung outward radially by the centrifugal force against the rows of pins, between which it passes, to fall down against the flange of the hood in a finely-divided condition on to the floor, where it accumulates in an annular heap, and can then be removed for use. Any particles of iron in the sand will collect in the middle of the horizontal disc, and in front of the rows of pins, whence they can be easily removed after the cover is taken off. No further screening is required, even if the sand is to be used direct for moulding machine parts, &c. A 2-h.p. D.C. or three-phase motor running at about 960 r.p.m. is provided, and the machine can deal with between 6 and 10 cwt. of sand per minute, which is as much as two or three men can keep on shovelling into the hopper. A saving of 50 per cent. in wages is claimed over hand screening. The complete machine measures about 4 ft. in height by 8 ft. in diameter, and needs no special foundation.

**New Mining Regulations.**—It has been officially announced by the Secretary of State for the Home Department that the General Regulations under the Coal Mines Act, 1911, will come into force on September 15th. The regulations in so far as they affect the use of electricity in mines have been dealt with in *ELECTRICAL ENGINEERING*, February 6th, p. 74, May 1st, p. 244, and June 3rd, p. 395.

**Gas Ignition by the Filaments of Incandescent Lamps.**—The United States Bureau of Mines has recently published the results of a large number of tests carried out to determine whether standard and ordinary miniature incandescent lamps with both carbon and tungsten filaments cause ignition of gas at rest. It was found that the naked carbon filaments of standard lamps, burning at rated voltage, will invariably ignite explosive gaseous mixtures. If gas can reach the filaments of standard lamps without breaking the filaments or producing partial combustion within the bulbs, the explosive gaseous mixture is sure to be ignited. Several sizes of both standard and miniature lamps, when smashed while burning at rated voltage, will ignite gas. Standard lamps that do not usually ignite explosive gaseous mixtures may do so if the broken pieces of the filament cause a short circuit when the lamps are smashed. Low candle-power lamps of high voltage are less likely to ignite gas than those of higher candle-power or low voltage. The experiments did not prove conclusively that the spark occurring when filaments are broken is not the cause of gas ignition, but they gave support to that view. It was conclusively shown, however, that glowing filaments may ignite gas independently of any sparking.

**Prosecutions under the Special Rules.**—At Chesterfield on July 19th Mr. T. H. Elliott, Manager of the Langwith Colliery of the Sheepbridge Coal & Iron Co., was summoned for the following alleged breaches of the electrical special rules: (1) Neglecting to earth the metallic covering of a lamp-holder. (2) Not protecting live parts of a switch and fuse. (3) Not having a metallic switchbox earthed. The case arose out of the death of a lad who had apparently received a shock from touching an unearthed lamp-holder which had become live. The other two charges were the result of an examination made after the accident. Mr. Robert Nelson, Electrical Inspector of Mines, gave evidence as to the danger of such non-earthed parts. The defence was that the manager had taken every reasonable precaution by the appointment of qualified electricians to prevent contravention of the electrical rules. The Bench imposed a fine of £1 and £5 5s. as costs in regard to the "non-earthed lamp-holder," and dismissed the other two charges.

A somewhat similar case, but where, happily, the irregularity was discovered without loss of life occurring, was heard at Nottingham on July 23rd, when Mr. J. Whyte, Manager of the New London Colliery of the Digby Colliery Co., was charged first with omitting to earth the cover of the starter of a pump-motor, and secondly with having a cable in the pit which was non-insulated in parts. When it was explained that on the inspector's visit the starter was under repair, the first charge was withdrawn, but as regards the second charge, which related to a cable which was so worn that the conductor was bare in places, a fine of £5 with £3 3s. costs was imposed. It was stated that the proprietors of the pit had been spending on an average £75 per week lately in remedying existing defects.

FOR  
BRITISH  
MANUFACTURED  
PAPER  
INSULATED  
CABLES  
THE UNION  
CABLE  
CO., LD

DAGENHAM DOCK,  
ESSEX.

## ELECTRIC MINING AND METALLURGICAL PATENTS OF JULY

### Mining.

The specifications of particular interest to mining electrical engineers, which have been published by the Patent Office during July, include in their number No. 3,903 of 1912 by E. A. Hailwood, which describes an igniting point for oil safety lamps having several radiating arms, so that one arm is always in position for igniting the wick whatever the position of the screw wick adjuster. This is an improvement on the design described in specification No. 18,415 of 1910. In specification No. 14,202 of 1912 by W. Thomson and J. H. Rothwell, a locking gear for an electric safety lamp is described, which allows the light to be switched on and off by a partial rotation of the upper and lower parts of the lamp, when the lamp is locked with either the lead plug or magnetic arrangement, or by a combination of the two. There are several improvements on the blasting machine described in specification No. 27,318A of 1906 are given in patent No. 22,450 of 1912 by the Sterling Telephone & Electric Co., Ltd., as communicated to them by Schaffler & Co., of Vienna. One end of the armature spindle and the driving gearing are supported in a single frame cast with the pole-pieces; and the second pole-piece is also fixed to this frame by non-magnetic bolts serving as distance pieces. A protruding sliding pin in the frame limits the motion of the driving gear and the clutch between driving-spindle and armature is of the ball type. The outer member is eccentric to the armature.

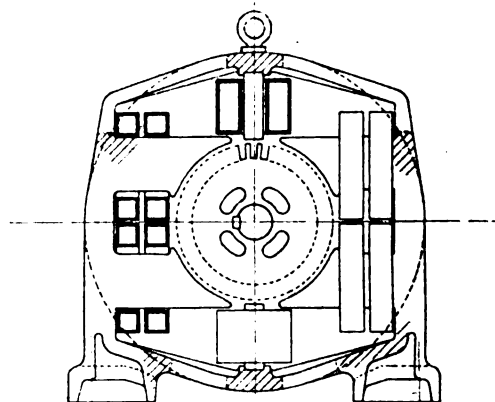
### Metallurgical.

The patents of particular interest to electro-metallurgists include No. 25,858 of 1912 by P. L. T. Héroult (New York). This is for a process for making high-grade pig-iron in which the pig as it comes from the blast furnace, cupola, or mixer is conveyed to a basic-lined electric furnace in a molten state, where the slag is maintained fluid, and is free from iron oxide. The atmosphere is non-oxidising, so that the sulphur is eliminated by the action of the slag. In specification No. 16,001 of 1912 by V. Stobie (Stobie Steel Co., Sheffield) the same object is attained by subjecting the iron in the electric furnace to the action of an iron-free slag, whilst carbonic acid gas from limestone which has been added to the bath is made to agitate the metal. In specification No. 20,557 of 1912, G. Michaud and E. Delasson (France) describe a method of refining tin in which an electrolyte, obtained by dissolving tin protochloride in water to which sulphuric acid, 1 per cent. of magnesium chloride, and 1 per cent. of boric acid are added. The tin is removed from the kathodes as it is formed. In specification No. 24,203 of 1912, A. L. C. Nodon (France) describes an electrolytic bath for recovering tin from waste tinned metals, &c., consisting of water 87.5 kg., sodium fluoride 6.0 kg., sodium pyrophosphate 0.5 kg., and hydrochloric acid 6.0 kg. Other ingredients may be substituted. In specifications Nos. 9,147 and 24,643 of 1912 by the Maschinenbau-Anstalt Humboldt (Germany), improvements in magnetic separators are described. The chief improvement in the first specification consists in providing auxiliary magnetising coils on the poles on rotary annular machines, so that the pole strengths may be adjusted independently of the main winding. An adjustable ring is also provided so that the main bearing is magnetically relieved of pressure on it. In the second specification the chief improvement consists of a design and arrangement of a single roller between the magnet poles so that the magnetisable particles are carried away by sharp ribs on it.

## A NEW PATTERN OF COMMUTATING POLE MOTOR

AFTER several years of careful experimenting, Newton's, Ltd. (Taunton), are placing on the market a commutating pole motor of special construction. The magnet system (with the exception of the commutating poles) is of cast-iron, and in one piece, and the frame is ventilated so as to provide better ventilation in a vertical direction than hitherto. The construction of the field system is shown in the illustration. The use of cast-iron combined with the particular position of the main field coils gives a better torque curve in motors having series or compound field coils. Owing, too, to the poles being solid and of special shape, the makers find it

possible to guarantee an absolutely silent running machine. One of the chief characteristics of the construction is that the usual magnetic leakage is absent. This, combined with the shortest possible path for main flux, makes a remarkably economical magnet system. The no-load losses are a minimum and the efficiency curve is very good. In a 10-B.H.P. continuous rated motor running at 850 r.p.m. the constant losses

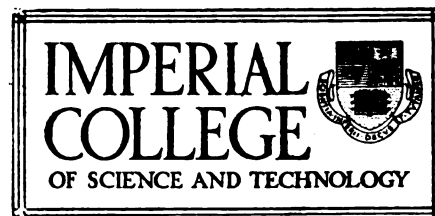


CROSS SECTION OF COMMUTATING POLE MOTOR.

at full load equal 550 watts, and the variable losses 700 watts, giving an overall efficiency of 85.4 per cent. at full load, 85 per cent. at three-quarter load, and 83 per cent. at half load. The weight of these machines is about the same as of the usual steel construction.

A number of these machines have been supplied for quick-rated reversible lift motors, &c., as well as for continuous-rated machines.

The temperature rise is within the standard specified by the British Engineering Standards Committee.



SOUTH KENSINGTON, LONDON, S.W.

VISITOR—H.M. The KING.

### CITY AND GUILDS (ENGINEERING) COLLEGE

The City and Guilds (Engineering) College, the Engineering Section of the Imperial College, provides complete Courses of Instruction leading up to, and including, the highest specialised instruction for Day Students, with the object of fitting them to take leading positions in the industrial world as Civil, Mechanical or Electrical Engineers; Scientific Advisers, Investigators or Experts in the Engineering industries; and for those already practising their professions who desire to take up more advanced courses of training and research in connection with the branches of Engineering in which they are specially interested.

The Courses are as follows:—

**MECHANICAL ENGINEERING AND MOTIVE POWER**—  
Under the direction of Prof. DALBY, F.R.S., M.Inst.C.E.

**CIVIL ENGINEERING**—  
Prof. DIXON, M.Inst.C.E.

**ELECTRICAL ENGINEERING**—  
Under the direction of Prof. MATHER, F.R.S., M.I.E.E.

The following Diplomas are awarded to students who satisfactorily complete Courses of from two to four years:—

**The Association of the City and Guilds of London Institute** ... (A.C.G.I.)

For admission to the Courses qualifying for this Diploma candidates are required to pass the entrance or matriculation examination of the College held in September (application to be made not later than the first Monday); or to have passed the matriculation of the University of London in certain subjects.

**The Diploma of the Imperial College** ... (D.I.C.)  
(For advanced specialised or fourth year work.)

Further information and the Prospectus of the College may be obtained on application to the Registrar.

# QUESTIONS AND ANSWERS BY PRACTICAL MEN

## RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

## QUESTION No. 1,350.

It is required to operate three 20,000-volt isolating switches simultaneously by means of fixed handle and link gear. The handle will be about 9 or 10 ft. away from the switches. Explain how you would do this, giving approximate dimensions of the apparatus in a sketch. The device must be mechanically and electrically sound, as the switches are not for a laboratory, but for use under the worst conditions. The gear must not be expensive to construct.—"ABSONDERN."

(Replies must be received not later than first post, August 14th.)

## ANSWERS TO No. 1,348.

A double pole circuit-breaker is required for a 500 ampere, continuous-current, 100-volt supply circuit. The double-pole switches are to be operated by means of a solenoid (mounted vertically) through a toggle mechanism. The switches are to be jammed against the contacts in the "On" position. Give a suitable design for the toggle mechanism and switch contacts, &c., showing how the "holding on pressure," and the "initial pull" to operate the solenoid can be ascertained. No automatic safety devices are required in the circuit breaker.—"B. C."

The first award (10s.) is given to "M. M." for the following reply:—

The sketches (Figs. 1, 2 and 3) show a suggested design to meet the given conditions. Contact pieces of this type should be well made; not only should there be plenty of metal, but the laminations must make good contact. Some similar contacts under the charge of the writer are at a current-density of 300 amps. per sq. in., and yet, if kept in good order, work fairly well; if dirty they get very hot. Let the area of the laminations be  $1.5 \times 2.25 = 3.375$  sq. in., and attach to end of switch lever as per Fig. 3. The slight "set" allows a better contact to be made, and if a saw-draft is made as *a*, this will be a further improvement. The toggle levers A and B (Fig. 1) are each 2 in. in length; solenoid cores to rise and fall 1 in. This will give a horizontal movement of  $R = 0.55$  in. This amount multiplied by length of switch lever gives a break of nearly 3 in. It will be noticed that P, Q and T are fixed points; to save confusion, method of holding P is not shown, Q is adjustable by means of the nuts shown, and solenoid works round T to allow for alteration in centres. Any out-of-balance between the solenoid cores and the switch levers can be adjusted by means of the spring S; i.e., the spring will draw up the cores and open the switches when the solenoid is not energised. To save winding on the solenoid it will be best to work the iron, at beginning of stroke at a very low density, say 15,000 lines per sq. in., allowing for a leakage of 30 per cent. density in gaps =  $\frac{70 \times 15,000}{100} = 10,500$  per sq. in. A total pull of 6 lb. at beginning of the stroke should give an ample margin. Area of cores will then be obtained from:  $P = \frac{B^2 A}{72,200,000}$  where  $P$  = pull in lbs.,  $B$  = density in lines per sq. in.,  $A$  = area in sq. in.

$$\therefore A = \frac{3 \times 72,200,000}{10,500 \times 10,500} = \frac{1,444}{735} \text{ sq. in., and diameter} = 1.5 \text{ in. (approx.)}$$

The ampere-turns required may be calculated from: amp.-turns =  $0.3133 B l$ , where  $B$  = density in lines per sq. in.,  $l$  = length of gap in inches.  $\therefore$  amp.-turns =  $0.3133 \times 10,500 \times 1 = 3,290$  (approx.).

With No. 16 D.C.C. wire and a winding space 6.5 in. in length we can get eighty turns per layer. Eight layers =  $8 \times 80 = 640$  turns, and at 5 amperes we have  $640 \times 5 = 3,200$

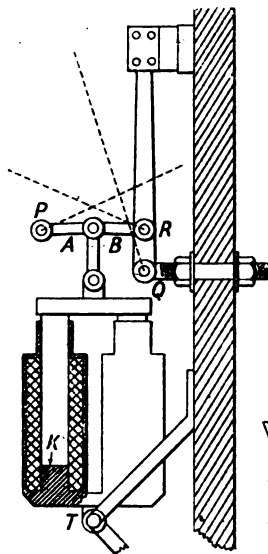


FIG. 1.

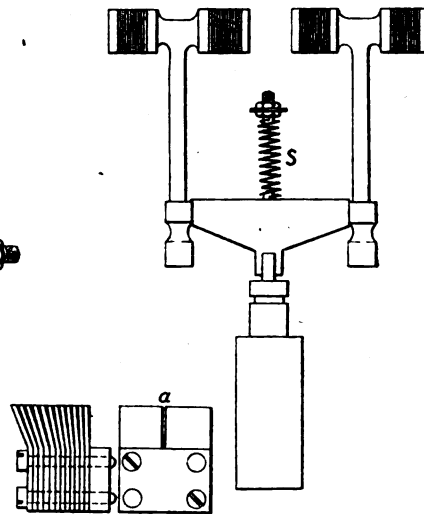


FIG. 2.

FIG. 3.

amp.-turns. Loss in winding = 22.5 watts (approx.). This is about 0.4 watt per sq. in. of winding-surface; therefore temperature-rise should not be excessive. Pull at time of contact will very much exceed that at commencement of stroke; pull with different air gaps can be calculated from the above-given formulae. Below the cores, at K, a thin disc of leather or fibre will act as a buffer, and also prevent any tendency of cores to stick.

This is but an outlined method of procedure; to treat the question fully in detail would take up far too much space. If the 500 amperes is only reached occasionally, the switch might be made smaller. Again, it would be an advantage to fit a carbon break to minimise effect of sparking; also, by fitting a catch, the switch could be closed, and then current cut off the solenoid. This would effect a saving, and a small magnet could be arranged to release catch when desired.

The second award (5s.) is made to "S. C. J.," who writes as follows:—

The design of suitable switch contacts is given in Fig. 4. The fixed contact blocks call for no special comment. The brush contacts should be of laminated copper, backed by a steel spring. Renewable auxiliary contacts and a magnetic blow-out of the usual type should be fitted to each pole. The general arrangement of the switches, levers and solenoid is shown in Fig. 6, which also gives the connections. The small auxiliary switch cuts in a resistance, which decreases the "operating" current when the main switches are closed.

The design of a suitable operating solenoid is largely a matter of trial and experience. The initial pull required might be ascertained as follows, referring to Fig. 5:— $F = \frac{S}{2 \cos \theta}$ , and  $Fd = \frac{W}{2} D$ .  $\therefore S = \frac{WD \cos \theta}{d}$ , where  $S$  = pull of solenoid;  $\theta$  = angle of toggle levers to direction of pull of solenoid;  $F$  = push of toggle levers;  $\frac{W}{2}$  = weight of half-moving mechanism;  $d$  = vertical distance of  $F$  from fulcrum  $f$ ;  $D$  = vertical distance of  $\frac{W}{2}$  from fulcrum  $f$ . An allowance must be made for frictional losses. The holding-on pressure

# "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

## Specifications Published July 31st, 1913

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

**Names in italics indicate communicators of inventions from abroad.**  
**8,197/12. High-frequency Currents.** W. DUBILIER. To improve the efficiency of high-pressure or high-frequency induction coils or transformers, the circuits are arranged so that in the primary circuit of one transformer is an adjustable interrupter, across which is a condenser in series with the primary of a second transformer, whose secondary may be connected to the secondary of the first transformer. Two figures.

**13,463/12. Signalling and Controlling Ships' Courses.** D. J. MORGAN. Signals controlled by the hand-lever of a ship's steering telegraph indicate to other vessels a contemplated change in the course of the vessel. The helm is locked so that no course contrary to that indicated may be taken, and beams of light are projected on to the bridge so that the officer in charge can see that his orders are being carried out. Thirteen figures.

**15,927/12. Arc Lamp Electrodes.** M. A. HERWIG. A rigid metallic connector extends a short way into the electrode, with which it is intimately connected. The projecting end of the connector is secured in an electrode holder. Eleven figures.

**16,014/12. Nitrogen Fixation Furnace.** E. K. SCOTT. The electrodes of a polyphase furnace are arranged to give a concentrated conical flame when supplied with air from beneath. A steam generator is arranged to form a water-cooled roof to the furnace, so that the gases from the arc come in direct contact with it. Two figures.

**18,017/12. Humidifying Radiator.** H. H. GRUNDY. It is arranged that the heating element can be set to different positions within a casing which is provided with a moisture-producing water belt. The element may be spiral in form and adjustably mounted on tie-rods which hold the parts of the heater in position. Two figures.

**18,112/12. High-pressure Mercury Vapour Lamp.** B.T.H. Co. (*G.E.Co., U.S.A.*). The idle space in the envelope communicating with the arc chamber is filled with solid material so as to reduce the condensation of mercury, and thereby increase the pressure of mercury vapour in the lamp. Three figures.

**18,799/12. Static Spark Generator.** F. NEHMER. The apparatus is intended for lighting gas or inflammable vapour. The field plates on a stationary disc are of curved form extending from the circumference towards the centre, and of greater length than the radius. Curved sections on the rotor are also provided. Seven figures.

**24,484/12. Salient Pole Rotating Field Magnets.** F. LUNGSTROM. The windings are sub-divided and preferably formed of spirally wound strip. The sections lying between the centre and the end are supported against centrifugal force by projections on the core. Air spaces are arranged between the projections and the next section. One figure.

**27,535/12. Loaded Telephone Lines.** F. A. BECKER. This specification is an addition to No. 65/11. Inductive shunts are arranged between lead, and return at a maximum distance apart of  $\frac{1}{2}$  wave-length existing before their insertion. The total loss for each compensator is such that the maximum total effective ohmic resistance is  $(\sqrt{y^2+1}-y)$  times the reactance of the line capacity of the corresponding conductor elements from the frequency transmitted;  $y$  is the denominator of the fraction to which the line attenuation is to be decreased.

**29,149/12. Automobile Lamps.** A. A. GODIN. Two diametrically opposite stems for carrying the leading-in wires and a dead wire connecting the inner ends of the stems, which may be attached to the filament, are provided. This prevents the stretching of the filament. A suitable slotted reflector is also used to accommodate the stems, which are provided with non-rotatable terminals. Two figures.

**3,853/13. Leakage Telephony and Telegraphy.** SIGNAL GES. The receiving instrument is connected to the secondary of a transformer of which the primary and the leads connecting it to the submerged receivers are of very low resistance. A ship's hull may be connected to the low resistance primary of each of the two transformers necessary. Three figures.

## Specifications Published To-day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free.

Summaries of some of the more important of these patents will appear in our next issue.

**Distributing Systems, &c.:** ECKMANN [Load equalising on A.C. motor system] 9,174/13.

**Dynamos and Motors:** FRENCH WESTINGHOUSE CO., and LEBLANC [Automatic balancing] 16,949/12

**Electrometallurgy and Electrochemistry:** LEE and BRAME [Electroplating] 13,746/12; GES. FÜR ELEKTRO-OSMOSE and SCHWERN [Extraction of water] 10,875/13.

**Heating:** MIDDLECOAT [Water] 26,948/12; HASKELL [Liquid] 8,395/13.

**Ignition:** BLAKE [Spark plugs] 4,381/13.

**Incandescent Lamps:** HERRMANN, 8,198/13.

**Instruments and Meters:** COOPER [Recording] 17,388/12; SIEMENS-SCHUCKERT. [Meters, meter systems, and controlling relays] 25,831/12; FLAMAN [Remote revolution indicators] 26,685/12; CIE POUR LA FABRICATION DES COMPTEURS ET MATERIEL D'USINES A GAS and BROCC [Mercury motor meters] 8,601/13.

**Switchgear, Fuses and Fittings:** DYER [Controller contact fingers] 13,695/12; ELECTRICAL CONDUITS, LTD., and HEMMING [Conduit continuity] 16,104/12; RAILING and GARRARD [Interlocking starters] 21,120/12; [Motor regulating resistances] 21,504/12; ELLISON [Motor starters] 22,423/12; ABBATECOLA [Automatic controllers] 23,542/12; HORTON [Switches] 26,671/12.

**Telephony:** SIEMENS & HALSKE [Call grouping] 28,751/12.

**Traction:** DUCELLIER and GUILLOU [Track circuit signalling] 16,554/12; THOMAS and THOMAS TRANSMISSION, LTD. [Railway motor coaches] 16,852/12; KERR [Automatic train control and signalling] 5,092/13.

**Miscellaneous:** MORETTI [Electric discharge apparatus] 16,164/12; LAKE (*Fabrique Internationale d'Appareils a Magneto S.A.*) [Hand-driven lighting machine] 17,752/12; GROSST [Control for automatic photographic devices] 21,533/12; HORTON [Illuminated revolving advertising apparatus] 23,977/12; O'TOOLE [Discharging electricity from paper in printing machines, &c.] 29,735/12; MILHADO [Portable illuminated advertising pouch and silent salesman] 2,192/13; BRUNO [Clocks] 7,275/13; MORETTI [Discharge apparatus] 13,918/13.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Electrometallurgy and Electrochemistry:** A.G. FÜR ANILIN FABRIKATION [Electrolytic production of hydrosulphates] 13,901/13; BALLY [Transformer furnaces] 16,011/13.

**Instruments:** LANDIS & GYR [Base-plate] 15,811/13.

**Storage Batteries:** WACKWITZ [Grids] 15,719/13.

**Switchgear, &c.:** VOIGT & HAEFFNER [Switches] 8,409/13; KENNEDY [Train-lighting regulators] 15,580/13.

**Telephony and Telegraphy:** SIEMENS & HALSKE [Telephone circuits] 12,651/13; GIRARDEAU [Indirect excitation of oscillatory circuits] 15,869/13.

**Miscellaneous:** BURGER [Primary battery] 15,463/13; DE LA RIBOISIÈRE [Control of automobile doors, &c.] 15,648/13.

## Amendment to Specification

**9,142/11. Telephone Exchange System.** P. JENSEN (*Clement International Engineering Corporation, U.S.A.*). As a result of the extended investigation under Section 8 of the Act this specification has been amended by way of disclaimer.

## Restoration of Lapsed Patent

**22,819/08. Electric Clocks.** T. J. MURDAY. An order was made on July 25th restoring this patent, which lapsed last October, owing to non-payment of the renewal fee. (*ELECTRICAL ENGINEERING*, April 24th, p. 232.)

The following Amended Specifications may now be obtained.

**1,950/08. Telephone Switch Hooks.** J. E. KINGSBURY (*W. E. Co.*) (*Bell Telephone Mfg. Co., Antwerp*).

**9,142/11. Telephone Exchange Systems.** P. JENSEN (*Clement International Engng. Corporation, U.S.A.*).

**10,600/12. Footsteps for Telegraph Poles.** H. LENCH.

## Expired Patents

The following are the more important Patents that have become void through non-payment of renewal fees.

**Arc Lamps:** W. J. DAVY [Flame lamps with separate condensing chamber] 8,308/08.

**Dynamos and Motors:** V. A. FENN [Single-phase repulsion-induction motors with sectionalised stator winding] 238/06.

**Heating and Cooking:** VERITY'S, LTD. and H. S. SMITH [Liquid heating element] 8,471/08.

**Switchgear and Fittings:** F. J. B. COLLIS [Adjustable hemispherical reflector for portable or automobile lamps] 8,427/08.

**Traction:** B. T.-H. Co. (*G.E.Co., U.S.A.*) [D.C. track circuits for A.C. railways] 8,027/05; J. RILEY, H. H. C. SEYMOUR and E. K. PERKINS [Cab signalling] 8,788/07.

**Miscellaneous:** C. L. BURDICK [Spraying colour on paper, fabric, &c.] 8,703/03; H. USENER [Ship telegraph] 8,168/05; G. BARKER (*Boiler Room Economy Co., U.S.A.*) [Automatically controlled furnace dampers] 8,795/07; M. MÜLLER [Illuminated moving sign] 22,069/08.



# ADAMS IGRANIC

MOTOR CONTROL GEAR FOR NEWSPAPER PRESSES.

ADAMS  
M<sup>FG</sup> C<sup>Y</sup> L<sup>TD</sup>  
BEDFORD  
AND LONDON

will be given by  $P = \frac{F_1 d_1}{D_1}$ , where  $P$  = pressure on contacts;  $F_1$  = value of  $F$  when  $\theta$  is maximum;  $d_1$  = vertical distance of  $F_1$  from  $f$ ;  $D_1$  = vertical distance of  $P$  from  $f$ .

The mechanism should be so arranged that the angle  $\theta$  is nearly  $90^\circ$  when the switches are on, and it will then

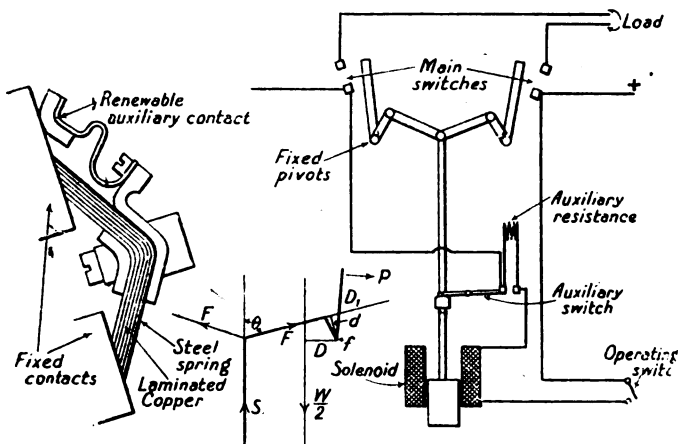


FIG. 4.

FIG. 5.

FIG. 6.

be found that the current in the solenoid may be considerably reduced and still maintain an effective holding-on pressure. It may be mentioned that a switch of this description having no automatic features is usually termed a "contactor."

## ANSWER TO CORRESPONDENT

**ACCUMULATOR.**—If the battery has been out of use for some time, we should advise you to let the makers test its condition in order to ascertain whether it needs special treatment.

## AN AUTOMATIC COAL SAMPLER

**A**N ingenious piece of apparatus has been brought out by the Sturtevant Engineering Co., Ltd. (147 Queen Victoria Street, E.C.), in the shape of an automatic coal crusher and sampler. This should be of considerable use to coal buyers, as not only can a considerable amount of coal be crushed and a sample automatically taken in a very much shorter time than by the hand methods of crushing and quartering, but a thoroughly representative sample is assured.

The coal is fed into a hopper in 3 in. pieces or finer, where it is nipped between the fixed and rotating top crushing members and is subject to gradual reduction until discharged at the periphery below. A sample spout is placed opposite the discharge opening, and is arranged to remove a certain percentage of the product, 5, 10, or 15 per cent. The machine is very simple, massive, and compact, and amply strong to crush coal and the impurities found therein. It runs at slow speed, and is instantly adjustable for fine or coarse work while in operation by simply turning a hand wheel.

**The Magnet Magazine.**—In commenting on the excellent magazine of the General Electric Co. on page 443 of last week's *ELECTRICAL ENGINEERING*, we much regret that the Weichert Electrolytic Bleaching Apparatus was called, by an error, "Pleading apparatus."

**Electric Light Switching.**—A letter from Mr. W. Perren Maycock takes up the discussion which has been proceeding in a contemporary, and refutes certain allegations that the various systems of multiple control developed by A. P. Lundberg and Sons are complicated, and that the amount of economy obtained is not worth the complication entailed. Mr. Maycock points out that the main reason of their great success is convenience, and that the economy in current consumption which follows should be looked upon as a further incidental advantage.

## ELECTRIC TRACTION NOTES

It is reported that, owing to dripping of water in the Loetschberg tunnel on to the conductors, and other difficulties, the running of the full service, which was to have been commenced on August 1st, has been further postponed.

An extension of the Southend Corporation Tramways towards Thorpe Bay has been opened, and it is anticipated that by next spring the complete extension to Thorpe Bay will be completed at an estimated cost of £30,000. A feature of the scheme is that the tramways run in the centre of a road 100 ft. wide.

In the King's Bench Division last week the London County Council were successful in securing the appointment of a person to make a provisional valuation list with a view to the reduced assessment of the L.C.C. tramways in Islington in consequence of the reduction in profits owing to motor omnibus competition. It was stated that similar applications have been made to other Borough Councils, who have agreed. In the last two years the receipts of the L.C.C. tramways in Islington have dropped from £114,000 to £89,000.

In our note last week upon the decision of the House of Lords with regard to the rating of tramways in Tottenham, we inadvertently referred to the Light Railways Act instead of the Tramways Act of 1870. The decision of the House of Lords is to the effect that a tramway constructed under the Tramways Act of 1870 is not a railway for rating purposes, and is therefore not entitled to the three-fourths exemption of the General District Rate. Thus, that portion of the Metropolitan Electric Tramways, Ltd., undertaking which is constructed under the Light Railways Act enjoys the three-fourths exemption, whilst those sections constructed under the Tramways Act do not. In consequence of the above decision, the Accrington Corporation has ordered the repayment of several deducted sums representing three-fourths of the rate for two years, in districts where the Corporation tramways are laid. These sums had been deducted in consequence of the Appeal Court decision, which has now been reversed.

## TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

The latest edition of the handbook for wireless telegraph operators working installations licensed by the Postmaster-General, which has just been issued, is almost twice the size of the book which it supersedes, owing to the revision necessary on account of the regulations decided by the Radiotelegraphic Convention of London last year. The book may be purchased for 3d. through the usual Government channels. It treats mostly with ship and shore stations, and is divided into six sections. The first gives general information, the second deals with the form and acceptance of radio-telegrams, the third gives details relating to special radio-telegrams, such as corrections and inquiries concerning radio-telegrams, and abbreviations to be used for prepaid radio-telegrams, and for night service, &c. Part four deals with charges, accounts, and re-imbursements, while the fifth embraces the entire procedure to be observed in transmission of messages of different kinds. Part six contains the detailed service regulations appended to the international convention, and appendices deal with the international Morse code, official abbreviations, examinations for wireless operators, &c.

At a meeting of the Liverpool and District Amateur Wireless Association on July 31st, Prof. E. W. Marchant and Mr. L. S. Cohen were elected vice-presidents. The subject of protection against lightning risks was discussed, and it was suggested that a double-pole two-way switch could be used, for the purpose of earthing both aerial and also the

## A BIG BILL FOR MATERIALS

may be entirely obviated  
by the regular use of

### CRANE'S MANY SPECIALITIES

for the Electrical and Metal Trades.

CRANE'S "COLD" LACQUERS obviate  
waste by excessive evaporation

CRANE'S SPRAYERS for distributing Paints,  
Lacquers, Varnishes, Enamels, etc., over metals,  
constitute one of the greatest economies of the age.

FREDK. CRANE CHEMICAL CO.,  
Armoury Close, Bordeley Green, Birmingham.

LIST  
C

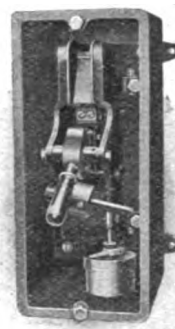


## SWITCHGEAR & COWANS, L<sup>TD</sup>.

Salford,  
MANCHESTER

50 Amps.  
to  
5,000 Amps.

Max.  
Reverse.  
No. Volt.



Large  
Stock  
Kept.

## CIRCUIT BREAKERS

# MICA

BRITISH MICA CO., LD.

Contractors to  
H.M. Government.

Lebanon Road Works,  
Wandsworth, S.W.

Tel.—405 P.O. Putney  
Teleg.—"Micamit," London

Plate Tubes,  
Rings, &c., in

## MICANITE

MICA MICANITE FIBRE.  
OILED FABRICS LEATHEROID

# NSULATION

The Micanite & Insulators Co., Ltd.  
Walthamstow, London, E.

## ELECTRICAL PORCELAIN

OF

HIGHEST QUALITY

APPLY TO

JAMES MACINTYRE & CO., LTD.,  
BURSLEM.

## CRYSELCO ELECTRIC LAMPS.

KEMPSTON WORKS, BEDFORD.

Telephone 1111 and 1112  
Bedford 27 Bedford

## GLASS TUBES AND RODS

FOR ELECTRICAL PURPOSES

GUILBERT-MARTIN  
9, Edmund Place, LONDON, E.C.

## F. WIGGINS & SONS,

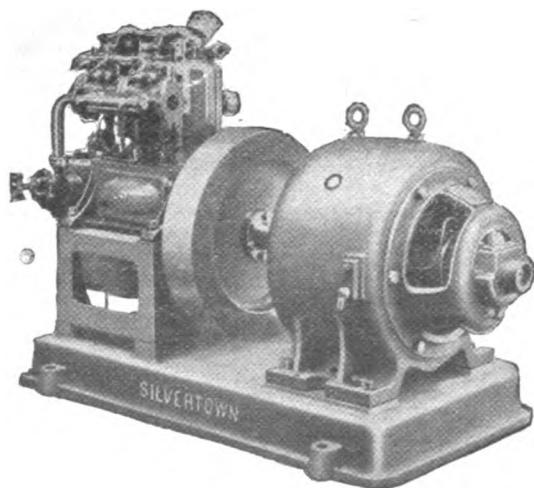
FOR

## MICA INSULATION

102, 103 & 104, MINORIES, LONDON.

# SILVERTOWN

## PETROL-ELECTRIC & PARAFFIN-ELECTRIC PLANT



Specially designed for PRIVATE  
HOUSE, HOTEL, and SHIP  
LIGHTING and POWER.

FURTHER PARTICULARS and  
PRICES ON APPLICATION.

THE  
INDIA RUBBER, GUTTA PERCHA  
AND  
TELEGRAPH WORKS CO., Ltd.

Head Offices:  
106, CANNON ST., LONDON, E.C.

Works:  
SILVERTOWN, LONDON, E.

When corresponding with Advertisers, please mention "Electrical Engineering."

metal guy ropes, if thought necessary. On Saturday afternoon, August 9th, the Association will pay a visit to the Formby Power Station of the L. & Y. Railway, and some notes thereon were given at the meeting by the Hon. Secretary and Treasurer, Mr. Frith, of Crosby.

The new agreement between the Government and the Marconi Co. relating to the chain of Imperial wireless stations has now been issued as a Parliamentary White Paper, together with the Treasury minute on the agreement, and other papers. In answer to a question in the House of Commons, the Postmaster-General has stated that the recommendation of the technical sub-committee of the Imperial Wireless Committee, that before a contract should be entered into the terms should be submitted to an expert committee, is intended to mean that the specification and technical details should be examined by a committee of experts before a contract is made. Such a committee, consisting of technical officers of the Government departments concerned, with whom Mr. Duddell had co-operated, has done so.

On July 31st the Chorillos-Iquique cable failed, the Mollendo-Chorillos section having given out two days previously. Later advices stated that communication with Lima and all telegraph stations beyond in South America had been cut off, but Guayaquil, Santa Elena and Esmerelda can be reached without risk.—The Ottoman Government announced on the 1st inst. that telegraph offices had been opened at Adrianople, Kirkilisse, Baba Eski and Rodosto.—The "via Moulmein" route (via Rahang) has been down since the 27th ult., and traffic is being sent "via Kanburi."—The St. Jacques-Doson cable was down on the 5th inst., and telegrams to Tonkin are subject to delay.

## LOCAL NOTES

**Bavaria: Electricity Supply.**—According to the *Financial News*, the Bavarian Government has granted the Schuckert Co. and Messrs. Brown, Boveri & Co. a monopoly for the supply of electricity in the whole of the Upper and Lower Franconia. It is stated that the intention is to form a separate company to work the concession.

**Beckenham: Supply for Small Domestic Uses.**—The Council has adopted a suggestion by the Electrical Engineer to charge private householders at the rate of 1d. per unit for small domestic uses. Current will be taken from the lighting mains, and the additional units to be charged at 1d. will be based on the average of the previous lighting consumption. Thus, the cost of a double wiring system and two meters will be avoided.

**Chelmsford: Electric Supply Co.**—The question of purchasing the undertaking of the local electric supply company has been under discussion.

**Chorley: Electric Lighting.**—The question of an electricity undertaking has again been revived, and the matter has been referred to a sub-committee. The Council spent £800 in obtaining electric lighting provisional orders some years ago, but the matter was allowed to drop, as it became evident that the installation of plant by the Council would not pay. It is probable now that the Lancashire Electric Power Co. will apply for an order.

**Glasgow: Electricity Accounts.** The accounts for the year to May 31st show a net profit of £7,520, after meeting capital charges, and setting aside £50,307 for depreciation. It is recommended that the charge for private lighting purposes, churches and public schools, except domestic consumers, shall be 3½d. per unit for the first 600 hours' use of the maximum demand, and for heating to the same class of consumers the charge is to be reduced from 1½d. to ¾d. per unit. For domestic consumers, current for cooking, heating and other domestic purposes over 800 hours' use per annum of the maximum demand for lighting, where the current is taken for both purposes through the same meter, is to be reduced from 1d. to ¾d. per unit.

**New Plant.**—With a view to gaining information as to the latest developments in generating plant and central station arrangements, a deputation consisting of one member of the Electricity Committee and Mr. W. W. Lackie, the City Electrical Engineer, is to visit a number of large installations in America.

**Hove: Electricity Undertaking.**—The Corporation, in an endeavour to please all sections of the ratepayers now that

its Bill authorising the taking over of the Hove Co.'s electricity undertaking has passed through both Houses of Parliament, has announced its willingness to receive any suggestions from the ratepayers with regard to its management, which may be sent in. This somewhat unusual course of action is no doubt attributable to the very wide divergence of opinion among the ratepayers as to the policy of taking over the Company's undertaking, and the more or less narrow margin by which the final decision to do so was passed by the Corporation.

**Kingston-on-Thames: Electricity Accounts.**—The deficit upon the electricity undertaking for the past year, reported in our issue for July 31st, was discussed at the last meeting of the Corporation. It was pointed out by the Chairman of the Electricity Committee that, owing to the fact that the new Diesel engine plant which it was hoped would be running by the end of 1912 was not yet completed, the anticipated benefit from the reduction in the cost of fuel from the use of this plant did not come into the accounts for the period under review. It was also pointed out that all electricity undertakings throughout the kingdom have suffered from the increased cost of fuel, the absence of which would have made a very material difference at Kingston last year.

**Kingstown: Electric Lighting.**—Mr. Mooney, M.P., has, by his objection in the House of Commons, been instrumental in holding up the Bill which at one time included the electric lighting Order sanctioned by the Board of Trade to the Dublin Southern District Electric Supply Co., Ltd., for Kingstown. We gave the circumstances with regard to this Order on page 427 in our issue for July 17th. When the Order was before a House of Lords Committee, the Alliance and Dublin Consumers' Gas Co. opposed in order that they might apply next session for an Order for supplying electricity in the three neighbouring districts of Kingstown, Dalkey and Blackrock. Owing to opposition in the House the Board of Trade withdrew the Kingstown Order from the Bill, an action which has created considerable resentment. Mr. Mooney has applied for an evening to discuss the question, but at the time of going to press we have not heard whether this request has been complied with.

**London: City of London: Street Lighting.**—It is anticipated that the scheme for the reorganisation of the lighting of the City in equal proportions by electricity and gas will be completed before the winter.

**Lytham: Electric Lighting.**—The Council is inquiring as to a supply in bulk from the St. Amos-on-Sea Council.

**Workshop: Electric Heating and Cooking.**—In order to obtain practical experience as to the cost, &c., of electric cooking and heating apparatus, the Borough Electrical Engineer has agreed to instal apparatus of this type in his house, and to pay for current at an inclusive rate of £4 per annum, purchasing the apparatus himself. There was some opposition in the Council to the amount to be paid for current, but it was pointed out that if the Council agreed to purchase the apparatus, the Borough Electrical Engineer would pay the ordinary rates for current. Eventually, however, the proposal that Mr. Crowther should buy the apparatus and pay the amount for current mentioned above was passed.

**York: Extension of Supply Area.**—The Electricity Committee is considering the desirability of applying to the Board of Trade for a provisional order authorising the supply of electricity within a number of areas adjacent to the city boundaries.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

### Generating Stations, Sub-Stations, Mains, &c.

**Accrington.**—Estimates are being prepared for mains, services, switchgear, and transformer extensions.

## THE RECORD ELECTRICAL Co., Ltd.

LONDON OFFICE:  
CAXTON HOUSE,  
WESTMINSTER, S.W.

Telephone  
3057 Victoria.  
Telegrams & Cablegrams  
"Infusion,  
London."

MEASURING  
INSTRUMENTS.

RECORD'S PATENT.

WORKS:  
BROADHEATH,  
MANCHESTER.

Telephone:  
164 Altrincham.

Telegrams & Cablegrams:  
"Infusion,  
Altrincham."

Write for Prices & Particulars.

**Australia.**—Switchgear for power house at Canberra. Secretary, Department of Home Affairs, Russell Street, Melbourne. Sept. 1st.

This intimation from the *Board of Trade Journal* is only of use to firms having agents in Australia who can be instructed by cable. A copy of the specification may be seen at 73 Basinghall Street, London, E.C.

**Ballater.**—A scheme for taking a supply of electrical energy from the Aberdeen Corporation mains is under consideration.

**Burton-on-Trent.**—New sub-station switchgear. Borough Electrical Engineer.

**Egypt.**—An electric lighting installation is required for the town of Damanhour. M. le Directeur de la Section des Municipalités et Commissions Locales au Ministère de l'Intérieur, Cairo. October 31st.

**Limerick.**—A Local Government Board inquiry has been held concerning a loan of £9,500 for extensions at the electricity works.

**Lurgan (Ireland).**—A committee has been formed to consider an electric lighting scheme.

**New Zealand.**—An expenditure of £21,500 upon electric lighting is contemplated by the Tauranga Council.

### Wiring

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Bradford.**—New theatre. Architects, Chadwick & Watson, Leeds.

**Cambridge.**—Extensions to infectious diseases hospital.

**Darwen.**—New mill for Sunnyhurst Mill Co.

**Exeter.**—Electric lighting of hospital. Mr. H. Munro, Borough Electrical Engineer.

**Glasgow.**—Large hall for industrial exhibitions, &c. Town Clerk.

**Grantham.**—New library.

**Hastings.**—Electric lighting of several schools during summer holidays. Borough Electrical Engineer. August 11th.

**Liverpool.**—Labour Exchange. H.M. Office of Works, Storey's Gate.

**London: L.C.C.**—320 points at Middle Row school, Kensal Road, N.W. (See advertisement on another page.)

**Lewisham.**—New music hall.

**Luton.**—New school, Tennyson Road.

**Manchester.**—New nurses' home, West Didsbury. South Manchester Board of Guardians. Mr. F. H. Overmann, 49 King Street.

**Nottingham.**—Two new schools.

**Tottenham.**—New school at Vale Road.

**Tunbridge Wells.**—Cinematograph theatre.

**Wigan.**—New school at Pemberton.

### Miscellaneous

**Bristol.**—The Corporation has passed the following resolution:—"That the Electrical Committee be requested to consider with other committees interested the advisability of substituting electricity for gas where the latter is now used in buildings owned or controlled by the Corporation, to take such action as may be agreed upon, and to report to the Council thereon."

**Kirkcaldy.**—The Kirkcaldy and Dysart School Board requires electric lighting supplies. Architect, W. Williamson. Royal Bank Chambers. August 11th.

**West Ham.**—Twelve months' supply of electrical fittings for Union. Clerk, Union Road, Leytonstone, N.E. Sept. 4th.

## MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. George Smith & Son, of 5 Philpot Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night, was £70 5s. to £70 15s. (last week, £69 to £69 10s.).

**"Wotan" Battery Lamps.**—Siemens Bros. Dynamo Works, Limited, will shortly be revising and extending their "Wotan" Battery Lamp List, their past experience having enabled them to effect some material changes. In the meantime, they will be pleased to deal with any special inquiries that may be on hand. Communications should be addressed

to the Battery Lamp Department at Tyssen Street, Dalston, N.E. These lamps are manufactured for voltages from 1.5 to 18, from  $\frac{1}{2}$  to 50 c.p., and have filaments of drawn tungsten wire, as used in the standard type of "Wotan" lamp.

**Advertising.**—We have received from Messrs. Robinson, Greenly & Co. (116 Charing Cross Road, W.C.), who, as we have already announced, are acting as advisers and consultants in connection with electrical and general advertising, an attractive little booklet containing reduced examples of advertisements and other designs prepared by the partners in the firm, and a few words outlining their sphere of action.

**Bankruptcies.**—The first meeting of creditors in the bankruptcy of J. Swainson, trading as J. Swainson & Co., electrical contractor, 22 Booth Street, Manchester, will be held at the Official Receiver's offices, Byrom Street, Manchester, on August 14th, at 3 p.m. The public examination will take place in the Court House, Quay Street, Manchester, at 10 a.m., on September 19th.

## APPOINTMENTS AND PERSONAL NOTES

The salary of Mr. J. H. Cowell, General Manager of the Blackburn Corporation Tramways, is to be increased from £400 to £500 per annum by £25 increments.

The recommendation of the Leicester Electric Lighting Committee that the salary of the Chief Electrical Engineer, Mr. T. R. Smith, be increased from £600 to £900 per annum by annual increments of £100 as from January 1st, 1913, has, after considerable discussion, been passed with the alteration that the increase starts as from July 1st this year.

Plumber-jointers are required by the British Insulated & Helsby Cables, Ltd. (See advertisement on another page.)

Assistant engineers on the Line Side are required by the Constantinople Telephone Co. (See advertisement on another page.)

## COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &c.

**London Electric Supply Companies.**—The Westminster Electric Supply Corporation has declared an interim dividend at the rate of 10 per cent. per annum less income tax on the ordinary shares for the June half year.—The Chelsea Electricity Supply Co. declared an interim dividend at the rate of 4 per cent. less tax on the ordinary shares for the June half year.—An interim dividend at the rate of 8 per cent. for the June half year has been declared upon the ordinary shares of the Kensington & Knightsbridge Electric Lighting Co.—An interim dividend of 6s. per share for the June half year less tax has been declared upon the ordinary shares of the City of London Electric Lighting Co.

An interim dividend for the June half year on the ordinary shares of the Brompton & Kensington Electricity Supply Co. has been declared at 9 per cent. per annum free of tax.

**Brush Electrical Engineering Co.**—As stated in our last issue, a loss of £7,710 was incurred last year. The directors' report points out that although the volume of business has been maintained, a proportion of the contracts on which the company has been working were entered into in previous years and at the lower prices which then prevailed. This circumstance, coupled with the serious effect of the coal and other strikes in the spring of 1912, and the consequent general advance in the cost of materials, has adversely affected the year's operations, and the directors regret that their expectations of improved results have not yet been realised. Another factor affecting the year's results has been the increased cost of insurance under the Workmen's Compensation Act, and the National Health and Unemployment Acts. As the result of conferences between the shareholders' committee and the directors, concerning the scheme of capital reorganisation, an issue has been made of £86,620 prior lien second debenture stock, which was offered to the first and second debenture-holders and ordinary shareholders. Of this amount £51,043 were allotted. The scheme for the reduction of the share capital is delayed pending the completion of the accounts for 1913. As already announced in our columns, the company has acquired a license to manufacture the Ljungström steam turbine, and the first set is now in successful operation at the Willesden power house of the North Metropolitan Electric Power Supply Co.



# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 346 [Vol. IX., No. 33]  
*All rights reserved.*

THURSDAY, AUGUST 14, 1913.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES and TECHNICAL COLLEGE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

*Other Advertisement Rates on Application.*

*Latest Time for Receiving*

Letters for Insertion, Tuesday first post.

Small Advertisements and Official Announcements, Wednesday first post.

Displayed Advertisements, Tuesday first post.

Corrections in Standing Advertisements, Monday first post.

All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 308-306, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Circling, Fleet, London." Telephone No.: 5509 Holborn.

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

THE "glare" bogey is discussed in a short article. (Page 464.)

SOME notes on the arrangements for the next session and other matters relating to the Universities and Technical Colleges are given. (Page 464.)

Two books are reviewed on page 464.

AN article by Mr. E. P. Austin sets out the main principles to be followed in shop-window lighting, and discusses the different conditions met with in various classes of goods displayed. (Page 465.)

A NEW metal filament lamp which gives light of practically the same quality as daylight, and which can be used for matching colours, has been introduced. (Page 466.)

ELECTRICAL methods of measuring temperature were dealt with in a Paper by Mr. R. S. Whipple, read at the Cambridge meeting of the Institution of Mechanical Engineers. (Page 466.)

THE first half of the 300,000 h.p. development scheme of the Mississippi River Power Co., at Keokuk, is now complete. The generating station itself measures 900 ft. by 133 ft., and is to house 30 water turbine-driven vertical-shaft alternators, each capable of delivering 7,500 kw. at 11,000 volts, three-phase, 25 cycles. The pressure is stepped up to 110,000 volts by oil-immersed, water-cooled transformers for transmission to St. Louis and other towns and cities. Motor-generator exciter sets supplied from separate alternators are used. The engine room floor cannot be seen from the main switchboard except from an inspection gallery. (Page 467.)

SOME particulars showing the superiority of modern wire-drawn filaments over older types of lamp for train lighting are given. (Page 468.)

THE reasons for using loose coupling in wireless telegraph aerial circuits are discussed in our Questions and Answers columns. (Page 469.)

THE specifications published by the Patent Office last Thursday include two for geysers by G. R. B. Middlecoat and C. O. Haskell. C. B. Herrmann proposes to frost only the interior of incandescent lamp bulbs; and L. Abbatecola describes a cut-out for incandescent lamp circuits, utilising both the magnetic and thermal properties of the electric current so that the danger of the circuit being opened when the lamps are all switched on together is reduced. Two patents by R. Moretti cover details in the "shock" discharge system for wireless; and W. R. Cooper claims an arrangement for recording instruments in which a spark passes from the pointer through the recording strip. (Page 470.)

THE Bill authorising the Post Office tube railway has been passed by a House of Lords Committee, but the clause empowering the Post Office to supply current themselves has been deleted. An effort is being made to re-introduce this clause in the House of Lords.—A high-speed tube railway is projected from the Strand to the Crystal Palace. (Page 471.)

THE new Marconi contract has now been approved by the House of Commons.—It is possible that a Parliamentary Committee may be appointed to investigate the cost of working the telephones.—Some successful experiments are reported to have been made in Japan in wireless telephony. (Page 471.)

A PROFIT of £2,408 has been made on the year's working of the Halifax Electricity Department, and £5,204 at Greenock, and a surplus of £1,181 is reported at Maidstone. There is, however, a deficit of £214 at Aldrington, and £106 at Gloucester. New supply schemes are contemplated at Boston and Oulton Broad. (Page 473.)

A LOCAL GOVERNMENT BOARD inquiry has been held at Felixstowe (£4,729), and an inquiry is to be held shortly at Belfast (£35,000); wet air filters are required at Rochdale and Bridlington. (Page 473.)

THE goodwill of the Sunbeam Lamp Co. has been acquired by the Armorduct Manufacturing Co. (Page 474.)

### GLARE

WE are glad that, in the course of the discussion on "Photophthalmia" at the International Medical Congress this week, the eye specialists devoted the greater part of their attention to the seaside glare, and that the daily newspapers have mostly seized upon this particularly topical subject and have not raised a glare scare against electric light. There are exceptions, however. The *Daily Telegraph* suggests that "the time may not be far distant when everyone will have to wear coloured spectacles at night in the streets and other public places where the light is most striking." The latter proposal—apparently made in all seriousness—is one of those slight touches of exaggeration which are so dear to the modern journalist, but which, in such cases as this, certainly do not lend "an artistic air of verisimilitude to an otherwise bald but unconvincing narrative." There are, it is true, some cases in cities of unshaded gas mantles of high intrinsic brilliancy hung so low that they irritate and confuse the drivers of vehicles, but smoked glasses or amber-coloured spectacles are not the cure.

The talk of glare from metal filament electric lamps in houses is also frequently exaggerated and wide of the mark. Even illuminating engineers are too apt to forget that people in a room which is artificially lighted occupy themselves in looking at the objects illuminated and not at the source of light itself. So long as the lamps are well above the line of vision, and the general illumination of the room is good, the occurrence of photophthalmia need not be feared. It should be remembered that there is also a physiological effect from absolutely even artificial illumination, which may be summed up in the one word, dullness. There is too great a tendency on the part of illuminating engineers to aim at imitating diffused daylight, but necessarily at a degree of illumination which can only be a fraction of that of daylight itself. The depressing effect of carrying indirect lighting too far (well exemplified in the new lecture hall of the Institution of Electrical Engineers) should be avoided just as much as producing too sharp contrasts of light and shade by careless distribution of the lighting units with direct lighting. Let the illuminating engineer who takes daylight for his pattern remember that the light on a bright sunny day is preferable to that diffused from a dull, sunless sky.

### REVIEWS OF BOOKS

**Wiring Diagrams of Electrical Apparatus and Installations.** 258 pp. 9½ in. by 6½ in.; 439 figures. (New York: McGraw-Hill Book Co.; London: Hill Publishing Co.) 8s. 4d. net.

On the pages of this volume we have a series of over four hundred diagrams of connections embracing nearly every branch of electrical engineering except telegraphy and telephony, with practically no letterpress except the footlines to each diagram. In a few cases, particularly in the switchboard and substation sections, the drawings show general lay-out of apparatus, as well as actual connections, and, as might be expected, some of them refer to systems little used in this country. It is a little difficult to see just to what class of reader the diagrams are addressed, but, as the compiler remarks in his preface, "The reader will obtain information from them in proportion to his training and experience."

**Resuscitation from Electric Shock, Traumatic Shock, Drowning, Asphyxiation from Any Cause.** By C. A. Lauffer. 47 pp. 6½ in. by 4½ in. Six figures. (New York: John Wiley & Sons; London: Chapman & Hall, Ltd.) 2s. net; by post, 2s. 1½d.

In this little handbook the importance of artificial respiration as a method of resuscitation from insensibilities produced by electric shock, asphyxiation, drowning, &c., is insisted upon, and the advantages of the Schaeffer or prone pressure method are pointed out. Its action is clearly explained, and the method of application is described in detail. The author deals briefly with mechanical resuscitation apparatus, such as the Draeger pulmotor, but on the whole prefers the manual method, at any rate, for cases of electric shock.

### UNIVERSITY AND GUILDS TECHNICAL COLLEGE ANNOUNCEMENTS

THE City and Guilds (Engineering) College, South Kensington, S.W., now forms the engineering section of the Imperial College, and complete general, or highly specialised courses in electrical, civil, or mechanical engineering will begin early in October. The courses have just been rearranged as follows:—Mechanical engineering and motive power under the direction of Professor Dalby, who is Dean of the College; civil engineering under Professor Dixon; electrical engineering under Professor T. Mather. Besides the B.Sc. (Engineering) degree of the University of London, which may be obtained by qualified students, the diploma of the Association of the City and Guilds of London Institute (A.C.G.I.) may be awarded after two to four years' satisfactory work, and the diploma of the Imperial College (D.I.C.) may also be awarded for advanced specialised work. Much attention has of late been paid by the authorities to this kind of work, further particulars of which may be obtained on application to the Registrar.

Day and evening classes in all branches of engineering, including wireless telegraphy, metallurgy, etc., open on September 23rd and 22nd respectively at the Royal Technical College, Glasgow. A diploma course extending over three or four sessions may be taken. The engineering degrees of the Glasgow University are open to students at the Technical College, and particulars may be obtained from the Calendar, which is sent by post for 1s. 4d., and prospectuses, which are sent free on application to the Director.

The next session of the engineering department of the Edinburgh University opens on October 7th, but the entrance examination is held in September. Complete three-year courses in electrical, civil, or mechanical engineering qualifying for the degree of B.Sc. in engineering are provided. All particulars may be obtained from the Matriculation Office, The University, Edinburgh.

At the South-Western Polytechnic Institute a complete three-year course, leading to a diploma or University degree in electrical engineering, commences on September 29th. A scholarships' entrance examination will be held on September 22nd at 10 a.m. On the evening of this day a four-years' course preparatory for the electrical engineering and wiremen's examinations of the City and Guilds Institute will also open. Inquiries for fuller information should be addressed to the Secretary, South-Western Polytechnic Institute, Manresa Road, Chelsea, S.W.

Diploma or special courses in civil and mechanical, electrical or some other of the branches of engineering start at University College, London, on September 30th. The courses are arranged to cover the syllabus of the B.Sc. (Engineering) degree of the University of London, and facilities are also provided for advanced work and special measurements for those students who have taken a complete course and gained diploma or degree. Professor J. A. Fleming is head of the electrical engineering department. All communications respecting the College courses should be made as early as possible and addressed to the Provost, University College, London. The prospectus contains full information as to the courses of study, registration of students in the faculty of engineering (University of London), scholarships, &c. The College Calendar will be published in the middle of September, and may be obtained on application to the Secretary (W. W. Seton) for 2s. 6d., or by post, 3s.

We learn that Mr. C. H. Avery, of University College, London, and Mr. F. A. Eustace, of the City and Guilds Technical College, Finsbury, have been appointed to the heating and ventilating scholarships awarded by the Institution of Heating and Ventilating Engineers, tenable at University College.

**International Engineering Congress, 1915.**—Colonel G. W. Goethals, Chairman of the Isthmian Canal Commission and Chief Engineer of the Panama Canal, has been appointed Honorary President of the Congress, and will preside over the meetings to be held in San Francisco in September, 1915.

**Factory Regulations.**—The Home Secretary gives notice of alterations in the Factory and Workshop Regulations relating to the payment of moulders in iron and steel foundries, and defining the manner in which information is to be given to those employed as to the piecework rates relating to any particular work.

## SHOP WINDOW LIGHTING

By E. P. Austin

THE time has gone by when shop windows were considered lighted by suspending what are sometimes described as "bottles on a string" promiscuously amongst the goods displayed, serving to hurt the eyes of spectators rather than to illuminate the contents of the window. Sounder principles are now more often applied to illumination problems, with advantage to shopkeepers, and indirectly to the supply authority, which benefits by the advertisement of a well-illuminated window.

In general, the best example of illumination to follow is stage work, where the light is diffused about the stage, and the sources are hidden from the view of the audience. The main principles are that the source of light should be hidden or fixed well above the line of vision, and the light directed on to the goods. Light sources should not be fixed in too close proximity to the objects displayed or a patchy effect will be obtained, and light units of markedly different colours should not be used in conjunction. The application of these principles resolves the question itself into the correct choice of reflectors, in conjunction with the best positions of the lamps, and the correct types chosen by reference to their distribution curves. Brightly polished reflector surfaces are not always the best; sometimes a dull aluminium surface gives better distribution.

A simple problem is the window in the dimensioned sketch in Fig. 1. In this case six aluminium angle reflectors are used, spaced 20 inches apart, and using 60-watt tungsten lamps fixed vertically. The distribution curve of the reflector is shown in Fig. 3; it is obvious that the maximum intensity is on the goods, while sufficient reflected light is thrown on the pavement to attract attention. The total lumens in this case are approximately 3,000, yielding 2,000 effective lumens.

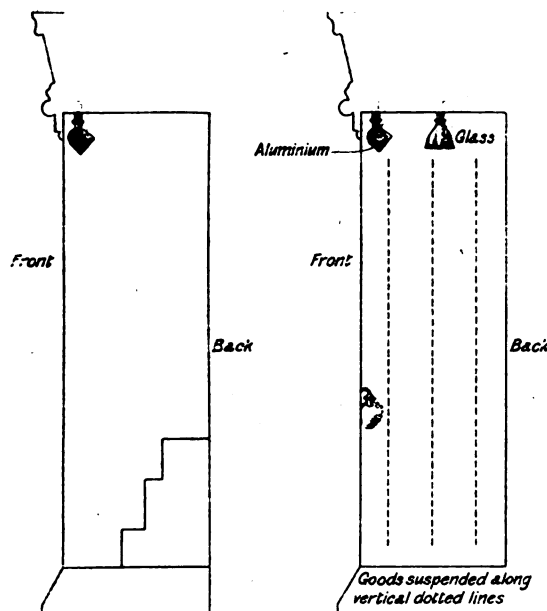


FIG. 1.

FIG. 2.

The vision is affected only by reflected light; there is no glare, and the goods are clearly defined at a distance of 100 ft.

A provision window dressed flat or nearly so requires different treatment, especially if the ceilings are fairly low. The prismatic glass reflector offers the best solution, and should be of the intensive type, the spacing and heights of such windows rarely lend themselves to the use of the extensive type of reflector. The colour of light units is an important point. To aim at daylight effects is somewhat misleading and not always desirable. A light that is rich in red rays has much to recommend it, particularly in the illumination of foodstuffs. Contrast, for instance, a butcher's shop using incandescent gas and one with the old-fashioned fish-tail gas burner, and notice the more attractive appearance of the meat in the latter case.

Windows which depend essentially on good lighting are those displaying fancy and white goods, hats, dress materials,

and tailors' and furniture shops. In determining the quantity of light required in individual cases, the reflective properties of different shades must be considered. A window that may alternate between white and dark goods must have a capacity for illumination suitable for the latter, with ample switching arrangements to prevent waste when showing light goods. The following table will serve as a guide in this matter, since it gives the reflective properties of different materials:

Approximate reflective values of different shades and surfaces:—

White blotting paper	...	82	per cent.
Foolscap paper	...	70	per cent.
Yellow paint, silk, &c.	...	40	per cent.
Blue paper	...	15	per cent.
Black cloth	...	1.2	per cent.
Black velvet	...	.4	per cent.

The nature and texture of fabrics affects their reflective values, which is largely a function of their transparency. Jewellery, pictures, and china ware all require their own treatment, influenced by the arrangement and proportions of the window. Such windows are usually shallow, dressed from top to bottom, very full, and close to the glass. Outside lighting with a "trough" type of reflector is very effective, and the light should be concentrated rather than diffused, since jewellery looks best when illuminated from a point. Millinery is best lighted from above with a well-distributed light. Tungsten lamps give the best colour effect in this case. Indirect, semi-indirect, or prismatic-bowl lighting are all eminently suitable for this class of work.

The arrangement shown in Fig. 2 is suitable for fancy goods and suspended tapestries, the analogy of stage lighting being closely followed in this instance. Tailors and furriers demand high candle power, since the dark materials have a high factor of absorption. Lamps should be kept well away from dark materials and suitably spaced intensive reflectors used entirely. Outside lighting by white flame arcs with reflectors to throw the light into the window gives good effects, but glare results from too much concentrated light, and the patterns of fabrics become indistinct and blurred under such conditions. The furniture window lends itself more to calculation than the previous examples. As a rule there is ample floor space, and the ideal space factor can be used, with prismatic reflectors. Again, absence of glare is most important. Furniture should show up in bold relief from its surroundings, yet light should not be unduly focussed to over-emphasise detail. Tungsten lamps give the most

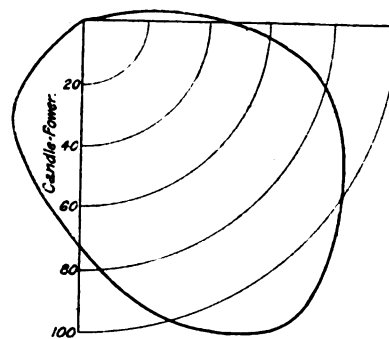


FIG. 3.—POLAR CURVE OF LIGHT DISTRIBUTION FROM REFLECTOR USED IN FIG. 1.

desirable effects, and indirect lighting with white ceilings is pleasing in result. By the ideal space factor is meant the relation between the height above the working plane and distance between centres of lighting units that gives even illumination with a given reflector. For instance, the space factor for holophane intensive reflectors with 50-60-watt tungsten lamps is  $\frac{3}{4}$ , and 4 points in a window 10 ft. by 15 ft., suspended at a height of 7 ft., give a luminar intensity on the floor of seven foot-candles, approximately, allowing for a light ceiling. Semi-indirect lighting offers special advantages for furniture display. When a window is dressed in representation of a room, daylight effect is desirable and can be very closely approximated by having the top reflector of the semi-indirect lighting fitting of a delicate china-blue tint. Metal covers of this colour fitted over silvered reflectors also give a near approximation to daylight, and have been

used with considerable success. The scheme is also useful in drapery departments, where colour matching is important.

Outside shop lighting fulfils a two-fold purpose. Its primary object is advertisement, and illumination of the windows is its secondary object. Metal lamps are largely displacing arc lamps for this purpose. Outside and inside lighting should be carefully balanced, particularly when dark materials are displayed, or the window has a dark background.

Jewellery windows with fitted show cases divided into small compartments present considerable difficulties. The bulkiness of a lamp and reflector make it difficult to conceal them in a small case, so that one naturally turns again to outside lighting. Arc lamps with angle reflector fittings give good results, but the white flame should be used, as the yellow light is unsuitable for the display of precious stones. Pictures require essentially a "soft" diffused light. A refinement is to use special trough reflectors, which give excellent results when fitted to the top of large pictures. In conclusion, it is well to remember that shop window lighting is not to show off electrical fittings, but to give effective lighting.

### A DAYLIGHT LAMP

**SIEMENS BROTHERS DYNAMO WORKS, LTD.** (Incandescent Lamp and Fittings Department, Tyssen Street, Dalston), make the interesting announcement that they are placing on the market a Wotan lamp (with pure drawn tungsten filaments) which will give illumination of practically the same quality as daylight, at a current consumption of 1.5 watts per c.p. It will be known as the Wotan Verico lamp, and will provide drapers, storekeepers, colour printers, &c., with an illumination in which colours can be matched as safely as with daylight. Hitherto it has been necessary to use colour screens or filters to obtain such an effect, which, apart from the high initial cost, waste such a great amount of light, that the consumption per candle-power reaches 3 to 4 watts. The Wotan Verico lamp, therefore, is not very expensive in either initial or running costs, the colour filter effect being obtained by means of a special kind of glass. These lamps can be used with any type of reflector or shade which is not coloured. These new lamps are at present made in two sizes, of 70 and 140 c.p. respectively, for voltages from 100 to 130 and 200 to 250.

**"Job Line" Wire.**—An interesting case came on for hearing before Judge Woodfall at the Westminster County Court last week, in which Mr. Corfield, receiver for the debenture-holders of the Davis Electrical Co., Ltd., claimed £34 for cable supplied to Mr. G. Cohen, who was at the time of the transaction carrying on business as The Premier Electric & Hardware Co. (Golder's Green), who entered a counter-claim for about £70, as his reputation had suffered through the material proving faulty. A quantity of cable had been supplied by the Davis Co. to Mr. Cohen at £6 5s. per mile as "job line" cable, the ordinary price being about £11. It suffered from local faults, and had a lower insulation resistance per mile than 600 megohms, and used on a 240-volt circuit, the faults showed up. It was sold on the understanding that the Davis Co. would take back any that was defective, but after a time they refused to take back any more, as so much was returned. Mr. H. E. Davis, formerly managing director of the Davis Electrical Co., and now manager and buyer, said that the term "job line" implied that the goods were bought with all their faults and at the buyer's risk. The case, not being concluded, was adjourned till October.

**Water Sterilisation.**—Dr. Max von Recklinghausen describes in the *Electrical World* (New York) his industrial designs of apparatus for the sterilisation of water by ultra-violet light. For this method of sterilisation to be effective, the water must first be freed from any suspended matter. The largest lamps now in use require 375 volts across the electrodes when they pass a current of about 3 amperes. The quartz tubes are the same diameter (2 in.) as those in general use for lighting, but they are made U-shaped. The limbs are bent somewhat in the shape of a pistol, and fit into cavities in the sterilising chambers. They are started by tilting, for which they are put into a special box for the purpose. The lamp box and the quartz tube are fastened to a vertical metal plate, forming part of one of the walls of the sterilising chamber. Owing probably, it is thought, to the heating effect of the neighbouring branches of the U-tubes, the ultra-violet light produced is stated to be 50 times as great as that of a 110-volt, 3.5 ampere lamp. To deal with quantities of water up to 2,000 tons of water per 24 hours, not more than two of these lamps are required, but for larger quantities a construction consisting of a canal about 50 in. by 70 in. in cross-section, in the walls of which ten or a dozen of the 500-volt lamps are inserted, is used. Several of these equipments have been in use for some time. Portable sets would be of great use for military purposes.

### ELECTRICAL METHODS OF MEASURING TEMPERATURE

IN the course of a Paper entitled "Modern Methods of Measuring Temperature," by Mr. R. S. Whipple, read at the Cambridge meeting of the Institution of Mechanical Engineers, some interesting details were given of various electrical methods that are employed.

Electrical recording systems are sometimes applied to mercury thermometers. In one arrangement, designed by Mr. A. Barry, a high-resistance wire is stretched from the bottom of the bulb along the capillary. The apparent resistance of the wire is increased or diminished as the mercury falls or rises in the thermometer tube. By means of simple electrical arrangements the resistance of the wire can be measured from a distance, and the temperature deduced from the galvanometer readings; if a direct deflection galvanometer is employed the readings may be given directly in degrees of temperature. Mercury thermometers can also be arranged to sound an alarm when a given temperature has been obtained. A platinum wire is fused into the capillary tube of the thermometer at a point corresponding to the temperature at which it is desired to sound the alarm, a second wire being fused into the bulb of the thermometer. These wires are connected to a circuit containing a relay, which controls a switch capable of making and breaking a current sufficient to ring a large alarm bell.

Thermo-electric thermometers of the best class are made of platinum and an alloy of platinum and rhodium, but couples composed of silver or copper and constantan (a copper-nickel alloy) are often used for temperatures up to 700° C., and nickel with nickel-chromium for higher temperatures. The main difficulty in thermo-electric pyrometry is the control of the temperature of the "cold" junction. Melting ice is impracticable near a furnace; water-cooled heads to the pyrometer have been tried, but by means of leads of special alloys giving the same E.M.F. against copper as that given by the platinum-platinum alloy couple the cold junction may be placed at a distance from the furnace without expensive platinum leads, and may be kept at a constant temperature by a thermos flask arrangement or a steam jacket. The E.M.F. developed can be measured by direct deflection or potentiometer methods, and various ingenious recording instruments have been devised in connection therewith.

The resistance thermometer depends on the change in resistance of a platinum wire with temperature. The resistance can be measured by Wheatstone's bridge methods with direct reading slide wires and dummy leads to compensate for the resistance of the leads to the platinum element, or by direct reading instruments similar in principle to the ohmmeter. Recorders can be arranged in either case.

Thermo-electric and resistance thermometers both have a distinct upper limit of temperature beyond which they should not be employed. In the case of the resistance thermometer the limit is 1,200° C., above which temperature the mica frame disintegrates. The thermo-couple can rarely be employed above 1,400° C., because of the impossibility of finding a gas-tight protecting envelope that will last above this temperature.

In radiation pyrometers advantage is taken of the Stefan-Boltzmann law that the total energy radiated by a black body is proportional to the fourth power of the absolute temperature. In several optical radiation pyrometers, the light from the incandescent body is compared against that from a standard lamp within the instrument, or as in the Fery radiation pyrometer and others, the rays are focussed on to a thermo-couple connected to a galvanometer. The Paper concludes with some practical points regarding the application of various forms of thermometer and pyrometer to industrial operations.

**Iron and Steel Institute.**—Among the Papers to be read at the Brussels meeting of the Iron and Steel Institute from September 1st to September 4th will be one by Mr. O. Frick on "The Electric Refining of Steel in an Induction Furnace of a Special Type," and one by Dr. J. E. Stead and Prof. H. C. H. Carpenter on "The Crystallising Properties of Electro-deposited Iron."

**Electrical Fires in Chicago.**—During 1912 there were 71 fires in Chicago certified as being due to electrical causes. The damage is estimated at about £6,300. It appears that 11 were due to the short-circuiting of low-pressure cables, six to motor armature burn-outs, six to flat-irons left on circuit, five to flexible cords short-circuiting (the most serious fire was due to this cause), four to short-circuits on conduit, three to ignition of cinematograph films, three to inflammable material about incandescent lamps, and the remainder to miscellaneous causes.



## THE MISSISSIPPI HYDRO-ELECTRIC SCHEME

### I. General Description of Generating Plant

THE huge power-house at Keokuk, on the Mississippi, started at the beginning of last month to give a supply of electric energy over some 144 miles of transmission line at 110,000 volts 3-phase 25 cycles, from the fifteen, of the maximum number of thirty, water turbine-driven 11,000-volt alternators of 7,500-kw. capacity already installed. The turbines work under a normal head of 32 ft., obtained from the old Des Moines Rapids, which are now flooded by a dam 50 ft. in height, stretching nearly a mile between the Illinois and Iowa shores. The power-house, says the *Electrical World* (New York) is 900 ft. long and 133 ft. wide, while in addition the present project has included the creation of a lake 65 square miles in area, a lock 400 ft. by 110 ft., with a 40 ft. lift, which is as large as those at Panama; a dry dock 150 ft. by 463 ft., and a road and railway bridge 30 ft. wide, carried on the piers of the dam structure. Owing to the fact that the head of water available is so low, many interesting departures from general practice have been made.

The leading features of the hydraulic plant show the magnitude of the works involved. The dam is of the gravity section type, and is 4,278 ft. long, with two abutments measuring 210 ft. and 81 ft. respectively. It is made up of 119 arched spans, each having 6 ft. piers and 30 ft. openings, and is 52 ft. high, 29 ft. wide at the top, and 42 ft. at the bottom. The discharge is controlled by electrically-driven sliding steel gates, each measuring 11 ft. by 32 ft. The ice fender which guards the plant-forebay is 2,625 ft. long, of which 2,325 ft. is made up of concrete construction carried on 10 ft. piers, while the remaining 300 ft. is formed by a floating timber boom. The raising of the water-level has necessitated the raising of the neighbouring track of the Chicago, Burlington and Quincy Railway Co. by a new sea wall 1,110 ft. long and between 45 ft. and 73 ft. high. An entirely separate water-power plant is installed to furnish energy for operating the locks already mentioned. The upper lock gates are worked by compressed air.

The sub-structure of the power-house is 70 ft. high, measured to the engine-room floor, while the superstructure adds a further 107 ft. From the forebay on the Iowa side, the water passes through the racks and gate openings in the gate-house section of the building to four branch intakes, each 22 ft. by 7 ft. in section, for each 10,000 h.p. turbine. The draft tubes leave the bucket wheels as circular discharge openings 18 ft. in diameter, enlarging rapidly to 22 ft. 8 in. by 40 ft. 2 in. at the tail-race openings. The velocity of flow is 14 ft. per sec. at the top of the tube, but only 4 ft. at the point of discharge. Each turbine unit consists of a single 15 ft. runner with 20 buckets. The main turbine shafts are 25 in. in diameter and 21 ft. long. With the alternator field magnet in place, the total revolving weight is about 220 tons. This is carried by a thrust bearing and by two main-shaft bearings. On twelve machines the roller and oil-pressure bearing employed utilises oil at 225 lb. pressure, which normally keeps the 225-ton load lifted off the rollers. Oil is supplied by gravity to the upper bearings, being thence drained to the reservoir under the lower bearings, from which it is pumped to central supply tanks. Kingsbury thrust bearings, which require oil circulation at only atmospheric pressure, are to be used for the remaining three machines. The oil-pressure governors are mounted on the engine-room floor, with relay valves and regulating cylinders on the thrust-bearing gallery. Here also are the accumulator and receiver tanks and the triplex oil-pressure pumps. These are in duplicate, one set being driven from the main machine shaft through chain gearing, and the other by a separate induction motor. The motor-driven pumps are controlled by a pressure system, starting up only when the oil supply needs replenishing. In the governor pedestal on the engine-room floor are the speed-control element and anti-racing devices controlling the large balanced relay valves and the oil-pressure cylinders. The change of the control of the gate motion from its automatic cylinder operation to hand manipulation is provided for. There are four handwheels on the governor pedestal; two control the supply of oil to the valves, while the others serve to alter the speed of the unit by adjustment of the centrifugal device. One is purely mechanical; the other is electrical, its circuit being extended also to the main switchboard on the fourth floor, so that the operator there can adjust the governor setting and control the speed of any unit while paralleling, &c.

A longitudinal wall divides the power-house superstructure into two compartments, the engine-room and the gatehouse, the latter containing also the high-pressure transformer cells. Opening to the engine-room, but on a raised-gallery level, are the compartments containing the exciter sets, auxiliary transformers and switchboards, &c. On the upper levels are installed the low-pressure bus-bar structure and low-pressure oil switches and the 110,000-volt oil switches, lightning arresters, &c. On the fourth-floor level at the south end of the present plant, where it will occupy the centre of the

future completed building, the main switchboard is situated. The 15 main generating units are 7,500 kw. vertical alternators, having their rotating fields carried on the water-wheel shafts and running at 57.7 r.p.m. They measure 31 ft. 5 in. outside diameter. In height they extend 11 ft. 3 in. above the floor, the field collector rings being reached by platforms extending from the side-gallery level.

In addition a pair of 1,600 kw. auxiliary alternator sets supply energy at 440 volt, 25 cycles to the exciter motor-generator units. They are of the same direct-connected vertical type and are driven at 125 r.p.m., and each has its own direct-current exciter mounted on the shaft extension above the alternator. The exciter motor-generator sets can also be driven from the main 11,000-volt bus-bars through transformers. In case of emergency, connection can also be established with one of the duplicate 320 ampere-hour storage batteries used for working the control switches. Parallel operation of all the Tirrill regulators controlling the exciter fields is accomplished by means of series transformers in the machine leads, so that circulating currents are automatically compensated for. Opposite each main alternator is the corresponding 9,000-k.v.a. 10:1 star-connected step-up transformer with neutral point earthed. These transformers are oil-immersed and water-cooled, requiring 56 gallons of cooling water per minute to give an efficiency of 98.5 per cent. They measure 16 ft. by 8 ft. and are 25 ft. high over-all, weighing complete about 120 tons each. A 6-in. discharge pipe is fitted, so that in case of fire the oil can be immediately emptied into the tail-race. The cooling-water system is arranged in duplicate. Connection between alternator and transformer is made through the duplicate 11,000 bus-bars by motor-operated oil switches. Four alternators and four transformers constitute a section, and one section feeds each of the two St. Louis circuits. Another unit is to be ordinarily devoted to the local Keokuk service, and the remaining six will serve the Fort Madison and Burlington circuits at 11,000 volts.

The 11,000-volt copper bus-bars are each of rectangular section 3.5 in. by 0.375 in., and are mounted on porcelain pedestal insulators. The oil switches and disconnecting switches are on the floor above the bus-bars, i.e., the third floor. Concrete slab construction is employed throughout. One of the bus-bar sets extends solidly round the station, while the other is divided into sections, as already mentioned. These sections are connected by automatic oil-switches and reactances composed of 1-in. copper cable wound on wooden formers and are adjustable for a reactance of 4, 6, or 8 per cent. at 9,000 k.v.a. The short-circuit current of the alternators is only from three to five times their normal full load current, and the reactance of the transformers about 5.7 per cent., so that by the method of sectionalising adopted, the maximum current input into a dead short-circuit on the low-pressure bus-bars is limited to thirty or forty times the full load current of one alternator. In case of a dead short-circuit on one of the high-pressure bus-bars close to the power-house not more than two sections on each side of the one short-circuited will be affected. In no case does the pressure on sections adjacent to the short-circuited fall below 75 per cent. of the normal. The total current is practically constant from the instant of short-circuit onwards. The only automatic main switches in the station are the outgoing low-pressure line switches and the low-pressure bus-bar sectionalising switches. The latter are opened by inverse time limit relays, the settings of which are rather high in order to delay the opening of the circuit until no possibility of clearing up the trouble easily remains. Operation with non-automatic switches is extended as far as possible over the transmission system, as it is hoped thereby to eliminate a source of trouble and failure. An automatic feature, intended to secure rapid clearing of arcing earths or crosses, consists of a special contact in the Tirrill regulators which introduces resistance into the alternator excitation on the opening of the oil switch, so that the line pressure falls. As the switchboard is on the fourth floor and the engine-room floor is out of sight except from an inspection gallery, duplicate emergency cut-outs are provided at each machine station, one on the engine-room floor and the other at the side of the exciter gallery. By breaking the glass cover, the attendant can close the remote-control switch inside and so isolate the machine and disconnect its field supply in cases of emergency.

The high-pressure bus-bars, which are situated on the roof, are run in duplicate and consist of 2-in. painted galvanised iron pipe. They are supported on suspension insulators consisting of seven 10-in. discs. For branch connections 1.4-in. pipe is used. The vertical risers in the shafts connecting the bus-bars with the transformers are supported on seven-

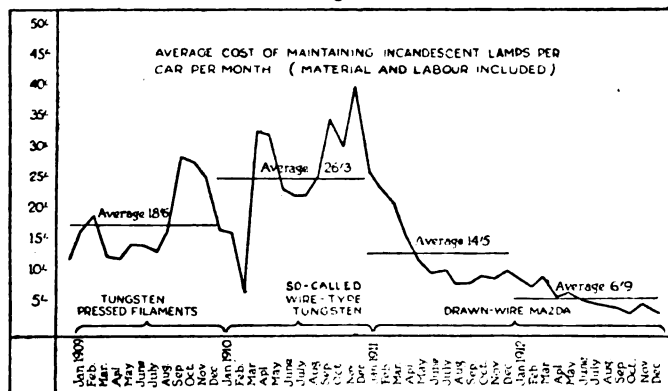
part pedestal insulators mounted on the side walls. The high-pressure oil switches, which are of the solenoid-operated, non-automatic type, can be disconnected from the transformers by disconnecting switches with 4-ft. blades. The long high-pressure bus-bar has a switch for interconnecting the two 110,000-volt sections. For wholly disconnecting the transmission lines from all high-pressure apparatus in the building, switches having pivotted arms 12 ft. long and ending in vertical horn gap members, are mounted on the roof structure. These switches are worked through a crank lever, and when they are opened the lines are at the same time earthed. Choke coils and arrester gaps of the double-horn type with charging resistors connected between the upper and lower sets of horns are provided. In addition four aluminium cell arresters are used in each set. Three are connected in star to the phase wires, while the fourth forms an earth connection to the neutral point. In all cases the factor of safety has been taken as three. Minimum clearances of 3.5 ft. to earth and 5.5 ft. between phases have been used in the 110,000 bus-bar connections.

In conclusion, it may be said that very complete signalling and telephone facilities are provided, while the lighting of the engine-room is effected by 114 500-watt tungsten lamps, giving an illumination of 3.5 foot-candles on the floor level. The switch room is illuminated with diffused light through a skylight, behind which are tungsten lamps. Emergency lighting in case of shut-down is provided for by automatic switches, which connect about one-third of the lamps to the storage batteries, which can supply them for about an hour. The 1,500 three-pane window sashes which make up the movable sections of the 120 windows are motor operated, and so can be rapidly closed on the approach of a storm.

A description of the transmission system will appear in a future issue.

### METAL FILAMENT TRACTION LAMPS

IT is essential that the lamps used for lighting railway cars should be mechanically strong and able to withstand vibration and jolts. Even current consumption is less important than that of mechanical strength. Thus, for several years after the introduction of the "pressed" tungsten filament lamp railway companies preferred the old carbon filament lamp, which, although much less efficient, was a great deal more durable. The invention of the Mazda lamp, with a filament of drawn tungsten wire, however, has made



MAINTENANCE COSTS OF TRACTION LAMPS.

it possible for the advantages of high efficiency and strength to be combined. As a consequence, Mazda drawn wire lamps are now being used on many traction systems.

The accompanying diagram, which has been sent us by the British Thomson-Houston Co., Mazda House, Upper Thames Street, E.C., translates the improved strength of these lamps into reduced maintenance costs. The curve was prepared by the Chicago Rock Island Railway of America, and shows the average maintenance costs per car per month for lamps, renewals, and labour over a period of four years. In the first year the ordinary "pressed" filament tungsten lamps were used, and the average monthly cost per car was 18s. 6d. In the second year so-called "wire" lamps were used and the maintenance cost was 26s. 3d. Mazda drawn wire lamps were employed in the third and fourth years, and the average monthly maintenance cost per car was 14s. 5d. and 6s. 9d. respectively. The lower figure in 1912 was due to the improved strength of the Mazda lamps used in that year. The reduction in the average maintenance cost during the second two years is evidence of the great strength of Mazda drawn wire lamps.

### CATALOGUES, PAMPHLETS, &c., RECEIVED

**SUPPLIES.**—A new list to hand from the London Electric Warehouse Co., Department of the Brush Electrical Engineering Co., Ltd. (Manners Street, York Road, S.E.), illustrates a very large number of street lighting fittings, both with and without globes, for use with metal filament lamps. Ships' fittings, hand lamps, and accessories are also dealt with. A separate bulletin describes the "Economic" series fitting for metal filament lamps, and a further one deals with "Brush" arc lamps made under Bremer-Westinghouse patents. Other leaflets and folders embrace holophane ware for all purposes, "Benjamin" reflector fittings, and some handsome fittings for holophane reflector bowls and spheres, &c. The Metallum wire tungsten lamp in the usual sizes for private and public lighting, as well as for train lighting, is also listed, as is the "Candolite" electric candle fitting. In addition, mention may be made of the export price lists embracing Metallum lamps; 600, 1,500, and 2,500 megohms grade rubber insulated cables in sizes from 20 S. W. G. to 37/14 S. W. G.; and small shunt-wound D.C. motors of the protected type.

*Readers desiring copies of catalogues or pamphlets should apply to the firms in question, referring to the notice in "Electrical Engineering."*

**AMMETERS AND VOLTMETERS.**—A new sheet from the General Electric Co., Ltd. (67 Queen Victoria Street, E.C.), brings to notice dead-beat moving iron "pedestal" or "controller" type instruments having ranges with maxima of 10 up to 600 volts, or 10 up to 600 amperes. These instruments may be used on either D.C. or A.C. circuits up to 600 volts; the movement is gravity controlled, though spring control may be substituted, and air damped. The accuracy obtained is that laid down by the British Engineering Standards Committee.

**MOTOR PANELS.**—Another sheet by the same company describes strong mistake-proof controller-type motor panels for pressures up to 650 volts. The panels are built up of standard apparatus consisting of ironclad circuit-breaker and controller, with or without shunt speed regulator.

**HOME CINEMATOGRAPH.**—A leaflet from the Wright Electrical Sales Co., Ltd. (94 Albion Street, Leeds), describes the "Wescoscope," which is a cinematograph apparatus for home use. The light is derived from an incandescent lamp fed from a battery.

**BALATA BELTING.**—The advantages of Silvertown Balata Belting, together with hints for belt users, are set forth in a new publication by the India Rubber, Gutta Percha, and Telegraph Works Co., Ltd. (Silvertown, E.). Prices and particulars of three- to ten-ply belting from one to 24 inches wide are given.

**ELECTRIC BLOWERS.**—A new type of hot-air douche, or electric blower, is described in a leaflet from Siemens Bros. Dynamo Works, Ltd. (Supplies Department, 38 and 39 Upper Thames Street, E.C.). The direction of the air current may be easily adjusted to any desired angle, which also enables the blower to be folded for convenience in packing. The consumption is given as 60 watts, and the weight as approximately 2 lbs.

Our Editor has been pleased to receive from Electrical Installations, Ltd. (27 to 28 Martin's Lane, Cannon Street, E.C.), a handsome and convenient blotter with which is ingeniously combined an alphabetical telephone index, scribbling pad, &c.

**Concentrated Filament Lamps for Photographic Purposes.**—Considerable experimenting has recently been done with Mazda electric lamps for photographing, copying pictures, making enlargements, printing films, and so on. Very satisfactory results have been obtained with six-volt concentrated filament Mazda lamps. They are being used successfully in automatic photographing machines, also for printing moving picture films. In both cases the lamps are equipped with parabolic reflectors to increase the intensity of the beam and concentrate the light over the relatively small area which it is desired to illuminate. It has been found that the operation of lamps at from ten to twenty per cent. over voltage produces a very white light, rich in the actinic rays which are necessary to affect the sensitised film of the photographic plate. For most photographic work the period during which it is necessary to burn the lamps is short; hence the loss of life, due to burning the lamps at over-voltage, is more than compensated for by the gain in photographic quality of the light obtained. The concentrated filament lamp is only one of many types of drawn-wire Mazda lamps manufactured at Rugby by the British Thomson-Houston Co., Ltd. For further information respecting these lamps application should be made to the company's London office, Mazda House, 77 Upper Thames Street, E.C.

## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,351.

A factory is to be driven electrically by motors aggregating about 200 h.p., varying in size from 3 to 50 h.p., and including a few of which the speed has to be varied. The only supply available is at 240 volts, 50 cycles, single phase. What class of motors and control would it be best to employ?—"P."

(Replies must be received not later than first post, Aug. 21st.)

### ANSWER TO No. 1,349.

State the theory of and advantages derived by using a loose-coupled inductance in wireless telegraphic receiving apparatus. Give the outline of construction of a suitable loose-coupled inductance for such work. Why is the iron core omitted in these, seeing that the two windings are quite independent, and apparently depend on transformer action.—F.

The first award (10s.) is made to "ANT" for the following reply:—

Any electrical circuit in which the capacity and inductance are high as compared with the resistance has a certain natural period of oscillation. The discharge of a condenser through such a circuit will take the form of an alternating current of a definite frequency, and if an alternating e.m.f. of this frequency is impressed on the circuit, it will cause a much larger current to flow than an equal e.m.f. of any other frequency. This property is made use of in wireless telegraphy by adjusting the inductance and capacity of the receiving circuit to correspond with the frequency of the received signals, thus establishing a condition of resonance and building up the received signals to a strength much greater than they would have if they were not in resonance with the circuit. The great advantage of a separate oscillating circuit for the receiver, connected through a "jigger" or loose-coupled air-core transformer to the antenna circuit, is the high degree of selective tuning which it renders possible, i.e., the ease with which the receiving circuit can be adjusted to respond readily to the frequency of the particular station from which messages are to be received, while being less sensitive to interruptions from other stations which may be transmitting at the same time, but at a different frequency. If the receiver is placed directly in the aerial circuit it will be equally affected by all the radiations picked up by the antenna, and although the antenna circuit can be tuned to some extent, this tuning cannot be so sharp as that of a separate oscillating circuit. If, however, the receiver is placed in another circuit which is inductively coupled to the antenna, oscillations in the antenna which are of the frequency to which the receiver has been tuned will be powerfully reproduced in the latter, while oscillations of any other frequency will affect the receiver but slightly. A further point in favour of the coupled receiving circuit, as compared with direct connection of the receiver in the earth wire of the antenna, is that at the earth end of the antenna the current is a maximum and the voltage a minimum, which are obviously conditions better suited to operate on a transformer than on a receiver which is usually of high resistance. Fig. 1 shows the arrangement referred to, the

oscillating circuit containing the receiver being tuned to the desired frequency by means of the variable inductance. It is also desirable to be able to vary the closeness of the coupling between the primary and secondary circuits of the jigger. If the coupling is too loose, only a portion of the energy available in the antenna circuit will be transferred to the receiver circuit, while if it is too tight, some of the energy given by the antenna to the receiver circuit will be returned to the antenna and lost, instead of being utilised in the receiver. The correct degree of coupling is best determined experimentally by adjusting the variable inductance and the degree of coupling until the maximum strength of signals is obtained. It will probably be found that less than 10 per cent. of coupling is required.

A simple form of jigger for a small receiving station is shown in Fig. 2, and can be made by hinging together two boards of convenient size (say about 1 ft. square), so that they can be opened and closed like a book. A flat coil consisting of a few turns of wire is mounted on each board, one coil forming the primary and the other the secondary winding. The degree of coupling is a maximum when the two coils are close together and lie parallel to each other, and is zero when the axes of the coils are at right-angles to one another. It is advantageous to wind the coils with cable composed of fine silk-covered copper wires twisted over an insulating core, in order to reduce eddy currents and skin effect. The ratio of primary to secondary turns will be

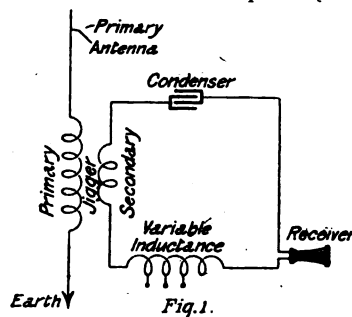


Fig. 1.

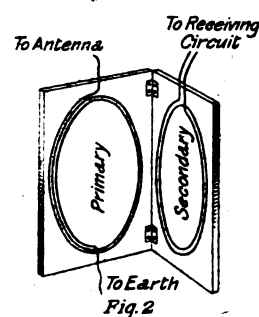


Fig. 2.

governed by the capacity of the aerial and the type of receiver used, and is most readily found by trial. The reason why an iron core is not used in such an oscillation transformer is that at the high frequencies employed in wireless telegraphy the losses in the iron due to hysteresis and eddy currents would be excessive. In fact, so much energy would be absorbed in this way that very little, if any, would be transmitted to the secondary circuit, the action of the primary currents being entirely masked by that of the eddy currents. A fuller account of the principles of application of loosely coupled transformers to both transmitting and receiving circuits, illustrated by mechanical analogies, will be found in the Yearbook of Wireless Telegraphy for 1913, pp. 338 *et seq.*

The second award (5s.) is made to J. F. ROMER, who writes as follows:—

In the ordinary wireless antenna the largest capacity is at the top, and when receiving signals the top becomes a region of maximum potential, while the part connected to earth carries maximum current. As most detectors work by a potential difference, the best place for them would be at the top of the antenna. This is very inconvenient, while if placed at any other part the detector would not be sensitive enough. The difficulty is got over by using a coupled inductance, which is in reality a resonance transformer, one coil being connected in series with the antenna and the other coil in series with a variable condenser. The detector is connected across the condenser terminals. The current in the antenna coil induces an oscillatory current in the receiving circuit and a maximum potential difference is produced between the condenser terminals. The detector is therefore in the most favourable position, and in effect the high potential of the top of the antenna has been transferred to a more convenient point. The antenna and the receiving circuit must be properly in tune with each other or the best effect will not be obtained. The two coils may be of equal size and consist of wire wound on wood or ebonite

## "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

### Specifications Published August 7th, 1913

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

Names in italics indicate communicators of inventions from abroad.

16,104/12. **Conduit Continuity.** ELECTRICAL CONDUITS and J. R. A. HEMMING. A bifurcated or hollow rivet is driven through the socket so that the end of the rivet is dumped up and the tube slightly indented, as well as having the enamel removed. Four figures.

16,164/12 and 13,918/13. **"Shock" Discharge System for Wireless.** R. MORETTI. Water is supplied to the gap for cooling purposes through a hollow electrode. The exciters are arranged in series or series parallel, and are situated in an electromagnetic field. Each pair of electrodes may have a single cooling jet, or one central jet may be used. In the second specification it is proposed to immerse the electrodes in water. The electrodes may also be arranged concentrically, and provided with water-discharge chambers at their ends. The outer electrode may be rotated. Each specification has five figures.

16,534/13. **Railway Signalling.** L. DUCELLIER and H. GUILLOT. Near the end of a track section is a pedal comprising a magneto with an inclined steel plate close to the rail, so that it is depressed by the wheels of passing trains. When depressed, the magneto armature is moved so that eddy-currents are set up, which are used for the signalling. For single-line working two pedals are required. They are connected to a relay and condenser so that the relay breaks the circuit of the one pedal, when the other is operated. Three figures.

16,852/12. **Self-propelled Vehicles.** J. G. P. THOMAS and THE THOMAS TRANSMISSION, LTD. A construction of passenger rail coaches in which the prime mover is situated in the middle of the vehicle, is described. The chief features are that the floor and roof slope down from the centre, where is the driver's compartment, to the ends. The driver's compartment has inspection windows above the main roof. Four figures.

17,388/12. **Recording Instruments.** W. R. COOPER. The record is produced by a periodic discharge from the point of the needle through the paper to a metal electrode behind. The spark is adjusted by resistance in the primary of the induction coil necessary to feed the spark gap. The pointer is partially of glass or other insulator, and a second spark gap in series with the one used for recording is provided, so as to prevent disturbance of the needle. By means of a low resistance mercury switch, several circuits may be recorded by one instrument on the same paper. Seven figures.

17,752/12. **Magneto Hand Lamp.** W. E. LAKE (*Fabrique Internationale d'Appareils à Magneto, Switzerland*). The armature shaft carries the lamp, which rotates with the armature, within a fixed reflector. The armature is driven by a spring motor by means of repeated depressions of the lid of the casing of the apparatus. A press-button stop mechanism is also provided. Three figures.

23,542/12. **Automatic Controllers for Lighting Circuits.** L. ABBATECOLA. To prevent an electromagnetic cut-out opening on circuits where several metal filament lamps are lighted at once, the magnet is wound with a shunt and a series winding. The latter is differentially wound in two sections connected by a stretched wire. When this becomes heated by the main current it short circuits one section of the series winding, and the cut-out can operate. Two figures.

26,948/12. **Water Heaters.** G. R. B. MIDDLECOAT. The water passes through about six helically wound copper tubes  $\frac{1}{2}$  in. diameter, enclosed within an insulating casing and connected, the bottom of one to the top of the next. Inside each tube is an open resistor. Three switches control the heating. Two figures.

8,198/13. **Incandescent Lamps.** C. B. HERRMANN. Only the inner surface of the bulb is frosted, so that the efficiency is not so affected by accumulation of dust.

8,395/13. **Water Heater.** C. O. HASKELL. Cold water is passed into the lower end of the heater and conducted to the opposite end, then passed down in contact with outer bare resistors, and then passed up through an inner shell in contact with inner bare resistors. When once started, the cold water gets a preliminary heating from the steam from the preceding water. Three figures.

9,174/12. **Motor Load Equalising.** S. ECKMANN. This is a patent of addition to No. 11,597/12 (ELECTRICAL ENGINEERING, June 19th, p. 356). Automatic regulators to decrease the current taken by the flywheel motors alone when the total current increases, and *vice versa*, are provided. One figure.

### Specifications Published To-day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free. Summaries of some of the more important of these patents will appear in our next issue.

**Dynamos and Motors:** L. D. & M. Co., McLEOD and WILD [Brush-gear] 18,777/12; B. T.-H. Co. (*G.E. Co., U.S.A.*) 21,761/12; B. T.-H. Co. and TAYLOR [Ventilation] 21,866/12.

**Electrometallurgy and Electrochemistry:** DE MARE [Ozone generators] 20,988/12; B. T.-H. Co. (*G.E. Co., U.S.A.*) [Furnaces] 26,082/12.

**Heating and Cooking:** BRITISH ELEC. TRANSFORMER CO., BERRY and LONDON [Viewing interior of oven] 16,960/12; STUBBING [Heated garments] 28,846/12.

**Ignition:** BOSCH [Automatic time adjuster] 4,692/13.

**Incandescent Lamps:** LUDDECKE and BRIMSDOWN LAMP WORKS [Furnaces for treating metallic filaments] 6,952/13.

**Switchgear, Fuses, and Fittings:** B.T.-H. Co. (*G.E. Co., U.S.A.*) [Relays] 12,060/12; ACKERMAN [Reverse current circuit-breakers] 27,090/12; CHUBB [Aluminium cable connectors] 2,146/13; BERGMANN A.-G. [Electro-magnetic heavy-current switches with automatic release] 2,778/13; SIEMENS & HALSKE [Automatic short-circuiting of lightning arresters] 14,214/13.

**Telephony and Telegraphy:** AITKEN [Telephone exchanges] 16,906/12; DUBILIER [Wireless oscillations] 19,763/12; RICHARDSON [Protective attachments for telephone mouth and ear pieces] 20,580/12; LAGUS [Telephone apparatus] 21,351/12; HAMMER [Telephones] 24,408/12; SHAW [Telegraph transmitters] 8,024/13; STILLE [Telephonic reproducers] 9,644/13; KELVIN & JAMES WHITE and FIELD [Loud-speaking telephones] 9,732/13.

**Traction:** POLLAK (*Elektro-Motoren-Werke Hermann Gradenwitz*) 20,446/12; STRAITON [Switches for trolley wires] 24,384/12; DAVIDSON [Tramway-point operating] 26,145/12; TH. GOLDSCHMIDT A.-G. [Rail bonding] 1,179/13; THOMAS and THOMAS TRANSMISSION [Power transmission and control] 12,841/13.

**Miscellaneous:** CARLSTEDT [Timing races] 17,666/12; SCHULER [A.C. electro-magnetic striking tools] 18,184/12; JAMES [Protecting submerged structures from barnacles, &c.] 19,297/12; CLUDERAY [Time alarms] 24,261/12; LOUDON [Lift signalling, &c.] 4,256/13; STILLE [Aluminium-acetone light sensitive cells] 9,060/13; MAGNET-WERK GES. EISENBACH [Lifting magnets] 13,911/13.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Dynamos and Motors:** A.E.G. [Cooling] 16,391/13.

**Heating:** LACASSE [Radiator] 16,485/13.

**Incandescent Lamps:** WOLFRAM-LAMPEN A.-G. [Manufacture] 15,824/13; KANAZAWA [Manufacture of cobalt filament] 16,481/13.

**Switchgear and Fuses:** POLLAK [Automatic circuit-breakers] 15,950/13.

**Telephony:** SCHIESSLER [Relays] 15,179/13; SIEMENS & HALSKE [Prepayment meters] 16,376/13.

**Miscellaneous:** ARNOLD [Reproduction of electric variations] 29,384/13; KRUPP [Magnetic separators] 14,426/13 and 14,427/13; ELIA [Submarine mines] 16,379/13.

### Amendment of Specification

14,015/12. **Wireless Telegraphy.** W. DUBILIER. An error in this specification (ELECTRICAL ENGINEERING, May 29th, p. 310) has been corrected.

### Expired Patents

The following are the more important Patents that have become void through non-payment of renewal fees.

**Dynamos and Motors:** B.T.-H. Co. (*G.E. Co., U.S.A.*) [Unipolar A.C. machines] 8,569/05; J. E. NOEGGERATH [Armatures and collector rings of homopolar machines] 8,415/08.

**Electrochemistry and Electrometallurgy:** A. S. R. WAINWRIGHT and F. J. MANN (executors of G. J. ATKINS) [Electrolysis: vat construction] 9,706/06.

**Ignition:** C. A. DAY (*Fabrik Elektrischer Zünder, Germany*) [Miner's safety lamps] 9,103/04; P. JENSEN (*L. G. Bartlett, U.S.A.*) [Gas and acetylene lamps] 8,730/08.

**Incandescent Lamps:** H. J. HADDAN (*Electroden-Ges., Germany*) [Finely divided zirconium, thorium, &c.] 9,384/04.

**Telephony:** J. E. KINGSBURY (*W.E. Co., U.S.A.*) [Prepayment slot meters] 9,714/06.

**Traction:** SIEMENS BROS. (*Siemens & Halske*) [Local and central control of points and signals] 8,968/08.

**Miscellaneous:** G. BARBOU [Filling bottles to a predetermined height] 9,325/07; EXPANSION SPRINKLER SYNDICATE, J. FIDDES, and J. F. WATT [Automatic fire-alarms] 9,535/07; W. and A. C. McWHIRTER [Signalling and recording changes in level of liquid] 8,920/08; R. T. GATES [Portable disappearing targets] 9,052/08.



# ADAMS IGRANIC

MOTOR CONTROL GEAR FOR HYDRAULIC PUMPS.

ADAMS  
M<sup>C</sup>C<sup>O</sup>L<sup>R</sup>  
BEDFORD  
AND  
LONDON

bobbins. The coupling is adjustable by varying the distance between the two coils, either directly or by sliding one coil inside the other. Loose coupling is used, in order to cut out atmospheric effects. An iron core is not used, because the signals received are produced by oscillatory currents of so high a frequency that all the energy entering the antenna would be dissipated by hysteresis and eddy currents in the iron, however finely it was laminated.

## ANSWERS TO CORRESPONDENTS

**EXAM.—CANDIDATE.**—The following books will be useful to you in reading for the examination of the Association of Mining Electrical Engineers:—"Application of Electric Power to Mines and Heavy Industries," by W. H. Patchell, "Electric Practice in Collieries," by D. Burns; and "Electrical Mining Installations," by P. W. Freudemacher. We can supply you with any of these. You will, of course, have to make yourself thoroughly acquainted with the Home Office Electrical Mining Regulations.

## ELECTRIC TRACTION NOTES

The Bill authorising the construction of a double track tube railway by the Post Office for the conveyance of mails across London was passed last Thursday by a committee of the House of Lords, under the chairmanship of Lord Newton. The tube, it was stated, is to be 9 ft. in diameter, with two tracks of 2 ft. gauge, and the trucks are to be of steel and 11 ft. 7 in. long. Owing to the opposition of the London Electric Supply Companies to the clause giving the Post Office power to supply energy from the Post Office generating station at Blackfriars to the railway and to the post offices on the line of route, though amended by the House of Commons committee, was struck out. A clause was also inserted putting the Post Office under a penalty of £10 an hour for any interruption, due to negligence, of electricity, gas, or water supply. This is the clause inserted in all the tube railway Bills. Evidence was given for the Post Office by Mr. W. Slingo (Chief Engineer) and Mr. H. C. Gunton (Principal Power Engineer), and for the Supply Companies by Mr. G. W. Partridge (Chief Engineer, London Electric Supply Corporation), Mr. Frank Bailey (Chief Engineer and Manager, City of London Electric Lighting Co.), and Mr. E. W. Seale (Secretary and Manager, Charing Cross, City and West End Electric Lighting Co.). The estimated consumption by the railway is about 480,000 units per annum. With this load the cost of generation by the Post Office would be reduced from 0.878d. per unit to 0.627d., and the cost per unit delivered would be reduced from 1.486d. to 1.077d. The additional capital expenditure for electrical equipment by the Post Office is £76,120, comprising £14,100 for the track, £1,450 for ventilation, £400 for telephones, and £44,330 for equipment between points of supply in substations and the track. The Supply Companies had not been asked to tender, but now that they knew the requirements, they said that they could supply at £4 per kw. of maximum demand per annum plus 0.5d. per unit. If the supply to the post offices on the route of the railway was taken away from them, they would be compelled to charge higher prices for the supply to the smaller post offices in London left to them. The average price now actually paid is 2.1d. per unit. In allowing the Bill to proceed, the Chairman said that the Committee considered that that part of the Bill which related to the supply of electricity had not been proved. It was unable, however, to express an opinion whether the supply by the Post Office would be in the interest of public economy.

On Monday the House of Lords went into Committee on this Bill, when it was announced by the Lord Chancellor that an amendment would be introduced by the Government on Report to restore to the Bill the clause giving power to the Post Office to supply electrical energy for the railway and

post offices on the route from its station at Blackfriars. The Report stage was reached on Tuesday, and was continued yesterday. Lord Newton submitted that if the Bill was passed as amended by the Select Committee, the tube could be made and the Post Office could come to Parliament next session with a considered proposal relating to the supply of electricity. A public department, he said, when appearing before a Private Bill Committee, must be treated as any other Bill promoter. The Marquess of Crewe stated that the Post Office had always intended inviting tenders for the electricity supply from the supply companies and local authorities, when, if a real appreciable saving would result from taking an outside supply, that course would be adopted. On these grounds, he asked the House to agree to the reinsertion of the clause. The Earl of Donoughmore, speaking as Chairman of Committees, from the point of view of private business, regretted the course the Government were taking. It amounted to a claim of privileged position and a right to review the decision of a Select Committee when not to the liking of the House. The Marquess of Lansdowne and others also pointed out that the unusual course suggested by the Government would, if adopted, constitute a not very convenient precedent.

It is stated that a Bill will be introduced into Parliament next session for the construction of a tube railway on the Kearney high-speed system from the Strand to the Crystal Palace. The distance is 6½ miles, and there would be intermediate stations at Westminster Bridge Road, The Oval, Brixton, and Herne Hill. The journey would be accomplished in ten minutes.

The Glasgow Corporation is considering the appointment of a special committee to report on a scheme of electric tube railways between the east and west of the city.

It has been announced that the part of the Canadian Pacific Railway system crossing the Rocky Mountains between Rossland and Castlegar is to be electrified. Direct current at 2,400 volts will be used, with overhead trolley.

The Tyneside Tramways & Tramroads Co. report a total surplus for the half year of £5,445. The final available balance of £4,864, after payment of debenture interest, &c., including the amount brought forward, is to be applied to the payment of a 5 per cent. dividend, and a dividend on the ordinary shares at the rate of 3 per cent., with £1,200 placed to reserve, and £724 carried forward.

## TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

The new contract between the Post Office and the Marconi Company for the Imperial Wireless Chain was passed by the House of Commons last Friday after a lengthy discussion.

From correspondence which has passed between the Post Office and Mr. C. S. Goldman, on behalf of the Parliamentary Telephone Committee, it appears that the investigation of the cost of working the telephones has proved more difficult than the Post Office anticipated. As soon as this inquiry is complete, which will not be before next session, opinions are to be invited "from all quarters before any action is taken to put the new rates in force." It appears that a Parliamentary Committee is to be appointed for this purpose. Apparently also the Post Office objects to the formation of a central advisory committee of business men, on the lines of those successfully appointed by the Board of Trade, which could deal with both rates and the general policy of administration. Without such a committee, Mr. Goldman points out, the local advisory committees appointed by the Post Office are not of such great value as they would otherwise be.

The *Electrical Review and Western Electrician* (Chicago) contains a note to the effect that the wireless telephone apparatus which Japanese officials of the Department of Communications are credited with having invented was success-

**REMOVAL.** Mr. J. G. LORRAIN, M.I.E.E.,  
M.I.Mech.E., Chartered Patent  
Agent, has removed his office from Norfolk House, Norfolk  
Street, Strand, W.C., to  
**Staple Inn Buildings, High Holborn, London, W.C.**

**PLAS MICA**  
**A SOLUBLE MICA**

SEEAR, PAGE & CO., 16/17, Devonshire Sq., London, E.C.

The Standard Insulation for  
repairing burnt Mica in com-  
mutators. Put up in convenient  
tubes. Enough for 25 ordinary  
repairs for 6s., post paid.

*Better order a tube at  
once and be ready  
for an emergency.*

**CAPPER PASS & SON, Ltd.,**  
Bedminster Smelting Works, BRISTOL.

SELLERS OF  
**ANTIMONIAL LEAD OF ALL GRADES.**

BUYERS OF  
**LEAD ASHES & LEAD RESIDUES FROM ACCUMULATORS.**

Telegrams: "Pass, Bristol."

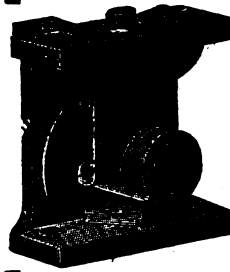
Telephone: 3475 & 3476.

**Why waste time and money  
on machining**

small intricate pieces when the most complicated  
parts can be cast in a finished state by

**"PRANA"**

**Die-finished Castings**



HOLES, SLOTS, etc., CAST to  
PERFECT SIZE! ABSOLUTE  
ACCURACY GUARANTEED  
FOR ALL REPETITION WORK

*Send for illustrated booklet, mentioning  
this paper; or send sample for quotation  
to*

**AERATORS, Ltd**  
UPPER EDMONTON  
LONDON, N.

**ELECTRICAL PORCELAIN**  
OF

HIGHEST QUALITY

APPLY TO

**JAMES MACINTYRE & CO., LTD.,**  
BURSLEM.

**PLATES**  
**MICANITE**  
**SEGMENTS**  
THE MICANITE & INSULATORS CO. LD.  
OFFICES AND WORKS -  
WALTHAMSTOW, LONDON, E.

**BLAKE & INSULATING STAPLES**

*Write for Samples and Prices.*

**MOSSSES & MITCHELL,**

Ohlswell Works, 122-124, GOLDEN LANE, E.O.

**STEATITE**  
**INSULATORS**  
SUPPLIED  
FOR ALL KINDS OF  
ELECTRICAL WORK  
**WILLIAM SUGG & CO. LTD.**  
WESTMINSTER.

**SILVERTOWN**  
**EBONITE**

The India-Rubber, Gutta Percha and Telegraph Works Co., Ltd.  
(The SILVERTOWN Company)

manufacture all descriptions of

**Ebonite for Electrical Purposes —**

Sheet, Rod, Tube, Accumulator Boxes, Fork Separators, etc.  
Also Ebonite Tubing, Pumps, Taps and other articles for use  
in Chemical Works for Hydrochloric and Acetic Acids.

**SILVERTOWN EBONITE**

was used by the National Physical Laboratory  
in conducting the exhaustive tests on which  
:: the Admiralty Specification is based ::

The Silvertown Company can make any special article in Ebonite to order.  
The India-Rubber, Gutta Percha and Telegraph Works Co., Ltd.

HEAD OFFICES:  
106, Cannon Street, London, E.C.

WORKS:  
Silvertown, London, E.

*When corresponding with Advertisers, please mention "Electrical Engineering."*

fully operated early in June, according to statements made by the parties concerned. From the Yokohama station limited conversations have been carried on with Japanese steamships as far distant as sixty miles.

The Gesellschaft für drahtlose Telegraphie have issued a special number of the *Telefunken Zeitung* to commemorate the 10th anniversary of the foundation of their business. The frontispiece illustrates the new liner *Imperator*, and a special article is included on projected long-distance wireless schemes, together with a review of the progress of the Telefunken systems during the last ten years and several other notes and illustrated articles relating to wireless telegraph schemes in various parts of the world.

Two new telegraph cables between this country and the United States are, we learn, to be laid *via* the Azores.

For the first time on record, says the *Electrical Review and Western Electrician* (Chicago) telegrams containing twenty-eight words were transmitted from the wireless station at Sayville to Nauen by means of Count Arco's high-frequency apparatus, on July 12th, with an expenditure of only six kilowatts, while recently, for the transmission of mere sounds over 100 kw. were needed.

At the meeting of the Spanish & General Wireless Trust, Ltd., which is one of the Marconi group of companies, a profit for the year of £4,654 was announced, which has been carried forward. Stations have been constructed at Arnaguez (near Madrid), Barcelona, Soller (in the Balearic Islands), Cadiz, Vigo, Las Palmas, and Teneriffe (in the Canary Islands).

The *Electrical Review and Western Electrician* (Chicago) announces that direct wireless communication between America and Asia has been established by night between the U.S. Army Signal Corps station at Nome, Alaska, and the Russian station at Anadyr, Siberia. There is a chain of four Russian stations between Anadyr and Vladivostok. Before a commercial service is established an agreement will have to be come to between the two countries.

We are advised, as from the 7th inst., that all telegrams for Venezuela are subject to censorship. All routes *via* Colon and Galveston to places in Peru and beyond are again restored, and the Chorillos-Iquique cable was repaired on 8th inst.

## LOCAL NOTES

**Aberdeen:** *Electricity Supply.*—A scheme is under consideration for a supply of current by the Corporation to Banchory, Aboyne, and Ballater.

**Aldington:** *Electricity Accounts.*—After payment of capital charges, a loss of £214 has been made on the undertaking, as compared with £246 for the previous year. The total sales amounted to 56,738 units as compared with £53,371. The deficit has been met out of general rates.

**Boston (Lincoln):** *Electricity Supply.*—Messrs. Crompton & Co. have given notice that they will apply for a provisional order for this district.

**Exeter:** *Electricity Accounts.*—A net profit of £1,573 has been made after payment of all capital charges.

**Fife:** *Interruption of Supply.*—A serious breakdown occurred last week to one of the turbo-generators in the power-house of the Fife Electric Power Co., at Townhill. The supply had to be discontinued for a short time, and there was considerable interruption of the local tramway services.

**Gloucester:** *Electricity Accounts.*—The result of the year's working of the Electricity Supply Department is a deficit of £106, after payment of all capital charges. This is partly accounted for by the extra capital expenditure incidental to the recent extensions, which are not yet being used to their full capacity, and the increased cost of fuel.

**Greenock:** *Electricity Accounts.*—A net profit of £5,204 has been made on the year's working at Greenock. The total income was £49,209, as compared with £46,150 for the previous year.

**Halifax:** *Electricity Accounts.*—The electricity accounts for the year ending March 31st, 1913, show the total income was £48,025, compared with £42,749 for the preceding year. The total units sold were 7,488,235 and 6,256,583, so that

the average price obtained per unit was 1'539d., compared with 1'640d. The surplus of income over expenditure amounted to £2,408, compared with £2,199. The costs of generation fell from 0'485d. per unit sold to 0'483d., and the costs of distribution rose from 0'107d. to 0'117d. Management and general charges fell from 0'109d. to 0'101d.

**Heywood:** *Bulk Supply.*—A provisional agreement is to be entered into for a ten-years' supply for this district by the Bury Corporation with the option of continuing for a further five years.

**Maidstone:** *Electricity Accounts.*—A surplus of £1,181 is reported on the electricity undertaking, in spite of a considerable increase in the cost of coal. The units sold for private supply have increased considerably, but the substitution of metal filament lamps for arc lamps for street lighting has caused a decrease in the supply for this purpose.

**Oulton Broad:** *Electricity Supply.*—The Oulton Broad Electricity Company has given notice of their intention to apply for a provisional order for the supply of electricity for all public and private purposes in the district. The company has already sent in a tender for street lighting.

**Portrush:** *Electric Lighting Order.*—The Provisional Order relating to the supply of electricity by the Urban District Council was passed on Tuesday by the House of Commons Committee on Unopposed Bills.

**Worthing:** *Electric Cooking in Camp.*—An electric cooking installation has been at work in the camp of the Church Nursing and Ambulance Brigade, and the camp is lighted throughout electrically.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

### Generating Stations, Sub-Stations, Mains, &c.

**Belfast.**—A Local Government Board inquiry is to be held early next month into an application for a loan of £35,000 for electrical purposes.

**Bury.**—The loan of £55,000, which, as stated in our issue of July 31st, is to be applied for, is to provide for the following plant:—Two rotary converters, £2,100; a third generating set for the Chamber Hall power station, £13,500; extension to buildings, £14,000; H.T. mains, £10,000; transformers, £4,000; L.T. mains, £5,000.

**Dublin.**—Tenders are invited for single-phase and three-phase meters. (See advertisement on another page.)

**Felixstowe.**—A Local Government Board inquiry was held last week into an application for a loan of £4,729 for extensions to the electricity works, including a 150-kw. Diesel set, a balancer, switchgear, and alterations to buildings.

**Manchester.**—Tenders are required for the supply and delivery of paper-insulated E.H.T. cables, 8-core telephone and 3-core pilot cable. Tenders by August 18th.

**Rochdale.**—Tenders are invited for a wet air filter and circulating water screens.

### Wiring

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Barnsley.**—New Town Hall.

**Chester.**—Additions to workhouse, Boughton Heath. Architect, J. H. Davies & Sons, 14 Newgate Street, Chester.

**Hunslet.**—Alteration to Nurses' Home. Architect, W. E. Richardson, Rothwell, Leeds.

**Letchworth.**—New hospital.

**London:** *L.C.C.*—Tenders are invited for an electric lighting installation at the Royal Hill Elementary School, Greenwich. (See advertisement on another page.)

FOR  
STEAM JOINTS  
USE



JOHN HUDSON & CO.'S SUCCESSORS, Mansell St., London, E.

**Islington.**—Extensions to postal stores. H.M. Office of Works.

**Manchester.**—New baths, New Quay Street.—Proposed Central Municipal School at Chorlton.

**Rugby.**—Tenders are invited for extensions to the electric lighting installation at the Rugby Co-operative Society's premises in Chapel Street. Tenders by August 18th. Particulars from W. H. Watson, Secretary.

**Sheffield.**—New premises for the *Sheffield Telegraph*.

**Stockport.**—New premises for Stockport Industrial Co-operative Society. Architects, Wrathmell & Blackshaw, St. Peter's Square, Stockport.

**Walsall.**—Tenders are invited by 25th inst. for electric lighting plant at Great Barr Hall and other buildings in Great Barr Park.

a varying amount to all girls who had been employed for three, five, and eight years. A special profit-sharing scheme was also put into force.

**Change of Address.**—Tetley & Co. (Falcon Works, Bedford Street, Greengate, Salford) have removed their offices to Exchange Buildings, 6 St. Mary's Gate, Manchester.

**Bankruptcies.**—W. R. Wedge, electrical engineer, of Northampton, has been adjudicated a bankrupt.

A first and final dividend of 1s. 4½d. is to be paid in the bankruptcy of Longdon & Cobb, Nottingham, and of 18s. 9d. in the £1 regarding the separate estate of W. Longdon.

The British Electromobile Co. is to be wound up voluntarily.

Mr. F. T. Johnson, Electrical Engineer, Cambridge, has been adjudicated a bankrupt.

## TENDERS RECEIVED AND ACCEPTED

**Bridlington.**—The tender of the Sturtevant Engineering Co. for a wet air filter (£115) has been accepted.

**Burnley.**—The tender of the Electrical Co. for 70 tramcar watt-hour meters mounted on special spring frames has been accepted.

The tender of the British Westinghouse Co. for turbo-alternator, &c., has been accepted. As the amount slightly exceeded the estimates, application is to be made to the Local Government Board for a slight increase in the loan.

**Falkirk.**—The tender of the Electrical Co. for polyphase meters with and without maximum demand indicators has been accepted.

**London: Hammersmith.**—The tender of the Electrical Co. for the supply of hour meters for the ensuing twelve months has been accepted.

**Loughborough.**—The tender of Clarke, Chapman & Co., £1,774, for a boiler has been accepted.

**Rotherham.**—The tender of Messrs. Chamberlain & Hookham for meters of 10 amperes capacity and upwards has been accepted.

**Stockport.**—The tender of Messrs. Bell Bros., Manchester, for grease-eliminating and water-softening plant, has been accepted.

## COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &c.

**Manaos Tramways & Light Co.**—A surplus, after payment of debenture interest, &c., of £28,107 is reported. £25,725 is to be transferred to reserve and renewals account, and a 4 per cent. dividend is recommended, with £3,435 carried forward. There has been a considerable increase both in the private and public lighting connections, and the power load has increased about 100 per cent.

**Northampton Electric Light & Power Co.**—An interim dividend at the rate of 5 per cent. per annum is announced.

**The Waste Heat & Gas Electrical Generating Stations.**—An interim dividend at the rate of 5 per cent. has been declared.

**Oxford Electric Co.**—An interim dividend at the rate of 6 per cent. per annum is to be paid for the half year.

## NEW COMPANIES

**EDISON ACCUMULATORS**, 49 Old Bond Street, W. Capital £150,000. Manufacturers of and dealers in storage batteries of all kinds. To adopt an agreement with J. F. Monnot. First directors, Lord Montagu, Colonel H. C. L. Holden, A. L. Pearce, and J. F. Monnot.

**LEYBURN ELECTRIC SUPPLY CO.**—Capital £12,000.

## APPOINTMENTS AND PERSONAL NOTES

The salary of Mr. H. F. Ellis, Electrical Engineer, South Shields, has been increased from £400 to £450.

A Junior Assistant Electrical Engineer is required for the Far East. (See an advertisement on another page.)

An experienced mechanical and electrical engineer is required for a group of collieries. (See an advertisement.)

## MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. George Smith & Son, of 5 Philpot Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night, was £72 10s. to £73 (last week, £70 5s. to £70 15s.).

**Works Outing.**—On Saturday last over 300 employees of A. Reyrolle & Co. (Hebburn-on-Tyne) made a day's excursion to Edinburgh.

**Sunbeam Lamps.**—The goodwill and trade-mark of the Sunbeam Lamp Co. (in liquidation) has been purchased by the Armorduct Manufacturing Co., Ltd., Farrington Avenue, E.C.

**Cryselco, Ltd.**—The directors of Cryselco, Ltd. (Bedford), on the occasion of closing their works for the week for the August holiday, announced that in addition to paying everybody employed a week's wages, a bonus would be paid of

## —OUR BOOK— DEPARTMENT.

Technical Books by all Publishers sent carriage free to any address in the United Kingdom at net published prices.

Orders should be addressed to the **KILOWATT PUBLISHING Co., LTD.** (Publishers of *Electrical Engineering*), 203, Temple Chambers, London, E.C., and should be accompanied by a remittance.

List of recommended electrical books on application.



# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 347 [Vol. IX., No. 34]  
*All rights reserved.*

THURSDAY, AUGUST 21, 1913.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES and TECHNICAL COLLEGE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

*Other Advertisement Rates on Application!*

#### Latest Time for Receiving

Letters for Insertion, Tuesday first post

Small Advertisements and Official Announcements, Wednesday first post.

Displayed Advertisements, Tuesday first post.

Corrections in Standing Advertisements, Monday first post.

All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 308-306, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Circling, Fleet, London."

Telephone No.: 5509 Holborn.

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

A SHORT article deals with the vexed question of "general conditions." (Page 476.)

A LARGE country house installation, where electricity is used for lighting, heating, vacuum cleaning, and pumping both for water supply and fire purposes, is described. (Page 477.)

A LETTER from Siemens Bros. Dynamo Works, Ltd., explains that the coming "Half-Watt" lamp will only be supplied in units of high candle-power for some time to come. Statements appearing in some of our contemporaries have implied that the lamps are to be obtainable in small units. (Page 477.)

THE design of isolating switches controlled from a distance is dealt with in our Questions and Answers columns. (Page 478.)

THE costs of operation of the street lighting systems in Chicago show that the system in use there of having tungsten lamps in opalescent bowls on old gas standards costs £1,720 per mile to instal, and £380 per annum to maintain. With flame arcs the corresponding figures are £1,875 and £860 to instal, and £348 and £255 to run, with underground and overhead distribution respectively. (Page 479.)

SOME particulars of closed circuit fire alarm systems for small and large installations for all classes of service, are set forth. (Page 479.)

A SHORT article deals with the award of contracts for the electrical equipment of the London & North Western and the South Western Railways. (Page 480.)

A DESCRIPTION is given under Telephony and Telegraphy of a continuously loaded telephone cable which has been laid between Vancouver and Victoria.—The Postmaster-General is prepared to continue the Hull telephone licence on certain conditions.—A net profit of £413,294 has been made by the Marconi Co. (Page 480.)

A PATENT specification by G. Lüdecke and the Brimsdown Lamp Works for a furnace in which the carbonising, decarbonising, and forming of metallic filaments may be carried out at one and the same time was published last Thursday.—Among the other patents is one for electromagnetic percussive tools by L. Schuler, and one for a loud-speaking electro-pneumatic telephone receiver by C. Stille.—Opposition has been entered to the grant of three patents to Julius Pintsch A.-G. for the manufacture of ductile tungsten filaments.—The patent relating to pull-chain switch lamp-holders granted to H. Hubbell and allowed to lapse has been restored. (Page 481.)

THE Report of the Select Committee on Motor Traffic recommends further power being given to the County Councils for the regulation of traffic subject to general control by a Traffic Branch of the Board of Trade. Responsibility for the increase of accidents is directly attributed to the motor-bus.—A clause in the Post Office Tube Railway Bill has been inserted in the House of Lords requiring the Postmaster-General to put the power supply to the railway up to competition of the supply companies.—The trolley omnibus system at Ramsbottom was opened for traffic last Thursday.—The loss of £2,865 on the Walthamstow Tramways is attributed to motor-omnibus competition. (Page 482.)

THE scheme of the Installation Department of the Sheffield Corporation has been referred to a special committee.—A deficit of £1,445 has been made on the Bath electricity undertaking, and a net profit of £337 has been made at West Bromwich. (Page 483.)

LOCAL GOVERNMENT BOARD inquiries are to be held at Batley (£8,206), Bingley (£7,000), Belfast (£35,000), Cardiff (£30,500), and Newport (£10,600). An application is also to be made for a loan of £12,000 at Heywood.—A turbo-alternator is required at Wimbledon; switchgear at the L.C.C. Greenwich station; and mixed pressure turbines and direct current generating plant at Edinburgh. (Page 483.)

SOME officially-attended experiments on wireless firing of explosives from a distance are reported from France, but are being received with some scepticism. (Page 483.)

## GENERAL CONDITIONS

THE differences between British electrical manufacturers and some buyers of electrical plant with regard to the General Conditions of tender still continue. In the short article, on p. 480, upon the contracts for the electrical equipment of the L. & N.W. and S.W. Railways, reference is made to an announcement in a contemporary that British firms refused to accept the General Conditions for the former contract, and did not tender. This, as we have said, is not the fact. British firms did tender, and the plant will be supplied by five firms—four British and one foreign. The award of the contract for the electrical equipment for the trains themselves was given to the Oerlikon Co. on price, and not as the result of any dispute as to the general conditions. Nevertheless, considerable soreness was felt owing to the drastic nature of these general conditions, a copy of which we have before us. The Chief Electrical Engineer to the Company, Mr. F. A. Cortez-Leigh, is designated as sole arbiter:—" . . . in all cases of difference of opinion between the Company and the contractors, the decision of the Engineer shall be final and binding upon all parties in all matters connected with the contract or any additions thereto." There are also many other onerous conditions, which we fear, however, are not uncommon in other similar sets of general conditions—for instance, holding the contractor liable for any expense he may be put to in consequence of errors in the specification or drawings, and a clause making the contractor "guarantee the Company harmless against all accidents, damages, claims and losses which may occur, or to be incurred, or claimed by reason of . . . any cause which in the opinion of the Engineer shall have been within the control of the contractors . . . notwithstanding any instructions which have or have not been given by the Engineer. . . ."

In such cases it is not unusual for contractors to send in tenders, even if they are not willing to accept the general conditions as they stand, the tenders being only conditional upon a subsequent agreement being arrived at as to a modification of the general conditions. This, we believe, has recently been the practice of the firms belonging to the British Electrical and Allied Manufacturers' Association, and it has been confidently stated to us from a source that should be exceptionally well informed, that in practically no recent

case has any important municipal electrical contract been awarded out of the country for the sole reason that the British firms have adopted this course when tendering. The placing of some recent large municipal contracts with foreign firms, instead of with British firms, has, our informant, contends, been invariably because the foreign firm has quoted a lower price. Certainly, it would be hard to credit that these disputes as to the wording of the General Conditions should be carried to such a pitch that the purchaser would be content both to pay more for his plant and to buy it abroad.

It is to be regretted that the "Model" General Conditions have not long ago been agreed upon. It is now a considerable time since a code was agreed between a Committee of the Institution of Electrical Engineers (upon which were representative consulting engineers and delegates of the I.M.E.A.) and the B.E.A.M.A., but apparently the Council of the Institution was loth to pass this as final until the I.M.E.A. had agreed to accept it. We understand from the Secretary of the B.E.A.M.A. that a further revised code (so far as it referred to the points in dispute), was then agreed upon between the I.M.E.A. Council and the B.E.A.M.A., and this has, as our readers know, already been discussed *in camera* on two occasions (at the Annual Convention, and again last month) by the members of the I.M.E.A. As the second of these meetings was held as long ago as July 11th, and no announcement has yet been made, it is reasonable to assume that the code agreed upon by the I.M.E.A. Council has not been ratified by the membership.

We have it on the authority of a high official of one of the largest manufacturers of electrical plant in this country that the differences of opinion as to General Conditions are usually concentrated upon three points, viz., disputes and arbitration, consequential damages, and terms of payment. On the first of these there should be easy compromise, once the untenable position is abandoned that the purchasers' engineer should be sole arbiter. On the second point it is almost safe to say that the majority of contractors aim chiefly at having their liability for consequential damages defined in such a way that they can insure against it; and the question as to terms of payment is, after all, merely a business bargain, and absolutely standard percentages to apply to all contracts should not be held to be a necessity.



**WELL-INFORMED TOURIST:—**Those kites help to pull the train up the steep hills. If the wind drops suddenly, they hook the thing on to the wire above so that the train doesn't run back, and the electrical compressors under the locomotives are then started to supply compressed air for the kites.

## A COUNTRY HOUSE INSTALLATION

VARIED applications of electricity for domestic uses are in evidence at Somerton House, Co. Dublin, the residence of Mr. T. K. Laidlaw, which has recently been reconstructed. Electric light is used throughout the house, farm, and stable buildings, and current is also utilised there for electric radiators and power appliances. Electric power is used to drive a stationary vacuum cleaning plant for cleaning carpets, floors, and furnishings; also for pumps to raise domestic and rain water to roof tanks in the house and supply fire service hydrants. Electric bells and telephones are employed throughout the house and outside buildings.

The generating and storage plant is accommodated in an outbuilding, and includes a horizontal oil engine by Tangye, Ltd., capable of developing a maximum of 22 b.h.p. and a constant working load of 19 b.h.p. with crude oil of 0.8 specific gravity when running at 210 r.p.m. The engine is fitted with a compressed-air starter. A storage tank to accommodate 5 tons of fuel is provided, and is buried in the ground. The dynamo, by the British Thomson-Houston Co., is belt-driven, with an output of 8 kilowatts at 100 to 150 volts. The battery, manufactured by the Tudor Company, consists of 56 cells contained in glass boxes, and has a discharge capacity of 480 ampere hours for 10 hours. Tanks for acid and distilled water are fixed on wall-brackets, and connected to flexible piping used to fill the cells as required. The switch-board in the power-house is made up of enamelled slate slabs resting on channel iron supports with iron fixtures, and provided with an expanded metal door at one end.

Underground vulcanised bitumen cables are led from the main switchboard to the house, stables, and domestic water and fire service pumps. They are laid about 2 ft. below the surface of the ground in creosoted wood troughing fitted with porcelain bridge supports filled in solid with pitch, and covered with tiles. For the branch wiring vulcanised india-rubber conductors of 2,500 megohm grade are contained in solid drawn steel tubing carried behind walls and ceilings, except in servants' quarters and outbuildings, where the tubing is exposed and spaced out from the walls by brass hold-fasts. The tubing throughout is fixed to the iron cases of distributing boards by lock nuts, so that the whole containing system is continuous, and also efficiently connected to earth. The electric light fittings harmonise with the interior decorations, and were supplied by Messrs. Perry and Messrs. Osler. The wiring for electric bells and telephones is of 1/20 S.W.G. 300 megohm conductors run in split Simplex tubing with slip couplings.

The stationary vacuum cleaning plant by the Scottish Vacuum Cleaner Co., is placed in a basement apartment. It includes a rotary pump belt driven by a 2 b.h.p. motor; 2 in. piping is led to nozzles fixed to wall skirting boards on the several floors.

The supply of water for general use is obtained from a well by a petrol engine-driven pump. This source of water supply is also available for fire-extinguishing purposes, the pressure being augmented by an electric turbine pump connected to fire mains led around the house, and fitted at intervals with hydrant valves for hose attachment. Rain water is collected and stored in an underground tank of 50,000 gallons capacity, and is raised therefrom by an electric centrifugal pump operated by automatic switches to two tanks in the roof space of the house. The water supply pipe system is arranged so that the spring water is led direct to the taps, &c., from an outside storage tank, and rain or spring water may be used to fill either or both house tanks, thus providing against the possibility of a scarcity of water due to shortage in the former supply. An artesian well is now being sunk in the grounds, and it is expected that a better supply of drinking water will be obtained from this source, and provision has been made for it being raised to these tanks by the existing pumping plant.

The rain-water pump is capable of lifting 1,500 gallons per hour, and is direct connected to a 2 b.h.p. shunt-wound motor.

A turbine pump and direct-coupled 6 b.h.p. shunt-wound motor, by Mather & Platt, at 1,500 revolutions per minute, is erected in the pump-house at the stables alongside the rain-water pump. The switch panels for both these pump sets include line and starting switches with no-volt and overload release, shunt regulator, and ammeter, all enclosed in cast-iron cases with glass fronts and mounted on iron framework. The fire pump is designed to allow three jets of water being thrown at one time to a height of 60 ft. from hydrants accommodated in ground boxes connected to the 4 in. diameter spigot and socket cast-iron pipe main led around the house. Air

valves are fitted to this piping where necessary, and a sluice valve with wash-out cock allows of the mains being emptied during frosty weather, although, as a rule, they are kept full of water. A very complete system of hot-water heating is provided.

The whole of the electrical work was carried out by Messrs. Brash & Russell, Glasgow, under the supervision of the consulting engineers, Messrs. J. E. Sayers & Caldwell.

## CORRESPONDENCE

## THE "HALF-WATT" LAMP.

To the Editor of ELECTRICAL ENGINEERING.

DEAR SIR,—In order to correct certain erroneous rumours which have been circulated during the past few weeks on the subject of the new "Half-Watt" lamp, we shall be glad if you will inform your readers that the lamp in question will, at any rate, for some considerable time to come, only be supplied in units of extremely high candle-power to compete with high-pressure gas arcs for street lighting, &c., and, of course, electric arc lamps.

It is probable that such "Half-Watt" lamps will be available in commercial quantities during the present year, and we hope before long to have an opportunity of demonstrating the lamp to members of the Press.

The new lamp is of particular interest as it embodies certain novel processes of manufacture, not hitherto applied to electric lamps.

Yours faithfully,

SIEMENS BROTHERS DYNAMO WORKS, LTD.

Incandescent Lamp and Fittings Dept.,  
Tysen Street, Dalston, N.E.

[These rumours were dealt with in an article in our issue of July 17th (p. 416), in which the correct facts mentioned in the above letter were stated, and the correct position was again emphasised in the cartoon which appeared in our issue of July 24th. As the incomplete statements and erroneous conclusions of some of our contemporaries have given rise to a considerable amount of uneasiness in various quarters, we have pleasure in publishing the facts once more in the above letter.—Ed., E.E.]

## CATALOGUES, PAMPHLETS, &amp;c., RECEIVED

**LIGHTING SUPPLIES, &c.**—A pocket size nett price list has just been issued by Baxendale Brothers (96 Whitechapel, Liverpool). Among the items making up the list are fans, "Sanitas," hot and cold air douches, cables of various sizes and grades, conduits, fittings, arc carbons, &c. There is also a selection of bells, bell wires, and primary and secondary batteries.

**DYNAMOS AND MOTORS.**—Particulars and illustrations of "Castle," W. type motors and dynamos are contained in a recent catalogue issued by J. H. Holmes & Co. (Newcastle-on-Tyne). Included are dynamos for cinematograph lanterns, low pressure dynamos, &c.

*Readers desiring copies of catalogues or pamphlets should apply to the firms in question, referring to the notice in "Electrical Engineering."*

**ACID-PROOF SILICA LAMPS.**—A leaflet descriptive of the acid-proof silica lamps, for direct current, recently introduced by the Westinghouse Cooper Hewitt Co., Ltd. (80 York Road, King's Cross, N.), has just been issued. The efficiency is stated to be 0.22 watts per candle, while an earthenware casing is employed which makes a tight joint with the globe. The interior being thus protected from corrosive vapours, the lamp is of particular value in chemical and galvanising works, and others of a like nature.

**Ontario Hydro-Electric System.**—It has been decided to enlarge at once the Niagara Falls transformer station of the Hydro-Electric Power Commission of Ontario, and to double the line between Dundas and Niagara Falls.

## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,352.

I HAVE recently become responsible for laying air space telegraph and telephone cables, and should be glad to have some information on the following points:—(1) Is dessicating apparatus absolutely necessary? (2) Give a design for a really accessible test box having high insulation, for use in railway signal boxes. (3) What is a satisfactory way of securing a lead-covered cable when it has to be carried straight up a wall? (4) Is any harm likely to accrue if a 4-in. sag is allowed in an armoured cable supported on hooks 6 ft. apart? (5) What is a satisfactory form of lightning protector?—"POTHEAD."

(Replies must be received not later than first post, August 28th.)

### ANSWERS TO No. 1,350.

It is required to operate three 20,000-volt isolating switches simultaneously by means of fixed handle and link gear. The handle will be about 9 or 10 ft. away from the switches. Explain how you would do this, giving approximate dimensions of the apparatus in a sketch. The device must be mechanically and electrically sound, as the switches are not for a laboratory, but for use under the worst conditions. The gear must not be expensive to construct.—"ABSONDERN."

The first award (10s.) is given to "W. R." for the following reply:—

The sketches in Fig. 1 show one method of operating the three switches simultaneously. It has here been assumed that the switches will be mounted vertically. As the con-

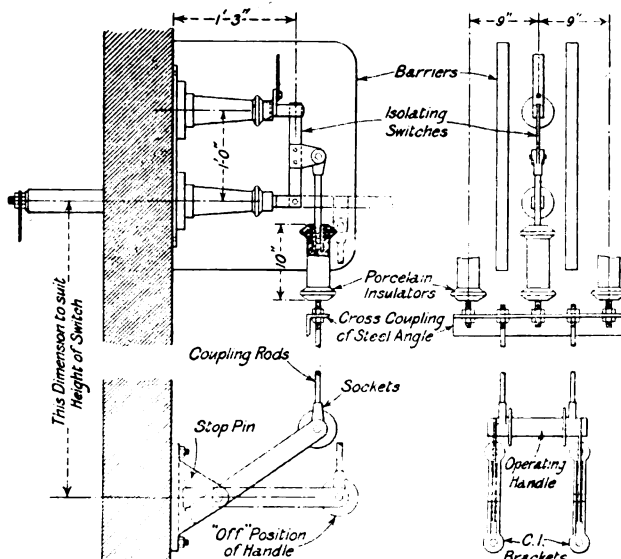


FIG. 1.

struction of the operating gear is dictated principally by the insulation requirements, it is important that there should be

ample creeping distance between poles and to earth. The insulators should be of glazed white porcelain, and although the overall dimension given for the insulators could be reduced by using the corrugated type, it is found advantageous in practice to adopt the smooth type, principally on account of the greater ease in keeping them clean. It will be seen from the sketch that a steel piece is rivetted to each of the switch blades (see Fig. 1), and connected by a short steel coupling-rod to the top side of the insulators, the rods being "ragged" at the end, and cemented in the insulators which are grooved inside. Steel studs are secured in the bottom side of the insulators in a similar manner, and connected to a cross-coupling of light steel angle, this construction allowing individual adjustment of the switches. The cross-coupling angle is operated by two steel rods (gas piping can be used) from the fixed handle. The

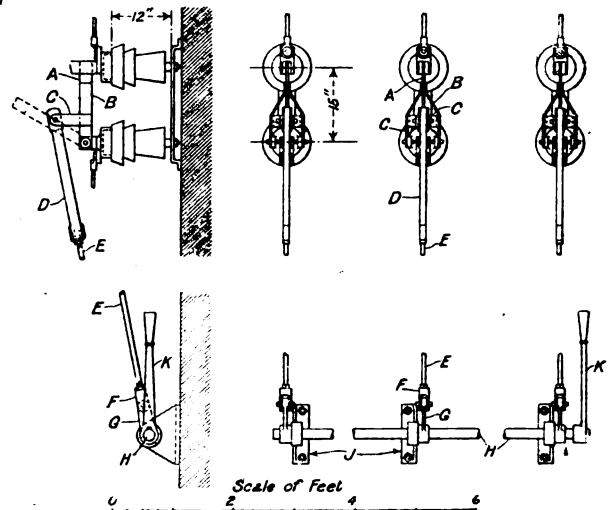


FIG. 2.

handle gear consists of a bobbin-shaped wooden handle mounted horizontally on a steel spindle which connects the two coupling-rods to the two side-links, these side-links at the other end being carried by two brackets. A stop-pin should be fixed to the brackets to act as a stop for the handle when in the "off" position, thus obviating any risk of shock to the switches themselves due to rough handling. The metal-work of the handle-gear should, of course, be efficiently earthed. It is important that the switches should be of strong mechanical construction apart from the actual current to be carried, and barriers of slate or other suitable material should be fixed between switch-poles.

The dimension given between poles can be varied to suit requirements, though a minimum of 6 in. (in air) should be allowed between live parts of different poles.

The second award (5s.) is made to "N. G. W.," who writes as follows:—

No particulars are given of the current the switches are to carry, but it is assumed that it is comparatively small, say 150 to 200 amps., and that therefore the dimensions of the switches will be decided by the voltage and by mechanical reasons. The sketch in Fig. 2 is to scale, and indicates the approximate dimensions. It is assumed that the switches can be mounted on a wall, and that the handle-gear can be mounted below them. Also that the main point concerning which information is desired is the coupling of the handle-gear to the switches, and that it is an advantage if the handle-gear can be adapted to standard switches. Suffice it to say, regarding the switches themselves, that the centres from top contact to hinge should not be less than 15 ins., and the insulators should give a sparking distance of about 12 ins. With switches of this size the blade should be of the "stayed" type. That is, the actual blade "A" should be supported by stay-straps "B." These can be of wrought-iron, and should be hinged concentrically with the blade. To each pair of stays should be rivetted a pair of levers "C" provided with a pin coupling to them a connecting rod "D." This rod should be made of good, sound teak, thoroughly impregnated. It should be strengthened at the top by a pair of wrought-iron plates, one screwed each side, and should be fitted at the bottom with a wrought-iron strap into which the coupling-rod "E" can be screwed and locked with a nut. The other end of the coupling-rod is provided with a device "F" pinned to a lever "G." The three levers are keyed to a common shaft "H," which is provided with three bearings "J" and the handle-lever "K." The gear should be



SPECIFY

**IGRANIC**

Electric Controlling Devices

**IGRANIC ELECTRIC CO. LTD.**

(PROPRIETORS OF ADAMS MANUFACTURING CO. LD.)

147, Queen Victoria St., London, E.C.

Works: BEDFORD.

SEE ANNOUNCEMENT ON PAGE 21.

adjusted so that when in the "on" position the levers "G" just pass the dead centre and come up against a stop, so that there is no danger of the switches falling out or being forced out by magnetic action. Also if this is done there is no danger of the switches when "off" falling into the "on" position. The use of the impregnated-wood connecting-rod provides a very simple and efficient coupling, which can be made of length to suit the circumstances, and enables the metal parts of the driving-gear to be kept well away from the electrical connections.

**ANSWERS TO CORRESPONDENTS**

WAGLER.—Your reply came too late; try and catch the post next time. Thanks for your kind expressions of appreciation.

**FIRE ALARM SYSTEMS**

MANY modifications of the Siemens "closed-circuit" fire-alarm system are set out in new catalogues from Siemens Bros. & Co., Ltd. (Woolwich, S.E.). The fire-alarm boxes are connected in series with a current flowing continuously between them and the central fire station. For those cases where not more than 120 boxes are required, the indicator at the central station may be a graduated dial and pointer indicating the number of the box originating the call. At the same time, an alarm bell rings until the indicator has been restored to normal. Should the line wire become

injured, a definite signal is given at the station until the fault has been remedied. Fire calls can, however, still be received. The alarm boxes themselves are robust and well insulated, as may be seen from Figs. 1 and 2, which show one design in which is a telephone equipment in a separate locked compartment for police or ambulance work, &c. The clockwork mechanism which transmits the code call may be obtained to send a number of calls may require rewinding without rewinding, or it after each call. Provision is made to prevent the glass door being closed unless this operation is carried out. The dial apparatus at the station consists of



FIG. 1.—FIRE ALARM CALL BOX (CLOSED).

a well-made case, with hinged back and glass front. At the top is a telephone set with automatic cradle, and a telephone and fault bell. Inside is the dial, signal annunciator disc, relay pin controlling the dial mechanism, and a milliammeter. There is also the restoring mechanism and broken wire switch. The latter is used to convert the system temporarily to open-circuit working. Should a second alarm box be operated before the pointer has been replaced, it can be arranged that this call be transferred to a reserve dial. Permanent records may be obtained by the use of a Morse inker or punching register.

Simple hand-operated or automatic arrangements for efficiently calling out the entire brigade or certain members of it may also be supplied.

A development of this system is that known as the Siemens "Morse" system, which we learn is installed in over 100 cities and is approved and used by the British and other Governments. By an ingenious arrangement of the switchboard it is possible to receive simultaneously and without mutual interference calls from eight different boxes. It is easy, also, to record automatically the date, time and origin of every call. Another system is the "Perforator" system, especially intended for those situations where a large number of boxes

are necessary, but where many simultaneous calls are not expected. The greatest development of all is the "Automatic Repeating" system, in which all alarm calls are concentrated

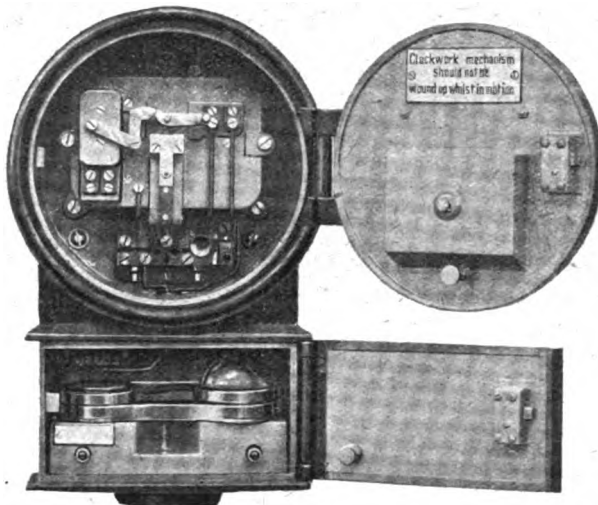


FIG. 2.—FIRE ALARM CALL BOX (OPEN).

at the central station, and at the same time repeated to all sub-stations. Simultaneous calls may be recorded, and in this, as in the other systems, ample facilities are provided for testing and repair.

**COST OF THE STREET LIGHTING IN CHICAGO**

SOME interesting figures relating to the cost of the new street lighting in Chicago (*ELECTRICAL ENGINEERING*, Vol. VIII., p. 581, Oct. 24th, 1912) were recently given by Mr. R. Palmer, the City Electrician. According to the *Electrical World* (New York), when the new contract was entered into in October, 1910, there were 12,200 street arcs, and up to the present time 4,000 of the 10,000 additional 10-ampere flame arcs have been installed. The price paid for the energy used is \$15 (£3 3s.) per h.p.-year of 4,000 lamp-hours, or approximately 3d. per kw.-hour.

To light one mile of street with twenty-three flame arcs costs, with underground distribution, \$9,000 (£1,875), and with overhead distribution, \$4,000 (£860). These figures include sub-station and distributing costs. Where the system of underground distribution and tungsten lamps in opalescent globes on the old gas posts has been installed, the cost has come to about \$8,000 (£1,720), using seventy-five staggered on both sides of the street, and about 150 ft. apart.

Flame arcs on underground circuits cost in 1912 \$39.91 (£8 6s.) a year to maintain. To this should be added an interest charge on investment of \$19.16 (£4), and a depreciation charge of \$13.67 (£2 16s.), making the total yearly cost, according to Mr. Palmer's figures, \$72.74 (£15 2s.) per lamp. On overhead circuits the interest and depreciation costs are lower, bringing the total yearly cost down to \$54.57 (£11 7s.). The most expensive form of electric street lighting is the underground distribution system with tungsten lamps. The cost per unit for maintenance is only \$13.86 (£2 15s.), but allowing for interest and depreciation this comes to \$24.27 (£5 1s.) per lamp per annum. Thus, per mile of street the cost is \$1,820 (£379), compared with \$1,673 (£348) for flame arcs on underground circuits, and \$1,255 (£255) for flame arcs on overhead circuits.

Attention has been given recently to the lighting of the 625 street crossings under the elevated railways, or subway crossings, as they are called. The railway companies will be forced to instal and maintain lamps in 275 of these subways, the city being required to light the remaining 350. After an investigation a standard of one 16-c.p. lamp for each 400 sq. ft. of inclosed subway area was decided upon as sufficient. The railway companies have been trying to get the area of 400 sq. ft. increased to 800 sq. ft.

## THE LONDON & NORTH WESTERN AND THE SOUTH WESTERN RAILWAY CONTRACTS

A LONG letter and an editorial paragraph on the contracts for the electrical equipment of the L. & N.W. railway suburban lines appeared in *The Times Engineering Supplement* last week, in which it is erroneously stated that the Oerlikon Co. received the contract for the generating plant, and further hinted that the British manufacturers refused to tender for the contract on account of the "general conditions" accompanying the specification. We are in a position to inform our readers that both these statements are absolutely incorrect.

The London & North Western Railway, we understand, originally obtained the equipments for four electric trains from Siemens Brothers Dynamo Works, but, after inviting tenders for the electrical equipment of the lines now being "electrified," awarded the contract for the electrical equipment of the rolling stock to the Oerlikon Co. The trucks and bodies are being made by the Metropolitan Amalgamated Carriage & Wagon Company. For the power house, however, Westinghouse-Siemens turbine sets were ordered; and B.T.-H. rotary converters were chosen for the sub-station equipment. It is true that exception was taken to some of the "general conditions" by the firms tendering, but in some, if not in all, cases a compromise was arrived at.

In the case of the South Western Railway, the order for the equipment of the trains was given to the British Westinghouse Company; Dick, Kerr & Co. supply the generating plant; and the sub-station equipment is, as in the case of the L. & N.W. Railway, to be carried out by the B.T.-H. Co.

### TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

The *Electrical News* (Toronto) contains an interesting description of a continuously-loaded telephone cable made by W. T. Henley's Telegraph Works Co., Ltd., of London, and laid by the British Columbia Telephone Co. between Point Grey, near Vancouver, and Newcastle Island to develop the telephone traffic between Vancouver and Victoria (B.C.). The length of the cable is 28.3 nauts, and it is continuously loaded. Each of the four conductors consists of a central wire 0.082 in. diameter, surrounded by twelve smaller wires each of 0.0285 in. diameter, giving the composite conductor a diameter of 0.139 in., and a weight of 300 lb. per naut. A soft iron wire, 0.012 in. diameter, is wound closely round this, making seventy turns per in. The conductor is then covered with gutta percha, having a weight of 300 lb. per naut, and the four cores are stranded round a centre of yarn with yarn worming between the cores. The whole is covered with brass teredo tape and armoured with fifteen galvanised steel wires 0.192 in. diameter, which are embedded in yarn and protected by two layers of yarn and preservative compound. The whole cable has a diameter of nearly 2 in. and weighs 8 tons per naut. The electrical constants of each core per naut are as follows:—Resistance, 4 ohms; capacity, 0.35 m.f.; dielectric resistance, 250 megohms after one minute's electrification at 75° F. The attenuation constant is about 0.019 per naut. of cable at 800 cycles per sec.

The cable is worked with a phantom circuit, so that it can be used for three conversations simultaneously. According to our contemporary, a continuously-loaded type of cable was adopted in place of the coil-loaded pattern used for the Anglo-Belgian cable, owing to the fact that it is laid in much deeper water, and that the latter type was not considered to be safe for the deep waters of the Gulf of Georgia. The maximum depth at which the cable is laid is about 1,300 ft.

A decision has been given by the Postmaster-General regarding the application of the Corporation to continue the control of the Hull telephones. It is understood that the

## PATENTS.

*Small Prepaid Advertisements with regard to Patents, &c., are inserted on this page, facing our Patent Record, at 1d. per word (minimum 5s.); three insertions for the price of two. Rates for displayed and card advertisements on application.*

*Advertisement matter, accompanied by a remittance, should be addressed to the Kilowatt Publishing Co., Ltd., 203 Temple Chambers, London, E.C.*

**TO ELECTRIC APPARATUS MANUFACTURERS.**—The owners of British Patent No. 10,793 of 1909, relating to "IMPROVEMENTS IN OR RELATING TO THE PRODUCTION OF ELECTRIC CURRENTS," are desirous of entering into negotiations with one or more firms in Great Britain for the purpose of exploiting the above invention, either by sale of the Patent outright, or by granting licenses to manufacture under royalty. Inquiries should be addressed to MESSRS. AEBL & IMRAY, Chartered Patent Agents, 29 Southampton Buildings, London, W.C.

**PATENT.**—The proprietors of British Patent No. 17,331 of 1908, relating to IMPROVEMENTS IN REVERSIBLE GALVANIC BATTERIES, desire to enter into arrangements by way of license or otherwise, on reasonable terms, for the purpose of developing and practically working the same in this country. Inquiries should be addressed to W. P. THOMPSON & Co., Chartered Patent Agents, 285 High Holborn, London, W.C.

The owners of British Patents Nos. 25,473, 25,397, and 6,402, all of 1910, entitled, respectively, "IMPROVEMENTS IN AND RELATING TO REPULSION MOTORS OPERATING AS GENERATORS," "IMPROVEMENTS IN AND RELATING TO THE EXCITATION OF INDUCTION DYNAMO ELECTRIC MACHINERY," and "IMPROVEMENTS IN AND RELATING TO THE CONNECTION OF SINGLE-PHASE MOTORS TO POLYPHASE CIRCUITS," are desirous of disposing of the patents or entering into working arrangements under license or otherwise with firms likely to be interested in the same.

Copies of the patent specifications and full particulars can be obtained from, and offers made (for transmission to the owners) to, MARKS & CLERK, 57 & 58 Lincoln's Inn Fields, London, W.C.

### John E. Raworth,

Queen Anne's Chambers, Chartered Patent Agent.  
36, Broadway, Westminster, London, S.W.

### REMOVAL.

MR. J. G. LORRAIN, M.I.E.R., M.I.Mech.E., Chartered Patent Agent, has removed his office from Norfolk House, Norfolk Street, Strand, W.C., to  
**Staple Inn Buildings, High Holborn, London, W.C.**

### APPOINTMENTS VACANT & WANTED.

**YOUNG MAN** with practical mechanical experience in telegraph and telephone repairs wanted for West Indies. Good climate. Three years' engagement; passage paid both ways. State age and salary expected. Apply with copy of testimonials to RAILWAY, c/o A. F. SHARP & Co., Advertising Agents, Glasgow.

**ADVERTISER.**—Six years' varied Mechanical Experience, and four years' Electrical (now Assistant Engineer on Staff of large Power Co.), desires responsible situation. Highest references, past and present. Address, A. UNIT, 192 Newport Road, Cardiff.

**CARTOONS FROM "ELECTRICAL ENGINEERING."**—In response to numerous requests for the original drawings of the Cartoons published in *ELECTRICAL ENGINEERING*, we have made arrangements by which these may be purchased by readers at £1 ls. each.

Reproductions of any Cartoons that have been published in *ELECTRICAL ENGINEERING*, neatly framed in plain oak frames, are also obtainable at 3s. 6d. each.

Books of Cartoons from October, 1910, to September, 1911. Price 8d. (post free, 9d.).

Orders (accompanied by a remittance) should be sent to the **KILOWATT PUBLISHING Co., LTD.**, 203 Temple Chambers, London, E.C.

# "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

## Specifications Published August 14th, 1913

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

Names in *italics> indicate communicators of inventions from abroad.*

18,184/12. **A.C. Percussive Tools.** L. SCHULER. The current is controlled by a synchronous interrupter so that the tool magnet coil is fed during two consecutive half-waves of pressure for a time, so that the magnetic field is produced and disappears. No sparking occurs when the current is stopped or weakened during the return of the armature. Five figures.

19,763/12. **High-frequency Currents for Wireless.** W. DUBILIER. A constructional form of the electrodes required for the system described in Specification No. 11,091/12 (ELECTRICAL ENGINEERING, Vol. VIII., p. 538, September 26th, 1912). A number of electrodes are moved by either rotation, reciprocation, or oscillation across other fixed electrodes, so that the arc is first made, and later suddenly broken. The faces of the electrodes are kept substantially parallel to the line of motion. Six figures.

20,446/12. **Telpher System.** J. E. POLLAK (*Elektromotoren-Werke Hermann Gradenwitz, Germany*). Rotary switches are operated mechanically by passing cars, and electromagnetically released so that separate block sections of the power contact conductor are cut in and out of circuit. The switch can take up a third position during the passage of a car to cut in an auxiliary section at the rear of the block section through a resistance, so that a following car may proceed slowly. Three figures.

21,351/12. **Loud-speaking Telephone Receiver.** R. LAGUS. The distance between the receiver and the microphone is adjustable, and in the cover of the microphone around the usual large central hole, small conical holes flared towards the membrane are provided. The carbon granules behind are subdivided into a corresponding number of independent parts. Four figures.

21,761/12. **D.C. Dynamo Field Construction.** B.T.H. Co. (*G. E. Co., U.S.A.*). A portion of the exciting windings are situated in slots in the interpolar space, which, in addition, carry compensating windings. The mid-interpolar tooth acts as a commutating pole. Two figures.

2,146/13. **Fixing Terminals to Aluminium Conductors.** L. W. CHUBB. A copper conductor is welded to the aluminium conductor so that the terminal may be soft-soldered to this. Five figures.

6,952/13. **Furnace for Tungsten Filament Manufacture.** G. LÜDECKE and BRIMSDOWN LAMP WORKS. With the object of carbonising, decarbonising, and forming filaments from the raw state in one operation, a cylinder of metallic tungsten or molybdenum is provided within the heated zone of a furnace as described in Specification No. 8,996/11. Rods of tungsten or molybdenum are arranged in the form of a cage, and serve to conduct the heating current. The cage is placed in a furnace shaft of copper or nickel, and the filaments to be treated are introduced into the cage through the top of this shaft, which may then be closed. Provision is made for the expansion of the cage by providing a mercury contact at the bottom of the cage. The furnace is water-cooled. Three figures.

9,644/13. **Loud-speaking Telephone Receiver.** C. STILLE. An electro-pneumatic sound-box is described in which a suspended slotted plate is moved to and fro above another similar plate by an electromagnet actuated by the received currents, so that the air escaping is regulated in accordance with them. Three figures.

13,911/13. **Large Traction Magnets.** MAGNET-WERK GES. Electro-magnets for lifting heavy loads have a fan built into the frame to cool the windings. One figure.

14,214/13. **Short-circuiting Lightning Arresters.** SIEMENS & HALSKE. A short circuit for lightning arresters is actuated by metals with different coefficients of expansion, so that heat due to an excessive current causes a bending so as to effect the short circuit, which is, however, automatically removed when the current falls. One figure.

## Specifications Published To-day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free. Summaries of some of the more important of these patents will appear in our next issue.

**Arc Lamps:** MOUL (*Korting & Mathiesen A.-G.*), 11,704/13.  
**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** SIEMENS BROS. DYNAMO WORKS (*Siemens Schuckert*). [Driving ring-spinning and doubling frames] 18,013/12; SMITH [Adjustable cable sling suspender] 18,542/12; HOWARD [Cable

armouring] 24,237/12; ROUTIN [Synchronous running of motors] 24,751/12; LOEWENTHAL [Insulating layers on cables] 27,651/12.

**Dynamos, Motors and Transformers:** BARTSCHI [Magnetos] 19,963/12; LEITNER [Variable-speed dynamos for starting internal-combustion engines, &c.] 23,273/12; KELLER-DORIAN [Induction generators] 1,100/13.

**Electrometallurgy and Electrochemistry:** SCOTT [Nitrogen-fixing furnaces] 14,871/12; DUNLOP TYRE Co. and KEEGAN [Wheel-rim welding] 17,583/12; HADDAN (*Cleveland Welding & Mfg. Co.*) [Welding] 17,749/12 and 29,999/12; MOLLER [Separating bodies in suspension from gaseous fluids] 17,840/12; HEROUT [High grade pig-iron] 25,974/12; DU BOIS [Electrolysis] 1,420/13 and 1,439/13; DEKKER [Deposition of metals] 7,328/13.

**Ignition:** SIMMS and SIMMS MAGNETO Co. [Automobile starting] 9,924/12.

**Instruments and Meters:** SIEMENS & HALSKE [Housing recording strip of electro-cardiographs] 7,846/13; ARON ELEKTRICITÄTSSÄHLERFABRIK GES. [Bearings] 11,277/13.

**Switchgear, Fuses and Fittings:** TUCKER [Fuses] 19,642/12; RAILING STRACHAN and HOADLEY [Current limiters] 23,917/12; TAYLOR [Relays] 26,351/12; SMITH [Adapter-holder] 26,651/12; WORRELL [Locking bayonet-type lamps to their holders] 2,139/13; WADE (*Voigt & Haeflner A.-G.*) [Luminous indicator for switches] 7,581/13.

**Telephony and Telegraphy:** CHABEAULT [Transmitting to a distance and recording theatrical performances, &c.] 1,444/13; GRAHAM and RICKETS [Telephone systems] 2,610/13; CEREBOTANI [Printing telegraphs] 9,833/13.

**Traction:** THOMAS and THOMAS TRANSMISSION, LTD. [Power distribution] 17,130/12; VAN DAALEN and SCHREIBER [Control of electrically-operated, self-propelled vehicles] 17,306/12; FIRTH and LEAKE [Signalling] 25,991/12; JOHNSON and THORROWGOOD [Signal control] 26,879/12; ANDERSON [Trolley wheels] 3,371/13.

**Miscellaneous:** HUDSON [Miners' safety lamps] 14,385/12; ROOTHAN and FERBANTI, LTD. [Resistances] 17,980/12; COCARD [Remote operation of valves, &c.] 27,979/12; GRAY [Gyrostatically-controlled moving body] 29,530/12; KRUPP A.-G. GRUSONWERK [Magnetic separator] 4,595/13.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Arc Lamps:** SIEMENS SCHUCKERT [Regulating light intensity] 17,086/13.

**Distributing Systems, Cables and Wires, &c.:** GILES [Safety devices for cables] 15,951/13.

**Electrometallurgy and Electrochemistry:** SOC. GEN. DES NITRURES [Furnace resistance elements] 12,837/13.

**Instruments and Meters:** SOC. D'ELECTRICITÉ MILMELIOR [Indicating recording and controlling devices] 16,641/13.

**Switchgear:** SIEMENS & HALSKE [Relay] 17,137/13.

**Telephony:** SIEMENS & HALSKE [Automatic and semi-automatic circuits] 14,487/13; ERICSSON [Automatic switch] 17,038/13.

## Opposition Entered to Grant of Patents

5,026/12, 5,027/12, and 5,028/12. **Ductile Tungsten Filaments.** J. HUBERS (*Julius Pintsch A.-G.*). The processes claimed are for the production of ductile tungsten filaments by first alloying a tungsten compound with an oxide of thorium or other rare earth metal. (ELECTRICAL ENGINEERING, June 26th, p. 386.)

## Grant of Patents Allowed

15,669/11 and 15,679/11. **Gyro-compass.** E. A. SPERRY. See ELECTRICAL ENGINEERING, Vol. VIII., p. 550, October 3rd, 1912.

## Restoration of Lapsed Patent

15,801/01. **Pull-chain Switch Lamp-holder.** H. HUBRELL. This patent which was allowed to lapse. (ELECTRICAL ENGINEERING, March 20th, p. 166.)

## Expired Patents

The following are the more important Patents that have become void through non-payment of renewal fees.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** A. E. TANNER [Sectionalised distribution systems in which if a section becomes faulty it is automatically cut out, and both ends earthed by special cut-outs] 10,080/04; SOC. MATHELOT ET GENTILHOMME [Synchronous rotation of motors driving a phonograph and cinematograph] 8,865/08, 9,371/08, and 9,372/08.

**Traction:** R. BARON [Pressed or stamped trolley heads] 8,846/05.

**Miscellaneous:** J. WILHELM [Electrically-driven coal-whips or hoists] 9,969/04.

general nature of the conditions laid down are that the Postmaster-General is prepared to continue the licence of the Corporation provided they will take over the plant of the National Telephone Co. at the price at which the Post Office purchased it, and also will make arrangements for the voluntary transfer of the staff. This offer is being considered by the Corporation.

In answer to a Parliamentary question as to the efficiency of the telephone service, the Postmaster-General stated that on the result of about 50,000 secret observations it had been ascertained that for the first six months of 1911 and 1913 the following figures had been obtained:—Average speed of answers to calls (1911), N.T. Co., 5·8 sec., P.O., 5·1 sec.; (1913), P.O. combined system, 5·1 sec. Similarly, effective calls formed 65·9, 68·7 and 70·5 per cent. respectively of the total number of calls. "Engaged" calls formed 18·6, 18·9 and 17·4 per cent. of the total calls, while "no-reply" calls formed 4·5, 2·5 and 4·1 per cent.; and "cut-offs," 0·7, 0·4 and 0·6 per cent. respectively of the total number of calls.

In the House of Commons last week a return was ordered to be issued of patents in respect of which royalties will be payable under the contract of the Government with the Marconi Co., the dates when such patents were granted, the areas in respect of which they run, and the dates when they expire in the ordinary course.

The annual report of Marconi's Wireless Telegraph Co. records a net profit of £413,294, as compared with £141,717 for 1911. In view of a part of this profit having been derived from the realisation of shares, the directors are creating a reserve fund, to which they have apportioned £100,000 out of the profits. A 17 per cent. dividend is to be paid on the preference shares, and 20 per cent. on the ordinary shares, with £146,726 carried forward. It may be remarked, however, that in view of the high price of the ordinary shares, this dividend represents a net yield of about 6 per cent. The directors state in the report that they do not believe that the altered conditions of the contract for the Imperial chain of stations will prove of any disadvantage to the Company, and with regard to rival systems they remark that, notwithstanding all that has been stated and published in recent times respecting the continuous-wave system of wireless telegraphy, experience has not yet proved that that system will be capable of conducting a long-distance wireless telegraph service as efficiently as the slightly damped spark system at present in use.

The report of the Select Committee appointed by the House of Commons in April, 1912, to inquire into the wages and conditions of employment in the Post Office has issued its report. It finds that, with the exception of a few of the more highly skilled branches of the engineering department during periods of abnormal expansion of work, there is no difficulty in obtaining a sufficient number of competent persons. With reference to wireless, the Committee recommends that the staff be recruited by selection from telegraphists, counter and sorting clerks between twenty-one and twenty-four years of age, and showing proof of such knowledge of French and German as is necessary for communicating with foreign ships. It recommends 70s. as the maximum weekly wages for this class; and thinks that the salaries of wireless overseers should be £200, rising to £230 a year. The Committee also states that no clear case that the undertakings of the Postmaster-General with regard to the transfer of the staff of the National Telephone Co. have not been carried out has been sustained. The staff therefore has no ground of complaint, and will share, says the report, in the advantage of the recommendations made in regard to the whole body of Post Office servants.

Private wireless stations in Germany may now only be erected on the understanding that any messages picked up are kept secret, and that the Government has the right at any time to order their demolition. Military and naval officers can at any time inspect the stations and order a temporary cessation of activity, and the stations must be placed at the disposal of the Government when required.

At the fortnightly meeting of the Liverpool Amateur Wireless Association, last Thursday, one of the members gave particulars of his station, from which vessels are heard all round the coast of England, as well as from some parts of the coasts of Ireland and Scotland. Many of the Continental stations are strongly received, including Bergen, Norddeich long and short wave, Belgium, France, and Spain. Soller (Balearic Isles) and Pola (Austria) are very often easily readable. A double slide inductance coil is used, with an extra coil of inductance for Clifden. The sliders on this set make contact with at most two turns of inductance. Very sharp tuning is obtained. Prof. Marchant has promised

to give a lecture on wireless in the near future, and the members are looking forward to a visit to the wireless installation at the Liverpool University. The next meeting was announced for Thursday, 28th August.

The first of a series of schools of wireless telegraphy is to be erected at Giffnock for the Faraday Correspondence Schools, Ltd. (Glasgow). There will be six portable wireless sets for transmitting up to twenty miles and receiving up to 150 miles. A very powerful station with an aerial supported on masts from 150 to 200 ft. high and about 250 ft. apart is also to be erected. Accommodation for about 150 students at any one time is to be provided.

The Roumanian Office states that new telegraph stations at Dobritch and Baltchik have been opened, known as Dobryci and Balcie.—As from the 14th inst., telegrams in code and cipher were again admitted by Greece.—A telegraph office has been opened at Durazzo (Albania) under the same conditions as Vallona.

## ELECTRIC TRACTION NOTES

### The Motor-'Bus Danger: Traffic Committee's Report

IF the Government give effect next session to the recommendations of the Select Committee on Motor Traffic (whose report was issued on Thursday evening), the London County Council and the suburban Local Authorities owning tramway undertakings will have reason to rejoice. The London Borough Councils, on the other hand, may be less pleased, and the owners of motor-'buses will not be pleased at all. The chief recommendation is that the licensing of stage carriages and hackney carriages should be transferred from the police to the County Councils and County Borough Councils, who shall also have power to issue regulations as to routes, time-tables, &c. These powers, it is suggested, are to be subject to a sort of general control by the Traffic Branch of the Board of Trade, which is to be reorganised for the purpose. The veto of Borough Councils with regard to tramway schemes is to be taken away, and in the case of opposition a hearing before this new Traffic Branch is to be substituted.

Needless to say, this would help considerably to mitigate the serious effect which motor-'bus competition has had upon the tramway undertakings, but, however desirable the recommendations of a Select Committee may be, and however well considered its report, it by no means follows that immediate legislation will follow. As the Committee points out, the whole problem of London traffic was inquired into by a Royal Commission in 1903-4-5; but, although made eight years ago, most of the recommendations of this Commission "have only become more urgent with the time which has elapsed since they were made."

A very exhaustive analysis of the street accidents in London during the past few years has shown an enormous increase year by year, and the Committee has satisfied itself that by far the greater part of the responsibility for this increase must be attributed directly to the motor-'bus. In addition, the methods employed by many 'bus drivers when running competitively with tramways are, in the opinion of the Committee, serious from the standpoint of public safety. Tramways, on the other hand, are held to be entirely free from blame for the increase in street accidents. Fatal accidents have been as frequent in streets in which there are no trams as in streets with tramlines, and the Committee "do not think that anything has been shown to connect with tramways, even indirectly, the alarming rise of fatalities in recent years." The suggestion that the licensing authority for motor-omnibuses should, in London itself, be the largest tramway authority, and in suburban London the County Councils, who will naturally be usually inclined to adopt the views of the local authorities running the trams, is somewhat drastic, but it appears to be almost justified; and, even if these authorities may be tempted to restrict omnibus traffic facilities unduly, the omnibus owners would always have an appeal to the traffic branch of the Board of Trade already mentioned.

Incidentally, it may be mentioned that the Committee find that lack of lighting has not been a contributory cause of the accidents. Taken over a period of three years, statistics showed 508 fatalities before sunset as against 355 after, and of the latter, 339 occurred where lighting was good, four in places not lighted and twelve with lighting medium or indifferent. Those tramway authorities who have found road-



widenings a burden, may or may not be comforted to hear that narrowness of the street does not conduce to a greater number of accidents; motor-omnibuses run more frequently in the wider streets. Nor is there anything to show that accidents would have been sensibly diminished if a speed limit had been enforced.

In fact, the tramways are blamed for nothing; practically the only recommendation for their improvement is that means should be taken as soon as possible to remove the congestion caused by "dead ends."

A system of stopping moving trains by wireless has been invented by Professor C. Wirth, of Nuremberg, who was also the inventor of the "wireless distance boat." The system has been inspected by Dr. Otto Edelmann (Chief Engineer, Bavarian Royal Institute of Industry and Commerce) in operation on the line between Nuremberg and Gräfenburg, in Bavaria. The telephone or telegraph lines alongside the railway are used as sending antennæ, while wires on the roof of the train serve as receiving antennæ. Sending stations are required every 80-100 kilometres, and are connected to intervening stations and signal boxes, where sending apparatus, either hand or automatic, is installed. A signal received on the train may be used to give a warning, apply the brake, shut off steam, &c. The cost of installation is said to be very low. Messrs. H. J. C. Grave & Co. (27-28 Old Jewry, E.C.) are representing the inventor in the United Kingdom as well as in other countries.

When the Report stage of the Post Office (Tube) Railway Bill was continued on Thursday last, an amended clause relating to the supply of electrical energy for the railway was proposed by the Government instead of the one originally in the Bill and deleted by the House of Lords Select Committee, as announced in ELECTRICAL ENGINEERING last week. The clause provided that the Postmaster-General should invite tenders for the electricity supply, and that if he were satisfied, taking all the circumstances into account, that an appreciable saving would result from taking the supply from a company or local authority, he should adopt that course. The Earl of Donoughmore suggested that the words "taking all the circumstances into account" should be omitted. The clause, subject to this amendment, was then agreed to, and the Bill read a third time and passed.

The trolley-omnibus system at Ramsbottom was opened for traction last Thursday. The route is five miles in length, and power is supplied by the Lancashire Electric Power Co. The cars have been supplied by the Railless Electric Traction Co.—A railless scheme is also being considered for Reading, and the Council has decided to promote a Bill for the purpose in the next session of Parliament.

A dividend at the rate of 5 per cent. per annum has been declared on the ordinary shares of the Oldham, Ashton & Hyde Electric Tramway Co.

A report has been prepared on the working of the Dublin & Blessington Light Railway, which is at present run by steam. It is stated that the cost per train mile is no less than 19'6d., and this is compared with a similar cost of 3'9d. for the electrically worked Lucan tramway as an argument in favour of the conversion of the line to electric traction.

Several sections of the new electric tramways in Constantinople are now complete, and were opened for traffic last Saturday.

A loss of £2,865 has been made on the year's working of the Walthamstow tramways, compared with last year's profit of £1,800. The change is attributed to motor-omnibus competition.

## LOCAL NOTES

**Bath: Electricity Accounts.**—A total expenditure of £11,846 is recorded for the past year, of which £7,332 is for generation and purchase of current, and £1,118 for distribution. The receipts were £22,130, but the balance was insufficient to pay capital charges, &c., and a deficit of £1,445 is the final result. Last year's deficit was £1,521, which has been met from the rates.

**Foleshill: Electricity Supply.**—The Midland Electric Light and Power Co. has given notice of its intention to apply to the Board of Trade for a provisional order in this district.

**Gravesend: Electricity Accounts.**—The profit on the year's working of the electricity undertaking was £166, out of which £120 has been applied to the wiring of the Technical School;

£25 was carried to capital account, and the remainder carried forward.

**Louth: Electricity Supply.**—It is reported that a London firm of electrical engineers has intimated its intention to apply for a provisional order for a supply of electricity in this district.

**Macclesfield: Mains.**—The New Electricity Co. are being asked by the Water Committee of the Corporation to give an undertaking to lay their cables in a trough insulation surrounded by 6 in. concrete for at least one yard each side of the water main in every case where the cables are laid under or over such mains.

**New Brighton: Interruption of Supply.**—On Saturday night, at about 9 o'clock, owing to failure of a feeder cable, supply was interrupted and considerable inconvenience caused. The Electricity Department were, however, able to effect the necessary repairs in about an hour.

**Portsmouth: Electricity Supply.**—A Committee has been appointed to consider the advisability of providing a supply of electricity for this district.

**Sheffield: Wiring Department.**—The report of the Electricity Committee regarding the future working of the Installation and Motor Department is to be referred to a Special Committee for further consideration in view of the opposition by local contractors regarding the scheme for the supply of fittings.

**Swanage: New Generating Station.**—The Board of Trade has given their consent to the construction of a generating station by the Swanage Electricity Supply Co. on a certain site.

**West Bromwich: Electricity Accounts.**—A net profit of £337 has been made on last year's working, after payment of capital charges, &c.

**Witney: Charges for Power.**—The following new scale of charges for power supply has been adopted:—Under 300 units per quarter, 2½d. per unit; up to 700 units, 2d. per unit; and exceeding 700 units, 1½d. per unit.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

### Generating Stations, Sub-Stations, Mains, &c.

**Basingstoke.**—Tenders are shortly to be invited for Diesel engines, generators, balancers, storage batteries, switchgear, cables, and overhead travelling crane.

**Batley.**—A Local Government Board inquiry is to be held regarding a proposed loan of £8,206 for mains, arc lighting, meters and services, and £1,550 for a new feeder cable.

**Belfast.**—A Local Government Board inquiry will be held on September 9th into the application for a loan of £35,000 for electrical purposes.

**Bingley.**—A Local Government Board inquiry is to be held regarding a loan of £7,000 for the electricity undertaking.

**Burton-on-Trent.**—New switchgear and new cables are to be put in at a sub-station at a cost of about £120.

**Cardiff.**—A Local Government Board inquiry is to be held next Tuesday regarding a loan of £30,500 for the electricity undertaking.

**Edinburgh.**—Tenders are invited by September 22nd for two 1,500-kw. mixed pressure steam turbines and D.C. generating plant at Edinburgh. Particulars from Sir A. W. B. Kennedy, 17 Victoria Street, S.W. (See advertisement on another page.)

**Heywood.**—An application for the expenditure of £12,000 is to be made for transformer plant, cables, &c., to deal with the bulk supply from the Bury Corporation.

**London: L.C.C.**—Tenders are invited, by September 23rd, for additional main high-tension switchgear and reconstruction of existing switchgear at the Greenwich Generating Station. (See advertisement on another page.)

**Newport.**—A Local Government Board inquiry is to be held regarding a loan of £10,600 for the electricity undertaking.

**Plymouth.**—Tenders are invited for a steam turbo-alternator and condenser. Particulars from E. G. Okell, Borough Electrical Engineer. Tenders by August 27th.

**Tunbridge Wells.**—Tenders are invited for the supply of high and low-tension cables for the ensuing twelve months. (See advertisement on another page.)

**Wimbledon.**—Tenders are invited for the supply of a 1,500-kw. alternator with condensing plant, and 20-ton over-

head travelling cranes. Particulars from Mr. H. Tomlinson Lee, Borough Electrical Engineer. Tenders by Sept. 1st.

### Wiring

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Abbey Wood.**—Extensions to tramcar depôt.

**Canterbury.**—New buildings to Bury Asylum. Architects, Jennings & Gray.

**Cardiff.**—New fire station.

**Grimsby.**—New isolation hospital.

**Haslingden.**—Conversion of buildings into wards at the Union. Architect, Henry Ross, 15 Cannon Street, Accrington.

**Hyde.**—Tenders are invited for electric lighting fittings, ventilating fans, &c., at the extensions of public baths. Particulars from H. J. Fletcher, 45 Clarendon Place.

**Ipswich.**—Additions to infirmary. Surveyor, Northgate Street.

**Keighley.**—Tenders are invited for wiring of a Sunday School in Albert Street. Architect, Mr. A. P. Harrison, High Close.

**London.**—Home Office Museum, Horseferry Road, S.E. H.M. Office of Works.

**Manchester.**—New brewery for Arthur Guinness, Son & Co.

**Morley.**—Cinematograph theatre. W. Peel, Schofield Park Road, Leeds.

**Northumberland.**—Tenders are invited for an electric lighting installation at Trimdon Colliery.

**Sunderland.**—Cinematograph theatre. W. & F. R. Milburn, Architects.

**Warrington.**—New imbecile block and offices at the work-house. W. & S. Owen, Cairo Street.

### Miscellaneous

**Aberdare.**—The Powell Duffryn Steam Coal Co. invite tenders for a supply of electrical goods. Particulars from Stores Manager, Aberaman Offices, nr. Aberdare.

**Tilbury.**—The Port of London Authority invite tenders for twelve electric luffing cranes, similar to those recently ordered for the Albert Docks.

## MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. George Smith & Son, of 5 Philpot Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night, was £72 15s. to £73 5s. (Last week, £72 10s. to £73.)

**The Record Patent Battery Auto Cut-In and Cut-Out.**—Owing to a printer's error, the price of the Record Electrical Co.'s Battery Auto Cut-In and Cut-Out advertised in our last issue was given as from £5 subject, instead of from £3 subject.

**Australian Trade.**—W. G. Watson & Co., Ltd. (Sydney), who have opened an office at 41 Cheapside, E.C., with the object of buying electrical goods for the Australian market, will be glad to see any of the trade or manufacturers who wish to do Australian business before the 30th inst.

**Self-Contained Locomotives.**—We understand that the sole selling licence in the Australian Commonwealth for Paragon self-contained locomotives, in which an electrical transmission system (W. P. Durnall's Patents) is employed, has been purchased by Messrs. Elder, Smith & Co., Ltd., of Adelaide and London. A manufacturing licence for locomotives and rail-cars on the "Paragon" system has been granted to Messrs. R. & W. Hawthorne Leslie & Co., Ltd. (Newcastle-on-Tyne).

## THE RECORD ELECTRICAL Co., Ltd.

LONDON OFFICE:  
CAXTON HOUSE,  
WESTMINSTER, S.W.

Telephone:  
3057 Victoria.  
Telegrams & Cablegrams:  
"Infusion,  
London."

MEASURING  
INSTRUMENTS.

RECORD'S PATENT.

Write for Prices & Particulars.

WORKS:  
BROADHEATH,  
MANCHESTER.

Telephone:  
164 Altrincham.

Telegrams & Cablegrams:  
"Infusion,  
Altrincham."

**Change of Title.**—The title of the firm Kelvin & James White, Ltd., has been changed to Kelvin, Bottomley & Baird, Ltd., in order to avoid possible confusion with the name of another firm of nautical instrument makers.

**Works Sports.**—The employees of A. Reyrolle & Co. held their annual sports at Hebburn on Saturday last, followed by a dinner and a dance.

**W. T. Henley's Telegraph Works Co.**—An interim dividend on the preference shares at the rate of 4½ per cent., and on the ordinary shares at the rate of 10 per cent., has been declared.

## NEW COMPANIES

**IGRANIC ELECTRIC CO.**, 147 Queen Victoria Street, E.C. Capital £35,000. To carry on the business relating to electrical control gear, &c., of the Adams Manufacturing Co. First directors, F. R. Bacon, F. L. Pierce, A. W. Berresford, and G. A. Mower.

**MITCHELITE LIGHTING CO.**, 161 Piccadilly, W. Capital £25,000. To adopt an agreement with C. H. Purvis. First directors, T. D. Stubbs, B. B. Sanders, A. W. Heron-Maxwell, C. H. Purvis, S. L. Elphinstone-Ollif, and J. W. Purvis.

**REINEKE'S WIRELESS TELEPHONES, LTD.**, Norfolk House, Norfolk Street, W.C. Capital £25,000. (Private company.) To adopt an agreement with J. F. Reineke and others regarding inventions relating to wireless telephony for mines, &c. First directors, Sir Archer Croft, L. W. Holmes, G. MacElwee, E. D. Young, G. S. Goldie.

## APPOINTMENTS AND PERSONAL NOTES

Mr. Robert Hammond is, we understand, starting for South Africa on the 30th inst., by the R.M.S. *Edinburgh Castle*.

Mr. F. W. D. Stubbs has been appointed Canvassing Engineer at Sheffield at a salary of £130 per annum, and Mr. S. C. Hurry as Chief Canvasser in the Publicity Department at the same salary, with Mr. H. E. Betts as Additional Canvasser at £117 per annum.

A young man with practical experience in telegraph and telephone repairs is wanted in the West Indies. (See advertisement on another page.)

**The Joint Meeting of the British and French Institutions of Electrical Engineers.**—An extra number of the *Bulletin* of the Société Internationale des Electriciens has just been issued, containing a verbatim report of the Proceedings at the joint meeting of the British and French Institutions in Paris last May. The Papers on electric railways, however, are published only in abstract, as they had appeared in full in previous issues of the *Bulletin*. The long Paper by M. Maurice Leblanc, giving a *résumé* of the present position of electric power transmission at very high pressures, is given in full. A special number of the *Journal* of the Institution of Electrical Engineers is also in preparation, containing all the Papers read (including translations of the French Papers), and a report of the discussion in English.

**Wireless Wonders!**—It was reported in the *Standard* last week that Signor Ulivi has demonstrated outside Havre a method of exploding at distances varying from 600 yds. to 12 miles charges hermetically sealed in metal receptacles and sunk in the ocean. Among those present at the tests may be mentioned Major Ferrié, Chief of the Wireless Company of the Eiffel Tower, and other officials of the French Government, so that the scheme is evidently regarded as containing great possibilities, but doubts are expressed by correspondents in the French Press as to the genuineness of the experiments. It is stated that other vibrations having frequencies of the order of those used in wireless telegraphy are by some means focussed on to the vessel, which is at least partly of metal, containing the charge to be exploded. We gather that at a certain critical value these waves are supposed to cause ignition of the charge by vibration or by some electric action due to resonance. It is said that the "radio-magnetic" capacity of the metal receptacle has to be determined before the explosion can take place with certainty.

# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 348 [Vol. IX., No. 35]  
*All rights reserved.*

THURSDAY, AUGUST 28, 1913.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES AND TECHNICAL COLLOQUE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

*Other Advertisement Rates on Application.*

#### Latest Time for Receiving

Letters for Insertion, Tuesday first post.

Small Advertisements and Official Announcements, Wednesday first post.

Displayed Advertisements, Tuesday first post.

Corrections in Standing Advertisements, Monday first post.

All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 208-206, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Circling, Fleet, London." Telephone No.: 5509 Holborn.

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

THERE is a strike of wiremen employed by contractors working for H.M. Office of Works. The matter has been considerably exaggerated in the daily press, and a correct statement appears on p. 486.

AN article by Mr. John B. Sparks deals with the supply of current to single-phase railways. The various methods of feeding single-phase railways from three-phase supply systems of different pressure or frequency are described, and the alternative of single-phase generation is discussed. (Page 486.)

THE first half-watt per c.p. tungsten lamps to be shown publicly in this country were exhibited to Press representatives by the British Thomson-Houston Co. yesterday afternoon. (Page 487.)

THE power gas and by-product recovery plant at the Accrington electricity works has now been satisfactorily working for some time. The plant consists of two "National" gas engines of 1,000 b.h.p. direct-coupled to 6,600-volt three-phase 50-cycle Peebles alternators running at 200 r.p.m. The gas is generated in a producer plant, and about 10 tons of tar and between 3½ and 4 tons of ammonium sulphate are recovered from the local bituminous coal used. It is found that the consumption is about 1½ lb. of coal per unit generated at the present load factor. (Page 488.)

A NEW line of rotary snap switches is described and illustrated. (Page 490.)

THE merits of A.-C. and D.-C. driving in a particular

factory are discussed in our Questions and Answers columns. (Page 491.)

A BRIGHT-GLOWING, easily replaceable heating element is illustrated and described. (Page 491.)

THE lowering gear for the metal filament lamp lighting in Fulham is illustrated. (Page 492.)

SINCE 1903 the number of trunk telephone lines has increased from 1,363 to 3,180. The operating cost per call has remained practically stationary at 1.26d.—Owing to a dispute with the Douglas Town Council (I.O.M.) as to the payment for wayleaves, the Postmaster-General has notified a number of subscribers that their instruments will be disconnected.—The Marconi Co. claims to be ahead of its rivals in wireless telephony.—Rules relating to the reception of wireless time signals in Germany have been issued. (Page 493.)

THE Greenock Corporation intends to acquire the undertaking of the Greenock and Port Glasgow Tramways Co.—An agreement has at last been come to between the Llandudno and Colwyn Bay Electric Railways Co. and the Colwyn Bay Council as to the extension of the Company's lines into Old Colwyn.—A proposal to convert the horse tramways in Stirling to electric traction, under certain conditions, is afoot.—A partial strike of tramway motor-men and conductors is in progress in Dublin. (Page 493.)

SPECIFICATIONS published by the Patent Office on Thursday last included patents for maintaining a uniform temperature in freight vans, a variable-speed dynamo with the field windings in sections and the necessary switchgear for connecting in series or parallel, and some details for lock and block railway signalling.—A patent for snap switches expires to-day after a full life. (Page 494.)

THERE has been arbitration at Bromley (Kent) in connection with the laying of mains for bulk supply.—Some discussion has taken place between the Stirling electrical contractors and the Corporation on the question of the sale of fittings.—The Glasgow Corporation is installing two 6,000 kw. sets at the existing power stations, pending the erection of the new generating station.—A bonus scheme suggested by the Dewsbury Borough Electrical Engineer has been rejected by the Electricity Committee in favour of an increase of wages to the workmen. (Page 495.)

A CONSULTING engineer has been appointed at Waterford; high- and low-tension mains and switchgear are required at Hammersmith; portable electric winches at Aberdeen; steam boilers at Southampton; and electrically-driven plant at Penwortham.—An underground electric railway is to be constructed in Brazil; meters and maximum demand indicators are required by the Melbourne Corporation; and electrical machinery for operating pneumatic tube by the Melbourne Postmaster-General. (Page 496.)

A COMPANY has been formed to acquire from Marconi's Wireless Telegraph Co. the patent rights of the Betulander automatic telephone. (Page 496.)

## WIREMEN'S STRIKE IN LONDON

THERE has been a small strike of engineering fitters and labourers (including some electrical wiremen) employed on maintenance contract work for His Majesty's Office of Works, chiefly at the Admiralty Building. No serious stoppage of work has been occasioned or is likely to be occasioned by it, and the daily newspaper reports have considerably exaggerated the matter; the only effect has been the cessation of certain general overhauling, repair, and small extension wiring work which was in progress at some of the Government buildings.

Through the courtesy of His Majesty's Office of Works, we are able to give the exact facts of the case.

About the beginning of July, the engineering labourers employed by one of the contractors to the Office of Works (Messrs. James Simpson & Co., of Pimlico) applied for an increase of pay from 7d. to 7½d. per hour, on the ground that they are builders' labourers, and that the terms of a recent settlement for the higher rate of wages should apply to them. The First Commissioner of Public Works was only concerned as to the application of the Fair Wages Resolution of the House of Commons, and explained that, for him to order the increase in wages, it would be necessary that he should have it proved to him that the 7½d. rate was paid to engineering labourers in the district. Twenty-one firms were cited by the men's representatives as paying this rate, but on enquiry it was found that only three, or at most four, firms paid it. In the circumstances, it was not possible to recognise this as the rate prevailing in the district, so that the Commissioner did not see his way to interfere, but on Monday last he offered to refer the matter to the Board of Trade for arbitration.

Meantime, a painter's strike occurred last Monday; all the Union painters went out, but three non-union men remained at work. The London District Secretary of the Electrical Trades Union called out the electrical wiremen (employed by the contractors for the electrical maintenance work, Messrs. Wilson & Smith) "in sympathy," and with these higher grade men out, the labourers were also thrown out of work. To what extent the electricians on strike are supported by the Electrical Trades Union headquarters at Manchester is not known. Inquiries which we have made from several of the leading wiring contractors in London have elicited the information that very few Union men are included among their workmen—in fact, several of the larger firms employ no Union men at all. There is therefore very little danger of the wiremen's strike spreading generally—unless the threatened general strike in the building trades takes place.

Among the statements circulated by the daily Press which are incorrect, is one that the fountains in Trafalgar Square were stopped owing to the men in charge of the pumps coming out on strike. The fountains were stopped until yesterday, it is true, but this was simply owing to a breakdown in one of the pumps.

Another statement, to the effect that the lifts at the General Post Office might be stopped, is equally wrong. The Post Office works the lifts with their own men, and the Office of Works merely looks after the repair of the lifts.

None of the Post Office or Admiralty workmen are on strike.

In the Engineering Department of the Post Office, at which we have also made inquiries, the chance of any action by the staff which would endanger the supply of electrical energy from the Blackfriars Power Station or interfere in any way with the Post Office business as far as the Engineering Department is concerned with this, is looked upon as an impossibility. In this connection, perhaps, attention may be drawn to the discussion which took place before the House of Lords Committee a week or two ago, when the Post Office Tube Railway Bill was under consideration. Counsel for the London electric supply companies was endeavouring to foretell the effects of a strike by the employees at the Blackfriars Power Station, with a view to showing that dependence for a supply of electrical energy should be placed upon the various London companies instead of upon one source of supply. Mr. W. Slingo, Engineer-in-Chief to the Post Office, admitted that in the past, Post Office employees had threatened to strike, but, speaking with an inside knowledge of what was taking place on the last occasion when a strike was threatened, he said he knew that there was never the slightest possibility of the threat being put into effect, and he followed this up by the statement that so long as he was at the Post Office he would undertake that there would not be a strike in the Engineering Department.

## THE SUPPLY OF CURRENT TO SINGLE-PHASE RAILWAYS

By John B. Sparks

IN discussing the merits of single-phase traction, so much attention is given to the manner and efficiency with which the current is to be utilised that the methods by which it is to be generated and supplied to the overhead line are sometimes barely considered. As the overhead construction and the train equipment become more standardised, however, it will be found that the method of supplying current to the line will become a problem of equal importance, and it may even become the determining factor as to the system which will be adopted.

The railway could have its own station generating single-phase current at the required pressure and frequency; but a cheap local supply may be available, and in such event the purchase of power would appear to be the logical and most economical solution, especially if the railway be a small one. Now, with but few exceptions, all the large power-supply undertakings, both in Europe and in America, generate and distribute three-phase, a form of power not directly applicable for feeding a single-phase railway. Besides the difference in form, there may also be differences of frequency and pressure. The last-named is of little account, in consequence of the simplicity and high efficiency of the static transformer, but the other two offer serious difficulties.

Taking, first, the case where the frequency of the single-phase railway is the same as that of the available three-phase supply, there are at least four methods of supply to select from.

First, the railway network may be divided into three or more separate sections insulated from one another, and the overhead contact conductors and feeders of the several sections may be fed separately from one or other of the three phases of the three-phase supply. In this case the track rails (and any return cables in parallel with them) of all the three or more sections are connected together, and form a common neutral. If equal traffic is running over each of the three sections, as should be arranged for, the track currents balance out. If, however, the loading is unequal, a resultant current flows back to the generator neutrals, to which the track rails are connected. Any unbalancing produces, of course, a variation of pressure, which may be great enough to affect seriously the lamps and small motors connected to the system. Besides this disadvantage, there is the difficulty of insulating the sections from each other, and the possibility of a short circuit when a train passes from one section to another, as the two sections have the full delta pressure between them.

These difficulties are not insurmountable, however, and the above was actually the system advocated by Mr. C. H. Merz for the Melbourne suburban railways in the event of single-phase traction being adopted. In this case no pressure transformation was required either, as the delta pressure of the three-phase supply was to be 20,000 volts, giving the required phase pressure of 11,000 volts for the single-phase railway system. The absence of transformers between the railway system and the power network might have proved to be a disadvantage, however, as they protect the network most effectively from the heavy surges frequent in single-phase railway systems. The frequency at Melbourne was to be 25 cycles per sec., a frequency adapted both to the single-phase railway and to the general power supply from the three-phase mains.

The second method is to transform the three-phase supply to two-phase by means of the well-known Scott transformer connection (in which one primary terminal of a single-phase transformer is connected to the middle point of the primary of a second transformer—the remaining three terminals are connected to the three-phase supply, and the secondaries give two-phase currents.) There are then only two phases to consider, and the railway network may be divided into two separate systems insulated from one another, as above; or, if the rush-hour traffic is in both directions, the "up" and "down" lines may be fed respectively from the two phases. If the difficulties at crossings can be overcome by suitable insulated sections between the conductors of the two phases, and the short-circuiting of the two phases by trains passing from one phase to the other prevented, this is the better solution, as the loading of the two phases is more likely to be equal. As in the three-phase case, the rails of both "up" and "down" lines form a common neutral. This system has been applied in the case of the 25-cycle, single-phase line between Rotterdam, Scheveningen, and the Hague, but with what result the writer is not aware. (A similar difference of pressure between the "up" and "down" contact wires



exists on the extension of the New York, New Haven & Hartford railway, where a three-wire, single-phase system is in use, the track forming the neutral.)

The third plan is only applicable in the case of a three-phase system with an unearthed neutral, and consists in connecting not the neutral, but one phase to the track rails, and the overhead line to one or other of the other phases. The single-phase railway is thus supplied at the delta pressure, and two phases only of the generator carry the railway current. This method is the one adopted by the London Electric Supply Corporation for the supply of the London, Brighton & South Coast Railway's electrified lines, and it is said that it was found possible to connect a small three-phase power load to the same generators. The pressure fluctuations would be troublesome, however, and it has probably been found advisable to keep the railway and power loads on separate machines in this instance.

The generators in single-phase generating stations are commonly three-phase machines used in this manner; the third phase forms a spare winding, or it may be left unwound.

The fourth system (with equal frequency) is to instal substations with motor-generators consisting of synchronous three-phase motors, direct-coupled to synchronous single-phase generators. The latter may generate at the contact-line pressure, but generally it will be found advantageous to transform up, partly on account of the greater reliability of low-pressure generators, but chiefly on account of the protective action of the transformers, already mentioned. The use of motor-generators, however, reduces very considerably the overall efficiency of the supply. On account of the complete conversion and the comparatively low efficiency of the single-phase generator, the overall efficiency of such a motor-generator substation, even under the best conditions of load factor, would not be more than 75 per cent., as compared with an efficiency of 85 per cent. obtained with three-phase to direct-current rotary-converter substations. One of the chief advantages of the single-phase system is therefore eliminated by this method.

Where the frequency adopted for the railway system is different from that of the supply, however, such motor-generators, or frequency-changers as they are then called, must perforce be employed if current is to be taken from the general supply system. Several continental railways are supplied in this way. Thus, the Bevers-Zuoz-Schuls and the St. Moritz-Pontresina sections of the Rhaetian Co.'s Engadine system are fed with single-phase current at 10,000 volts, 16 $\frac{2}{3}$  cycles from motor-generator substations supplied with three-phase current at 25,000 volts 50 cycles from the famous Brusio water-power station, which already supplies (through three-phase-D.C. motor-generator substations) the Bernina railway from St. Moritz to Torino. The motors of the motor-generator sets have, of course, three times the number of poles that the single-phase generators have, so as to obtain the desired ratio of frequency.

Another example is the Rjukan single-phase railway, described in *ELECTRICAL ENGINEERING*, July 31st, 1913, p. 441. This case is identical with the above.

A further example is the Wiesenthal line of the Baden State railways. Power for this is obtained from a local company supplying at 7,000 volts, three-phase, 50 cycles, while the railway is 15,000 volts, 16 $\frac{2}{3}$  cycles, single-phase. The energy is purchased at a fixed sum per annum up to a maximum demand of 1,040 kw., with an increased rate for the units taken over this limit. To keep down the peak, direct-current battery storage has been adopted, as described in detail in *ELECTRICAL ENGINEERING*, June 28th, 1913, p. 385. The substation at Basle contains two three-phase-single-phase motor-generators, each with a D.C. machine direct-coupled. These latter are connected with a battery of 2,200 amp.-hour capacity, and act as motors or generators, according to the railway demand, either helping to drive the single-phase alternators or charging the battery. The single-phase alternators generate at 15,000 volts, 16 $\frac{2}{3}$  cycles.

It may be noted that a similar attempt to reduce the peak load is also being made in the case of the Bardonnecchia substation of the Turin-Modane three-phase railway. This is a 25-cycle line, and the available supply is 50 cycles. Motor-generator sets or frequency changes will be used, and it was proposed to provide each set with a heavy flywheel and a special machine to reduce the speed on peak loads, and thus make use of the stored-up energy of the flywheel, and reduce the maximum demand on the generating station.

As mentioned above, where it is necessary to employ motor-generator conversion, a serious drop in the overall efficiency of supply is effected. The only alternative, when the frequency of supply is not that of the railway, is for the

railway to have its own generating plant, and a number of the large single-phase railways, therefore, have their own power stations. The economic disadvantages of this solution cannot, however, be over-estimated. Apart from the greater size and cost per kw. of single-phase generators, as compared with three-phase machines, both the railway and the community as a whole are prevented from benefiting by the improved load factor of the station with a combined power, lighting, and railway load. This important consideration was strongly emphasised in a Paper by Mr. Samuel Insull, President of the Edison Commonwealth Co., Chicago, read before the American Institute of Electrical Engineers last year. Mr. Insull points out that, owing to the diversity of load between railway and power-supply, a very great improvement in load factor is effected by a combination of these supplies, and he mentions the case of the New York, New Haven & Hartford single-phase station, with a load factor of about 25 per cent. only, and compares this with the 60 per cent. load factor of a combined station. The load factor of the Chicago station, with a comparatively small railway load only is over 48 per cent. (See *ELECTRICAL ENGINEERING*, July 10th, 1913, p. 403.)

It is possible, however, for the railway to have its own generating plant allotted to it, housed in the same station as the power and general supply plant, and supplied from the same boilers, so that the gain in the load factor of the whole station is not lost. If the difficulties of the three-phase-single-phase conversion are such that separate generating plant is deemed advisable, this should usually be the best solution, unless three-phase current can be bought at so low a rate that the additional cost of conversion does not matter.

## THE HALF-WATT LAMP

THE first public exhibition of the half-watt per c.p. tungsten lamp in this country was given at Mazda House yesterday afternoon by the British Thomson-Houston Co., Ltd., to members of the electrical Press. Mr. F. W. Willcox explained on behalf of the company that the credit of evolving this lamp belonged to the B.T.-H. and associated companies, having been developed first at the laboratory of the Schenectady works by Mr. W. C. Whitney. The lamp was, he said, being further developed at Rugby, and the specimens shown had been made there. The lamps exhibited, which were burning at their rated wattages, were as follows: a 1,400 British c.p. lamp, at 0.52 watt per British c.p.; a 1,375 c.p. lamp at 0.53 watt per c.p.; a 1,260-watt lamp at 0.535 watt per c.p., and a 1,600-watt lamp at 0.50 watt per c.p. All were supplied at about 80 volts.

The lamp has passed the experimental stage, and it is hoped that some sizes will be on the market well before the end of the year. The first ones that will be obtainable will probably be 300 c.p. 150-watt lamps at from 60 to 80 or 100 volts, with a useful life of 1,000 hours, and sizes up to 1,500 c.p. and over will follow.

The filament, we understand, is of pure tungsten, and the globe is filled with an inert gas.

We hope to publish further particulars in our next issue.

**Finsbury O.S.A. Magazine.**—The August issue of the Finsbury Technical College Old Students' Association Magazine contains a short biography and a portrait of Mr. H. A. Humphrey (the inventor of the Humphrey pump), who is the President of the Association. Besides official and editorial notes there are reports of various recent social functions connected with the Association, a description of a visit to Dover Harbour works, some remarks on engineering in Paraguay, notes on old students' doings, and a list of officers for the current session.

**A Long Delayed Controller Patent in the U.S.**—We learn from the *Electrical World* (New York) that an unusually broad and comprehensive patent for an electric controller was granted to Mr. H. Ward Leonard by the United States Patent Office on June 17th last. The application was lodged on December 12th, 1904, nearly nine years ago. The patent covers the use of a system of electromagnetic contactors for automatically cutting out motor starting resistances, and also means for utilising the same contactors and resistances in automatic electrodynamic braking. It is applied to the multiple unit control of trains. There are 64 claims.

# PRODUCER GAS PLANT AT ACCRINGTON ELECTRICITY WORKS

## Complete By-Products Recovery Plant

THE first municipal producer gas and by-product recovery plant to be put to work, in this country at least, is to be found at Accrington, where the Borough Electrical Engineer, Mr. H. Gray, has installed two complete 1,000-h.p. generating sets on this principle. The steam plant in the station has been retained, and is used for the peak loads. This plant generates at 460 volts direct current, while the two new 1,000-h.p. sets are accommodated in the original building, and generate at 6,600 volts, three-phase, 50 cycles. There is ample space for extensions. The producer plant is erected on the ground at the back of the generating station, and there is also a water reservoir at a higher level than the generating station, and additional buildings containing a chemical laboratory for effecting tests of the by-products, of the producer gas, and the fuel used, &c.

The gas engines are each rated at 1,000 b.h.p. (200 r.p.m.), and were supplied by the National Gas Engine Co., Ltd. (Ashton-under-Lyne), and our representative who visited the works was informed that during the time they have been working some important improvements have been carried out. They were originally arranged with pipe lubrication, but by fitting new hollow connecting rods and rearranging the oiling system, the oil consumption has been reduced by 50 per cent., as it is not burnt up on the cylinder walls to such an extent as formerly. Each engine is fitted with duplicate ignition circuits supplied from low-tension Bosch magnetos. There are thus two independent sparking plugs to each cylinder. The eight cylinders are arranged vertically in four tandem pairs, the diameters being 22 in. and 23 in. for the lower and upper rows, so that the upper pistons may be withdrawn easily. Direct-coupled to each engine is a 938 k.v.a., 6,600-volt, three-phase, 50-cycle alternator, supplied by Bruce Peebles, Ltd. (Edinburgh). The chief alteration from standard for this class of alternator is in the fact that the windings are specially treated and have large creeping surfaces, in case gas or fumes should be encountered, though their presence has not yet been detected in the engine room. The stators weigh 21 tons, and of course a heavy flywheel has been provided for each set. Each set drives a 12-kw. exciter. Two 200-kw. and one 425-kw. motor-generator sets, converting from 6,600 volts three-phase A.C. to 460 volts D.C., have been put in, and they can be used in either direction, though they are used to give a supply to the 460-volt network from the new A.C. generating sets. They are arranged for three-wire balancing on the D.C. side. They were supplied by the General Electric Co., Ltd. (Witton).

Before passing to a description of the producer and recovery plant, it is well to indicate how the engines and their immediate auxiliaries operate. The producer gas for the engines requires the presence of air for its complete combustion in the cylinders, and this is sucked in through specially designed "admitters" in the suction pipe, which are very silent in action. After combustion in the cylinders the exhaust gases are led through a special locomotive-type boiler in the boiler house, where steam at approximately 100 lb. pressure per sq. in. is produced. This steam is led through a heat-lagged pipe to the producer plant itself. By referring to Fig. 2, the general arrangement of the generating plant may be seen and the paths of the incoming and exhaust gases located. By this cooling, the gases are effectively silenced, as well as, at the same time, being made to serve a most useful purpose. A plentiful supply of cooling water for the cylinders is required, and this water is circulated by pumps and effectively cooled in a Heenan's patent water cooler, supplied by Heenan & Froude, Ltd. (Worcester). This ingenious machine, as may be readily appreciated by an inspection of Fig. 1, is of small size, considering the work it has to do. It consists of a cylindrical casing with horizontal axis. The lower part of the casing contains the water. In this chamber are a number of concentric metal plate cylinders fixed about  $\frac{1}{8}$  in. apart, and in several sections. These are carried on a shaft, which is revolved at a slow rate, are open at both ends, and are all of the same length. The lower half of the cylinders dips into the hot water in the casing, and as the cylinders revolve, a thin film of moisture on each side of each plate is carried into the upper portion of the casing. A cased fan is fixed at one end of the machine, and induces the air through the annular spaces between the cylinders. The water to be cooled is circulated by a centrifugal pump, driven by an electric motor arranged to drive the cooler by belt. The air and water are passed through

the cooler in contrary directions, and baffles are fitted for the air and water to ensure proper distribution, and in order to increase the efficiency of the machine. As the cylinders revolve, the thin film of water on the surfaces of the cylinders is partially evaporated, and this evaporation causes the heat given to the cylinder plates by the warm water to be rendered latent. Heat is also extracted from the water by conduction. The amount of water evaporated varies according to the temperature within the limits of 1 to 3 per cent. of the amount of water circulated. This is made up automatically by connecting the ball-cock supplied with the machine with the ordinary fresh-water supply. There are no other water losses. The air leaving the cooler is entirely free from loose moisture.

In Fig. 2 will also be noticed the motor-driven air compressor and the three air-storage tanks, where air at 300-lb. pressure per sq. in. is stored for starting the gas engines. One set is now kept running continuously, and the other, though put in as a stand-by, now runs factory hours (6 a.m. till 6 p.m.). It is the practice to clean two cylinders every three weeks, as this keeps the engines in perfect order, and no stoppages have been experienced for some considerable time. On test the sets ran for the prescribed period of thirteen weeks without a stop. The pressure and thermal qualities of the producer gas are continuously recorded in the engine room itself. The heat value is determined by a meter supplied

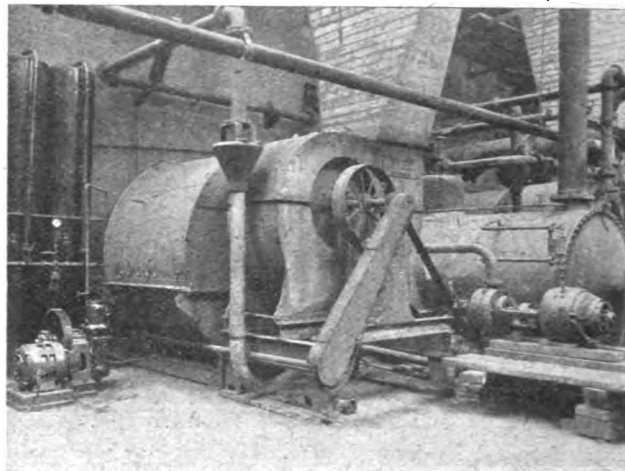


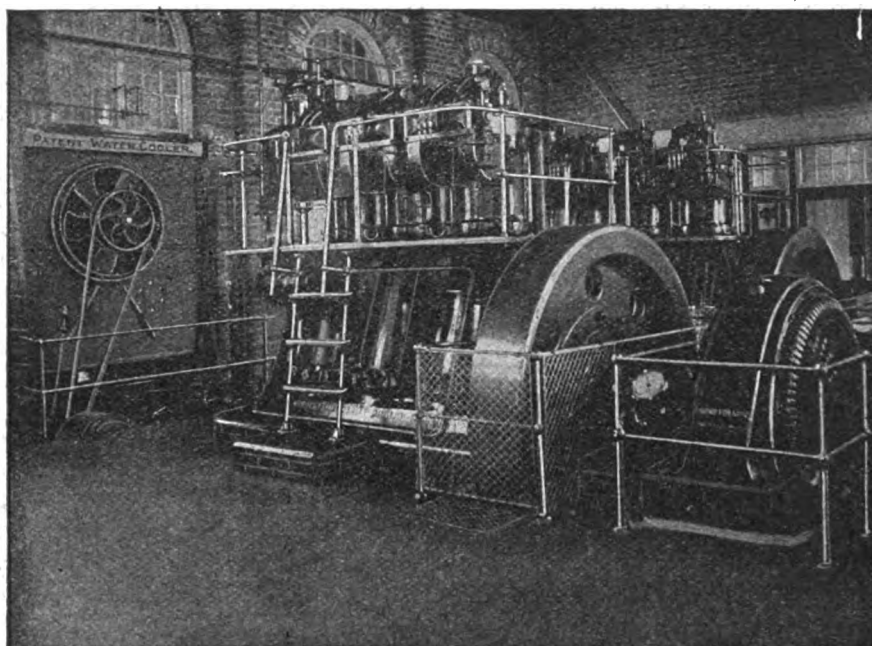
FIG. 1.—HEENAN PATENT WATER COOLER.

by Parkinson & W. B. Cowan, Ltd. In this instrument it is arranged that the heat of a gas flame causes the expansion and contraction of a small oil column, and this in turn acts on the secondary mechanism.

Referring now to Fig. 3, the general lay-out and arrangement of the producer and recovery plant may be seen. The whole of this plant was supplied by the Power Gas Corporation, Ltd. (Stockton-on-Tees), and consists of two units, each rated at 1,250 I.H.P. The producers are of the Mond pressure type, provided with water bottoms and fitted with wide fire bars of the standard pattern. The coal—a cheap, bituminous variety, mined only a short distance from the station—is well screened, and fed into a hopper, from which a bucket-conveyor lifts it to bunkers erected on a steel framework over the producers, into which it is discharged as required. The fire in the producers is kept some  $4\frac{1}{2}$  ft. thick and supplied with hot saturated air and extra steam. The proportions of each necessary to give the richest gas, in respect of ammonia for the purpose of forming the maximum amount of ammonium sulphate, and at the same time for preventing the formation of clinker, were determined by experiment, and now the amount of live steam is adjusted so that the temperature of the incoming air before it is superheated is  $85^{\circ}\text{C}$ . An excess of steam has this effect by keeping the temperature of the fire low. On the top of the producer bells are a number of heavy iron balls, each with a diagonal hole. These balls rest in seats, and when one is removed by a rod through the hole, the fire may be seen, or the rod may be used to poke the fire without permitting the escape of gas, while the balls also act as safety valves.

# HEENAN COOLERS

---



EGHAM ELECTRICITY STATION  
(in which is installed a Heenan Water Cooler).

---

Many hundreds of these Machines are now working, saving water and space, and providing ideal thermal conditions

*For all Types of*  
**INTERNAL COMBUSTION ENGINES**

---

---

**HEENAN & FROUDE, LTD.,  
WORCESTER.**

*When corresponding with Advertisers, please mention "Electrical Engineering."*

# TRADES DIRECTORY OF ADVERTISERS IN "ELECTRICAL ENGINEERING."

(One Free Entry is given to every Advertiser. Entries under additional headings, 6d. per insertion.)

## ACCESSORIES (Electric Light and General Supplies).

Cuttriss (S. W.), 72, Prudential Buildings, Park Row, Leeds.  
Edison & Swan United Electric Light Co., Ltd., Ponders End, Middlesex.  
Electrical Co., Ltd., 122 to 124, Charing Cross Rd., W.C.  
General Electric Co., Ltd., 67, Queen Victoria St., E.C.  
Gullbert-Martin, 9, Edmund Place, E.C.  
Lundberg (A. P.) & Sons, Liverpool Rd., N.  
Scholey & Co., Ltd., 151, Queen Victoria St., E.C.  
Simplex Conduits, Ltd., 118 to 117, Charing Cross Rd., W.C.  
Sun Electrical Co., Ltd., 118, Charing Cross Road, W.C.  
Wardle Engineering Co., Ltd., 196, Deansgate, Manchester.

## ACCUMULATORS, &c.

Copper, Pass & Son, Ltd., Badminton Smelting Works, Bristol.  
D.P. Battery Co., Ltd., Bakewell, Derbyshire.  
Electrical Power Storage Co., Ltd., 4, Great Winchester St., E.C.  
Hart Accumulator Co., Ltd., Marshgate Lane, Stratford.  
Tudor Accumulator Co., Ltd., 119, Victoria St., S.W.  
Wernop & Co., Ltd., Carlton Lamp Works, Halifax.

## AIR FILTERS.

Balcke & Co., Ltd., Broadway Court, Westminster, S.W.  
Carrier Air Conditioning Co., Caxton House, Westminster, S.W.  
Sturtevant Engineering Co., Ltd., 147, Queen Victoria St., E.C.

## ALUMINIUM.

British Aluminium Co., Ltd., 199, Queen Victoria St., E.C.

## ARC LAMPS AND ACCESSORIES.

British Thomson-Houston Co., Ltd., Rugby.  
General Electric Co., Ltd., 67, Queen Victoria St., E.C.  
London Electric Firm, Croydon.  
Oliver Arc Lamp Ltd., Cambridge Place, Burrage Rd., Woolwich.  
Union Electric Co., Ltd., Park Street, Southwark, S.E.

## ARMATURE REPAIRS.

Marryat & Place, 28, Hatton Garden, E.C.

## BOILERS.

Babcock & Wilcox, Ltd., Oriel House, Farringdon St., E.C.

## CABLES AND WIRES.

Callenders Cable & Construction Co., Ltd., Hamilton House, Victoria Embankment, E.C.  
General Cable Manufacturing Co., 15, Garlick Hill, E.C.  
Ges. für Elektrotechnische Industrie m.b.H., 88 Belle-Alliance Str., Berlin.  
Hewley's (W. T.) Telegraph Works Co., Ltd., Blomfield Street, E.C.  
Hooper's Telegraph & Indiarubber Works, Millwall Dock, E.  
India Rubber, Gutta Percha, & Telegraph Works Co., Ltd., 106, Cannon St., E.C.  
and Silvertown, E.  
Key Engineering Co., Ltd., 4, Queen Victoria St., E.C.  
Liverpool Electric Cable Co., Ltd., Linacre Lane, Bootle, Liverpool.  
London Electric Wire Co. & Smiths Ltd., Playhouse Yard, Golden Lane, E.C.  
Macintosh (Chas.) & Co., Ltd., 22 & 23, Jewin St., E.C.  
Rickard (Wm.) Ltd., Ashbourne Road Mills, Derby.  
Siemens Bros. & Co., Ltd., Woolwich.  
Union Cable Co., Ltd., Dagenham Dock, Essex.

## CASTINGS, &c.

Dore (J.) & Co., Bromley, E.

## CATALOGUES AND PROCESS ENGRAVING.

Swain (John) & Son, Ltd., Shoe Lane, E.C.

## CONDENSING PLANTS.

Mirreless Watson Co., Ltd., Scotland Street, Glasgow.  
Storey (Isaac) & Sons, Ltd., Empress Foundry, Cornbrook, Manchester.  
Willans & Robinson, Ltd., Rugby.

## DIE-FINISHED CASTINGS.

Aerators, Ltd., Upper Edmonton, N.

## DYNAMOS, see Motors and Dynamos.

## ELECTRO-PLATING.

Canning (W.) & Co., 183 to 187, St. Hampton St., Birmingham.

## FLEXIBLE METALLIC TUBING.

United Flexible Metallic Tubing Co., Ltd., 112, Queen Victoria St., E.C.

## GAS AND OIL ENGINES.

British Westinghouse Electric & Manfg. Co., Ltd., Trafford Park, Manchester.  
Premier Gas Engine Co., Sandiacre, Nottingham.

## HEATING AND COOKING APPARATUS.

Belling & Co., Lancaster Works, Derby Road, Edmonton, N.  
British Prometheus Co., Ltd., Salop St. Works, Birmingham.  
British Thomson-Houston Co., Ltd., Rugby.  
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester.  
Dowling Radiant Heat Co., Ltd., 105, Great Portland St., W.  
Ferranti, Ltd., Central House, Kingsway, W.C.  
General Electric Co., Ltd., 67, Queen Victoria St., E.C.  
Holmquist Electric Coy. 1911 Ltd., 27, Kingly St., Regent St., W.  
London Electrical Trading Co., Ltd., 185, Wardour St.  
Schniewindt Electric Co., 40-1, Stamford St., Birmingham.  
Siemens Bros. Dynamo Works, Ltd., 39, Upper Thames St., E.C.  
Simplex Conduits, Ltd., 118 to 117, Charing Cross Rd., E.C.  
Townshend's Art Metal Co., Ltd., Ernest St., Birmingham.

## INSTRUMENTS.

Everett, Edgcombe & Co., Ltd., 117, Victoria St., S.W.  
Everard & Vignoles, Ltd., Acton Lane Works, Chiswick.  
India Rubber, Gutta Percha and Telegraph Works Co., Ltd., 106, Cannon St., E.C.  
Kelvin, Bottomley & Fird, Ltd., 18, Cambridge St., Glasgow.  
Nalder Bros. & Thompson, Ltd., 34, Queen Street, E.C.  
Record Electrical Co., Ltd., Caxton House, Westminster, S.W.  
INSULATING VARNISH, ENAMELS, PAINTS AND LACQUERS.  
Blume (Chas. H.), The White Building, Sheffield.  
Fredk. Crane Chemical Co., 22 & 28, Newhall Hill, Birmingham.  
Griffiths Bros. & Co., Marks Rd., Bermondsey, S.E.  
Pinchin, Johnson & Co., Ltd., 26, Bevis Marks, E.C.  
Sterling Varnish Co., Royal London Buildings, 196, Deansgate, Manchester.

## INSULATORS AND INSULATING MATERIALS.

MacIntyre (J.) & Co., Ltd., Burslem.  
Moseley (D.) & Sons, Ltd., Ardwick, Manchester.  
Mosses & Mitchell, 122 to 124, Golden Lane, E.C.  
Sugg (William) & Co., Ltd., 63, Regency Street, S.W.  
Traun (Dr. Heiner) & Sons, 25, Goswell Rd., E.C.  
Weidmann (H.), Rapperswil, Switzerland.

## INSURANCE.

Phoenix Assurance Co., Ltd., 19 & 70, Lombard St., E.C.

## LADDERS.

Heathman & Co., 10, Parsons Green, S.W.

## LAMPS (Incandescent).

British Thomson-Houston Co., Ltd., Mazda House, 77, Upper Thames St., E.C.  
British Westinghouse Electric & Manfg. Co., Ltd., Trafford Park, Manchester.  
Cryselco, Ltd., Kempston Works, Bedford.  
Edison & Swan United Electric Light Co., Ltd., Ponders End, Middlesex.  
General Electric Co., Ltd., 67, Queen Victoria St., E.C.  
Siemens Bros. Dynamo Works, Ltd., Tyssen St., Dalston, N.E.  
Simplex Conduits, Ltd., 118 to 117, Charing Cross Rd., W.C.  
Stearn Electric Lamp Co., Ltd., 47, Victoria St., S.W.

## LIFTS.

Marryat & Place, 28, Hatton Garden, E.C.  
Waygood (R.) & Co., Ltd., Falmouth Road, S.E.

## MACHINE TOOLS.

Taylor & Challen, Ltd., Constitution Hill, Birmingham.

## METERS.

Eastian Meter Co., Ltd., Kentish Town, N.W.  
Ferranti, Ltd., Central House, Kingsway, W.C.  
Isaria, Ltd., 308, Tower Bridge Road, S.E.

## MICA.

British Mica Co., Ltd., Lebanon Road Works, Wandsworth, S.W.  
Jaroslaw (D.), 19, Tower Hill, E.C.  
Micanite & Insulators Co., Ltd., Walthamstow, E.  
Secar, Page & Co., 16 & 17, Devonshire Sq., E.C.  
Wiggins (F.) & Sons, 102 to 104, Minorities, E.C.

## MINE EQUIPMENTS AND APPARATUS.

Dick, Kerr & Co., Ltd., Abchurch Yard, E.C.  
Ellison (George), Warstone Lane, Birmingham.  
Ferranti, Ltd., Central House, Kingsway, W.C.  
General Electric Co., Ltd., 67, Queen Victoria St., E.C.  
Reynolds & Co., Ltd., Hebburn-on-Tyne.  
Siemens Bros. Dynamo Works, Ltd., Caxton House, Westminster, S.W.  
Switchgear & Cowans, Ltd., Springfield Lane, Salford, Manchester.  
Willans & Robinson, Ltd., Rugby.

## MOTORS AND DYNAMOS.

British Thomson-Houston Co., Ltd., Rugby.  
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester.  
Brown Boveri & Co., Ltd., Caxton House, Westminster, S.W.  
Dick, Kerr & Co., Ltd., Abchurch Yard, E.C.  
Matthews & Yates, Ltd., Swinton, Manchester.  
Peabees (Bruce) & Co., Ltd., Edinburgh.  
Siemens Bros. Dynamo Works, Ltd., Caxton House Westminster, S.W.  
Vickers, Ltd., River Don Works, Sheffield.

## OIL CANS.

Kaye (J.) & Sons, Ltd., Lock Works, Leeds.

## PACKING.

United States Metallic Packing Co., Ltd., Bradford.

## PATENT AGENTS.

Lorrain (J. G.), Norfolk House, Norfolk St., W.C.  
Raworth (J. E.), 30, Broadway, Westminster.

## PETROL AIR GAS.

Safety Light, Ltd., 118, Queen Victoria St., E.C.

## PRESSPAHN, &c.

Weidmann (H.), Rapperswil, Switzerland.

## PUMPING PLANT.

Merryweather & Sons, Fire Engine Works, Greenwich, S.E.  
Willans & Robinson, Ltd., Rugby.

## STEAM ENGINES AND TURBINES.

Allen (W. H.) Son & Co., Ltd., Queen's Engineering Works, Bedford.  
British Thomson-Houston Co., Ltd., Rugby.  
Dick, Kerr & Co., Ltd., Abchurch Yard, E.C.  
Vickers, Ltd., River Don Works, Sheffield.  
Willans & Robinson, Ltd., Rugby.

## STEAM ENGINE ACCESSORIES.

Lea Recorder Co., 82, Deansgate, Manchester.

## SWITCHGEAR.

British Thomson-Houston Co., Ltd., Rugby.  
Dorman & Smith, Ordsal Electrical Works, Salford.  
Eckstein, Heap & Co., Ltd., Caroline Street, Broughton, Manchester.  
Ellison (George), Warstone Lane, Birmingham.  
Ferranti Ltd., Central House, Kingsway, W.C.  
Igranic Electric Co., Ltd., Balfour House, Finsbury Pavement, E.C.  
Record Electrical Co., Ltd., Caxton House, Westminster, S.W.  
Reynolds & Co., Ltd., Hebburn-on-Tyne.  
Switchgear & Cowans, Ltd., Springfield Lane, Salford, Manchester.

## TECHNICAL BOOKS AND JOURNALS.

Cambridge University Press, Fetter Lane, E.C.  
Cassell & Co., Ltd., La Belle Sauvage, E.C.  
Caxton Publishing Co., Clun House, Surrey Street, Strand, W.C.  
Constable (Archibald) & Co., Ltd., 10 Orange St., Haymarket, W.  
Crosby Lockwood & Son, 7, Stationers' Hall Court, E.C., and 5, Broadway,  
Electric Journal, Donington House, Norfolk St., Strand, W.C. (Westminster, S.  
Graham Publishing Co., 84, Southampton St., W.C.  
Griffin (Chas.) & Co., Ltd., 12, Exeter St., Strand, W.C.  
Indian Industries and Power, 204, Temple Chambers, E.C.  
Longmans, Green & Co., 39, Paternoster Row, E.C.  
Whittaker & Co., 2, White Hart Street, Paternoster Square, London, E.C.

## TELEPHONES.

British L.M. Ericsson Mfg. Co., Ltd., 4, Chancery Lane, W.C.  
General Electric Co., Ltd., 67, Queen Victoria St., E.C.  
Graham (Alfred) & Co., St. Andrew's Works, Crofton Park, London, S.E.  
Siemens Bros. & Co., Ltd., Woolwich.  
Sterling Telephone & Electric Co., Ltd., 200, Upper Thames St., E.C.  
Western Electric Co., Ltd., North Woolwich, E.

## TESTING LABORATORIES.

Electrical Standardising & Testing Institution, (Faraday House), 62 to 70, Southampton Row, W.C.

## TRANSPORTERS.

Bleicherts Aerial Transporters, Ltd., Egypt House, 36, New Broad St., E.C.

## WATER COOLERS.

Heenan & Froude, Ltd., Worcester Engineering Works, Worcester.

## WATER SOFTENERS.

Kennicott Water Softener Co., Wolverhampton.

## WIRING CONTRACTORS. See page iv.

When corresponding with Advertisers, please mention "Electrical Engineering."



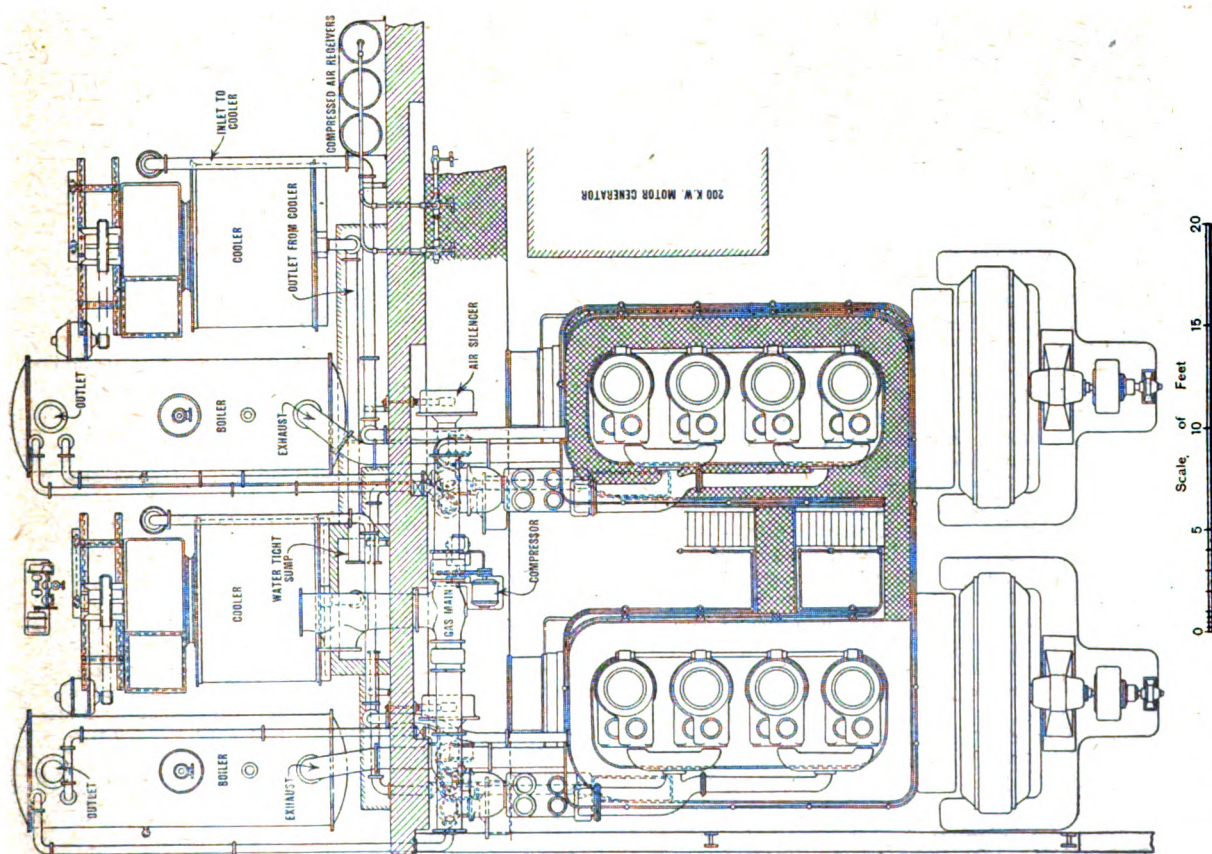


FIG. 2.—GENERAL ARRANGEMENT OF THE GAS GENERATING-PLANT IN THE ENGINE-ROOM AT THE ACCRINGTON ELECTRICITY WORKS.

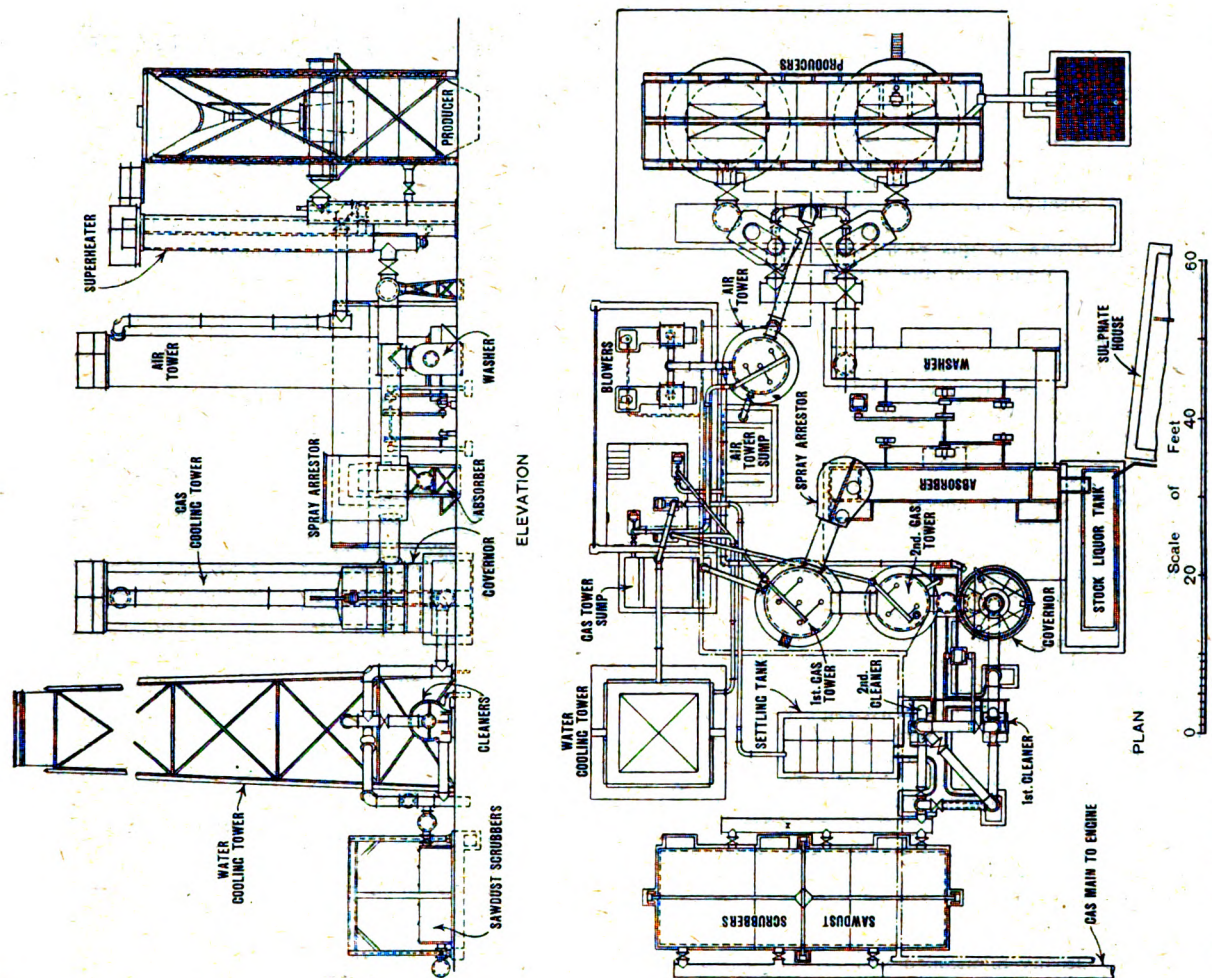


FIG. 3.—GENERAL ARRANGEMENT OF PRODUCER GAS AND BY-PRODUCT RECOVERY PLANT AT THE ACCRINGTON ELECTRICITY WORKS.



The gas from each producer is led through a tubular superheater to a collecting main. The superheater consists of concentric tubes, and the hot producer gas in the annular space warms up the incoming saturated air, which is passed through the fire in the producer bell, and is at the same time itself cooled. Dust catchers are arranged at the base of the superheaters, where the fine dust carried over from the fires is collected and may be periodically discharged. The temperature of the gas in the collecting main is about  $400^{\circ}\text{C}.$ , and it is then passed through the first washer. This consists of an oblong enclosure over a water trough in which are two revolving "dashers," shaped like paddle-wheels, which produce a fine spray and cause the fine particles of tar in the gas to be deposited in the water trough and to escape through lutes at the sides into an external trough, from which it is removed by ladles to suitable containers. The gas is next led to a washer of similar construction, except that instead of ordinary water being used, it is slightly acidified by the addition of about 2 per cent. of sulphuric acid. A chemical reaction takes place here, so that a solution of ammonium sulphate is formed. This is drawn off at intervals and conducted to a stock tank, and at the same time an equal volume of fresh acidulated water is added, so that this process, like all the others, is continuous. The gas then passes through a spray arrester to two vertical coolers, in which, during its ascent, it meets a fine, falling, cold-water spray, and deposits most of the tar. It is then led to a governor like a small gasometer, which, by its rising and falling, controls the supply of compressed air, obtained by Roots' blowers, to the producer bells through a butterfly valve by allowing a varying quantity of the air to escape direct to the atmosphere. The gas is now passed through two centrifugal cleaners, each about 5 ft. in diameter, and containing eight blades. The speed of rotation is 1,400 r.p.m. Here the remaining traces of tar are extracted, and a final cleaning is given to the gas by passing it through a sawdust scrubber, which has not yet become at all dirty, thus showing that the other arrangements are very effective. After this, the gas is metered, and goes by an 18-in. main to the engine-house, where it passes through another small gasometer known as an anti-pulsator.

The air for the producers is put under pressure by the two Roots' blowers already mentioned and passes up a tower, where it meets a broken stream of hot water from the gas-cooling towers. It is thus considerably heated, and also saturated with water-vapour. After leaving these towers, the extra live steam from the boilers in the engine-house is added as mentioned earlier. The mixture is then superheated, by the producer gas in the superheater towers, just before it enters the producer bells. In the shed where the Roots' blowers are situated are also the motor-driven centrifugal pumps for circulating the water through the gas-cooling towers and the water-cooling tower, as well as the air-heating tower. Here, also, are pressure gauges connected to the various parts of the equipment.

The ammoniacal liquor from the stock tank is lifted at intervals by an ejector to a tank in the sulphate-house. From here it is drawn into a steam-heated evaporating tank and boiled until sufficient crystals are produced. These are withdrawn in a nearly dry condition through a hopper in the base, and dried in a hydro-extractor, and then allowed to fall through to the store on the ground floor of the sulphate-house, where they are bagged and sold without further preparation. No pumps are placed in any part of the plant where they are liable to corrosion by chemicals. Some trouble was at first experienced from this cause in the absorption plant, where the ammoniacal liquor is separated out, but this plant is now entirely lead lined and gives no trouble.

We understand that about £5 per week is at present realised by the sale of tar, though the installation of a pitch-making plant at an early date is contemplated, as pitch should fetch something over £2 per ton, compared with 10s. per ton for crude tar. The revenue from the sale of sulphate is between £40 and £50 per week, at the current market price of about £12 10s. per ton. The amount of coal used is about 85 tons per week, being  $1\frac{1}{2}$  lb. per unit generated. Between 12,000 and 13,000 units per week are generated by the gas plant, which therefore runs at a load factor of over 40 per cent., but, reckoning one set as a stand-by, the load factor on the remaining set approaches 100 per cent. An additional twenty-four hour load of some 350 kw. for a paper works will shortly be connected.

The cost of the entire equipment without buildings or foundations was about £23,000, or with cost of containing walls, &c., necessary on account of the nature of the ground, the amount is raised to £28,000 or £14 per h.p.

Besides the gas plant, the station is interesting on account of the dust destructor combined with it, which gives good results. The clinker formed is ground in a mill for mortar. The lighting of the streets in Accrington where there are tramways, is effected in an efficient and economical manner by the use of metal filament lamps on batterns supported on the guard wires over the trolley lines. The position of the lamps is thus easily adjustable to suit local circumstances, so as to give a good light at crossings and at junctions of side streets, &c.

Our thanks are due to Mr. Gray for kindly affording us facilities for viewing the entire plant.

## ROTARY SNAP SWITCHES

A LOW-PRICED line of rotary switches with certain distinctive features has recently been placed on the market by the British Thomson-Houston Co., Ltd. (77 Upper Thames Street, E.C.). The weight of moving parts has been

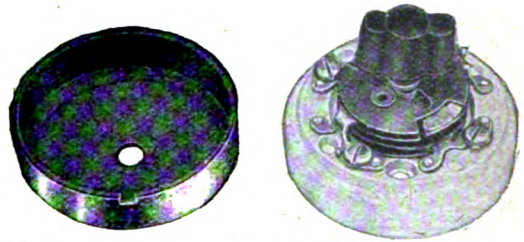


FIG. 1.—FIVE AMPERE D.P. ROTARY SNAP SWITCH.

reduced to the minimum consistent with durability and proper current-carrying capacity. Bases of the best quality porcelain and ebonised handles with self-contained springs are used. By the employment of flat binding posts, easy access to the binding screws is obtained, in however confined a position the switch may be fixed, as the screw-driver works from the front of the switch, at right angles to the wall. The danger of cutting the wires at the screw contacts is also removed. These switches are supplied with both nickel (fibre-insulated) and porcelain covers. Single and double pole switches are supplied for 100-250 volts and 250-600 volts, with current-carrying capacity ranging from 3-20 amperes, and with or without indicating dial in the cover. The illustration, Fig. 1, shows the interior of one of the double-pole rotary snap switches for 5 amperes. There is a three-way switch in three sizes—3, 5, and 10 amps., 100-130 volts; or 1, 3, and 5 amps., 200-250 volts—and a three-circuit rotary switch for automobile lighting, suitable for use on voltages up to 250, and supplied with or without indicating dial. It is arranged with three circuits, so that the headlights, tail-light and interior lights of a motor-car can be switched on or off separately or together. The condition of the circuits is shown by an indicator for that purpose. For heating and cooking apparatus a series-parallel, three-heat switch with the usual type of indicator may be obtained for currents up to 10 or 20 amperes, and for voltages up to 250. A switch of this type is shown in Fig. 2.

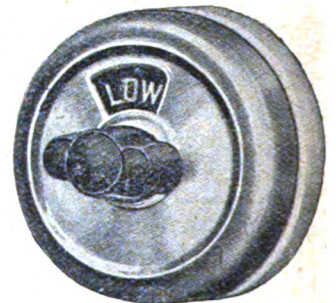


FIG. 2.—SERIES PARALLEL THREE HEAT SNAP SWITCH FOR RADIATOR CIRCUITS.

**Voltage Rating of Mazda Lamps.**—In the early days of the metal filament lamp, it was a fairly general practice for electric light users to employ lamps rated about 5 per cent. above the supply voltage. The excuse for this was that the pressed filament tungsten lamps were fragile, and that by under-running them their life was increased, and they were enabled to withstand the slight fluctuations in the supply voltage. The British Thomson-Houston Co. (Mazda House, Upper Thames Street, E.C.) ask us to state that their lamps should be used rated at the actual voltage of the supply, without fear of premature failure. Although under-running may slightly lengthen the life of the lamp, they maintain that the saving is more than offset by the lower efficiency of the lamp when run below voltage.



## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,353.

A three-phase induction motor with squirrel-cage rotor runs clockwise. Another similar motor, from the same makers, runs anti-clockwise; both are coupled up to a star delta switch, and to same sketch, which is standard. Having a quantity of these motors running, it is desired not to change over the mains at the starter. Can the right rotation be obtained by altering any of the six connections at motor end, and run satisfactorily with load?—"MOTOR."

(Replies must be received not later than first post, Sept. 4th.)

### ANSWERS TO No. 1,351.

A factory is to be driven electrically by motors aggregating about 200 h.p., varying in size from 3 to 50 h.p., and including a few of which the speed has to be varied. The only supply available is at 240 volts, 50 cycles, single phase. What class of motors and control would it be best to employ?—"P."

The first award (10s.) is made to "W. H." for the following reply:—

First consider the scheme if the single-phase A.C. supply were used. As variable-speed motors are required in some cases, ordinary single-phase motors with slip-ring rotors will not be suitable. The reason is that as resistance is inserted in the rotor circuit, so does the overload capacity of the motor become reduced, and, if any considerable speed reduction is required, the motor will not even withstand full load unless a very large and consequently expensive machine is used. There will, in addition, be the reduction in the efficiency of the motor, due to the losses in the resistance inserted in the rotor circuit. This means that single-phase commutator motors will be necessary, with their liability to trouble in small sizes, and also their poor efficiency. The remaining machines would be made up of squirrel-cage and slip-ring motors. The squirrel-cage motors could only be installed for small horse-powers and very low starting torques. Even the slip-ring motors would require friction clutches for starting up against high initial torques, thus entailing additional expense.

The efficiency and power-factor of a large number of small single-phase motors would also be very poor, especially when working on low loads. A much more satisfactory method would be to instal a motor-generator set consisting of a single-phase motor of about 200 h.p., driving a D.C. generator having a capacity of 135 kw. at, say, 440 volts, thus allowing a load-factor of 75 per cent. The generator could be either shunt or compound, depending on the nature of the load.

This scheme may have a slightly higher first cost, but all the motors installed in the factory could be built to suit the various conditions in the way of speed, speed variation, and type of winding—shunt or compound—for light or heavy starting torque. There would probably be some gain in overall efficiency, and there would certainly be a reduction in the cost of wiring, as compared with the single-phase system. Some disadvantage may be incurred by the necessity for running the motor generator set, even when only a few of

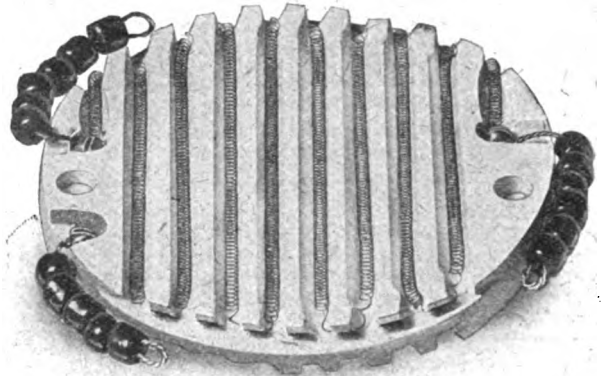
the factory motors are running, such as on overtime. If small factory extensions were in view, it would be advantageous to instal a slightly larger motor generator set. In the case of extensive additions, a second motor generator set could be installed.

The second award (5s.) goes to "M. M.," whose reply in abbreviated form is given below:—

Single-phase induction motors are not suitable for starting up under load, nor for variable speed; and although much is claimed for repulsion motors, such machines are costly and complicated. On the other hand, induction motors with squirrel-cage rotors often give every satisfaction, and stand up against any amount of hard usage. Two systems should be provided: (1) single-phase direct from the supply, and (2) either three-phase or direct-current from a motor generator set, with a single-phase synchronous motor. If most of the work is to be done at varying speed, shunt-wound motors with inter-poles will be best, as the control is simple, and commutating troubles are now negligible. A.C. slip-ring motors with adjustable resistance in the rotor circuit are inefficient, and the various other arrangements either give prearranged speeds with little grading, or are too complicated and expensive. It appears attractive at first sight to have a complete single-phase installation throughout, but single-phase motors are higher in first cost and lower in efficiency than three-phase motors.

## ELECTRIC HEATING AND COOKING

A COMPREHENSIVE list of "bright, glowing electric fires" (Townshend's system) and cooking apparatus, known under the name "Calor," has just been sent us by Townshend's Art Metal Co., Ltd. (Ernest Street, Holloway Head, Birmingham, and 62 Holborn Viaduct, London, E.C.). The heating element for all "Calor" appliances, with the exception of electric fires, consists of resistances of a special alloy wound on asbestos-covered mica strips, insulated with further strips of mica, and protected with sheet-iron casing against mechanical injury. In the case of toasters and grillers the sheet-iron casing is dispensed with and a perforated iron case protects the elements and allows a fierce heat, so essential for this purpose, to be directed where required. The heating element is run at a comparatively low temperature, which gives it a long life. When burnt out, however, the element can be renewed by simply removing



HEATING ELEMENT AS SENT OUT FOR REPLACEMENT.

a few screws, and new elements, ready wound with resistance wire, are obtainable at a trifling cost.

The element for electric fires consists of resistances of a non-oxidisable alloy mounted on a special base composed of a clay of a highly refractory nature, which quickly becomes red-hot. The illustration shows an element as sent out for replacement. This is made in various shapes and sizes suitable for any patterns of case, from which there are a large number to choose. Among the other appliances listed are irons, toasters, kettles, ovens, boiling rings, hot-plates, &c. A special feature of the ovens lies in the way the heating element is placed in a separate chamber at the bottom, from whence the heated air ascends between the double sides of the oven to the top, then strikes downwards again through holes in the sides near the bottom, and then upwards again. Three or four heats are provided, and a separate boiling ring may be used at the top to effect a preliminary warming and to give a final browning.

## CATALOGUES, PAMPHLETS, &c., RECEIVED

**DYNAMOS AND MOTORS.**—A new publication dealing exclusively with open-type dynamos and motors for outputs between 19 h.p. and 1,750 h.p., has just been issued by Bruce, Peebles & Co., Ltd. (Edinburgh). Besides giving a full detailed specification it contains a number of half-tone illustrations of interesting machines and equipments, as well as approximate weights and dimensions of the different frame sizes, lists of ratings with technical data, &c. The standard pressures are 115, 230, and 500 volts, but the machines can be designed to run on pressures as low as 100, 200, or 400 volts, or as high as 125, 250, or 600 volts, without any variation in speed or output, except in the case of some four pole machines. All ordinary requirements are covered by four standard types of machines, but of course any special conditions can be met. The standard types are (a) half-coupling and one bearing; (b) half-coupling, one bearing, and horse-shoe bed plate, or three separate sole plates; (c) two bearings and bed plate, or four small separate sole plates for direct-driving through a flexible coupling, or for belt or rope drive, and (d) three bearings and bed plate for belt or rope drive. The care with which every electrical and mechanical detail is thought out and put into practice should be well known to our readers, and is evidenced by the long list of important customers contained in this pamphlet. It might be mentioned that smaller direct-current machines form the subject of a separate list, already noted in our columns.

**DYNAMOS AND MOTORS.**—A new list dealing with D.C. dynamos and motors has just been issued by Simplex Conduits, Ltd. (Garrison Lane, Birmingham). Particulars of machines from 1/100 h.p. to 44 h.p. are given, and we understand the company holds large stocks of these machines at its works. Illustrations and some notes on motor-generators for cinematograph purposes, vertical motors, and large generators up to 1,000 kw. are also given. Dimensions and weights of the machines and prices of suitable control gear are included in this catalogue. The motors are all supplied either semi-enclosed, enclosed ventilated, or totally enclosed. Each type is fitted with ring lubrication, and special attention has been given to the design of the brush gear. All 4-pole machines are of the inter-pole type and each part is standardised, so as to be readily replaceable, and of the usual Simplex quality. In the intermediate sizes from 1/2 h.p. and up to the 6-pole machines, the end plates of the motors are so arranged that they may be turned through 90° or 100° should it be necessary for the machines to be run in a vertical position. Amongst the illustrations included in the catalogue is a very interesting example of a 110-kw. generator, seven of which have recently been supplied for a large Atlantic liner.

*Readers desiring copies of catalogues or pamphlets should apply to the firms in question, referring to the notice in "Electrical Engineering."*

**IRONCLAD SWITCHGEAR.**—A pamphlet from A. Reyrolle & Co., Ltd. (Hebburn-on-Tyne), illustrates some ironclad switchgear for controlling the power supply to a large cement works in Canada. The main switch is for three-phase current and has a capacity of 3,000 amperes. It has a two-pole time-limit overload and no-volt release.

**"MERZ-PRICE" PROTECTIVE GEAR.**—Another pamphlet from the same firm describes the well-known "Merz-Price" system of automatic protection for high-pressure circuits.

**SILICA LAMPS FOR POWER CIRCUITS.**—This is the title of the latest literary production of the Westinghouse Cooper-Hewitt Co., Ltd. (80 York Road, King's Cross, N.). These lamps will burn in parallel on 500 volts, and will stand pressure fluctuations of 10 per cent. up or down without variation in operation, so that they should find use in car sheds, ship-yards, and similar industrial buildings and yards. The burner is in the form of an inverted U, and is lighted by means of a heater on a horn projecting from the luminous tube proper, so that tilting is unnecessary. The heater is cut out immediately the burner is lighted.

**ALUMINIUM FOR RAILWAYS.**—A leaflet from the British Aluminium Co., Ltd. (109 Queen Victoria Street, E.C.), makes some suggestions as to the utilisation of aluminium in electric railway working. A section through a 30,000-volt aluminium cable and particulars of some designs of aluminium collector bow strips, motor field coils, rolling stock, construction, &c., are given.

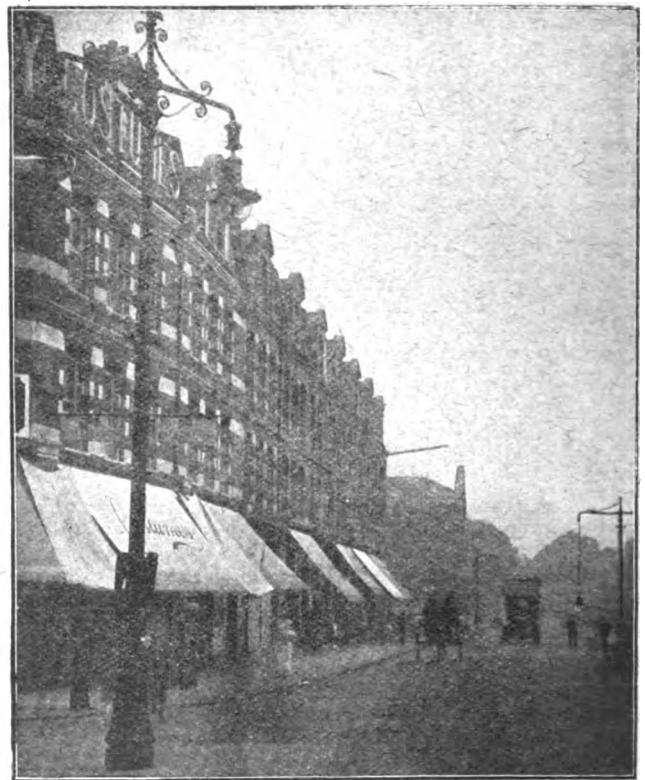
**CONDUITS AND CONDUIT FITTINGS.**—A new catalogue, cancelling all previous issues, has just been produced by Electrical Conduits, Ltd. (18 Bennett's Hill, Birmingham). The numbers of some of the fittings have been altered, and prices

revised to agree with those of other standard makes. As well as a complete range of conduits, numerous fittings, including switches, plugs, junction boxes, and other accessories, are conveniently listed. Special attention is drawn to the "HIC" patent grip fittings illustrated in *ELECTRICAL ENGINEERING*, Vol. VIII., p. 546, October 3rd, 1912. Gas, galvanised, and steam tubes and fittings are included in the list.

**FLEXIBLE COUPLINGS.**—A new list from the Power Plant Co., Ltd. (39 Brandville Road, West Drayton, Middlesex), gives particulars and detailed illustrations of the patent reversible insulating couplings made by this firm. The couplings are made in several standard types, and special combinations can be arranged to suit special requirements.

## LOWERING GEAR FOR METAL FILAMENT LAMPS

SOME idea of the raising and lowering gear for the metal filament lamp street lighting in Fulham may be gathered by those who have not seen it from the accompanying illustration. In the foreground is a double arm post, and in the background a single arm post; in this case the lamp is lowered for cleaning, &c. About 200 brackets and sets of gear for this installation were supplied by the London Electric



METAL FILAMENT LAMP STREET LIGHTING IN FULHAM.

Firm (George Street, Croydon). The gear is of their well-known positive acting weight-relieving type, and the winches are of their self-sustaining type. The brackets are of the rectangular type, with pulleys and tubes fitted inside to prevent the rope from touching the electric cables, which are also inside.

## UNIVERSITY AND TECHNICAL COLLEGE ANNOUNCEMENTS

The next session of the University of Leeds begins on September 30th, when the entrance examination will be held at 10 a.m. and 2 p.m. The prospectus, dealing with the departments of electrical, civil, mechanical, and mining engineering, and coal gas, fuel, and metallurgy, may be had free on application to the secretary.

The new course at the Crystal Palace School of Practical Engineering will commence on Wednesday, September 10th. Intending students should attend the previous day between 10 a.m. and 1 p.m. for examination. Particulars of the various courses will be forwarded to those applying to the Registrar, School of Engineering, Crystal Palace, S.E.



HIGHEST  
QUALITY!

SPECIFY

**'IGRANIC'****SWITCHGEAR**

IGRANIC ELECTRIC CO. LTD.

BEDFORD and LONDON.

**TELEPHONY AND TELEGRAPHY  
(INCLUDING WIRELESS)**

According to a return just published, by an order of the House of Commons, the number of trunk calls (excluding calls to and from the Continent) has increased fairly uniformly from 13,467,975 in 1903-4 to 35,815,959 in 1912-13. At the same time, the mean number of trunk lines in use increased from 1,363 to 3,180, and the double-wire mileage increased from 49,100 to 117,900. The average number of calls per trunk circuit per day was 34.1 in 1903-4, rising to a maximum of 36.9 in 1905-6, and falling to a minimum of 33.0 in 1908-9. After this the number rose to 39.6 in 1911-12, and in 1912-13 was 38.8. The estimated average operating cost per call varied as follows, from 1907-8 to 1912-13 inclusive: 1.27d., 1.36d., 1.37d., 1.29d., 1.23d., 1.26d. From 1903-4 to 1912-13 the receipts from inland trunk calls increased from £325,525 to £912,342, and the average fee per call increased from 5.8d. in 1903-4 to 6.1d. in 1911-12 and 1912-13. It is also stated that the busy-hour traffic usually amounts to about one-fifth of the total traffic between 8 a.m. and 8 p.m. The average time a trunk circuit is held in connection with a three-minute call ranges from three-and-a-half to six minutes, while if six-minute calls be included, the time ranges from four-and-a-quarter to seven-and-three-quarter minutes.

The Postmaster-General has notified a number of telephone users in Douglas, I.O.M., that their instruments will be disconnected in consequence of the Town Council's having refused what he states he considers to be the generous terms he has offered for wayleave over municipal property (£5 per annum). The Chamber of Commerce has approached the Governor of the Isle of Man on the matter, and he has undertaken to communicate with the Postmaster-General. The rent demanded by the Council was £25 per annum.

At the general meeting of the Marconi Co., which took place on Friday last, the report and accounts, given in our last issue, were agreed to. The Chairman, Mr. G. Marconi, announced that the Company has just obtained a fifty years' concession for connecting Rio de Janeiro and other centres in Brazil with Europe. As soon as possible, a Brazilian Company will be formed for the purchase from the parent Company of its long-distance rights, together with the concession. The new Company will no doubt enter into an agreement with the American Co., by which the station to be built at Para will carry on a service with New York and other parts of the United States. The Managing Director, Mr. Godfrey Isaacs, in the course of his speech, said: "... Whatever you have read in the papers as having been done by wireless telephony, the Marconi Co. has done more. But until the Marconi Co. is prepared to say exactly what definite results in a practical way can be obtained from wireless telephony, it will remain silent. We shall, perhaps, at an early date be able to turn wireless telephony to practical commercial account, and it will then be time enough to speak."

Rules have been issued in Germany with regard to stations erected to receive the wireless time-signals which are sent out by the Norddeich wireless station. The apparatus has to be adjusted to receive waves only of 2,000 metres length; and everything, with the exception of the handle for tuning, the detector switch, and the telephone receiver, must be encased, and closed with a seal, so as to be inaccessible to the owner.

The last issue of the *Telefunken Zeitung* contains a great deal of interesting matter in commemoration of the tenth anniversary of the Company's establishment. Among other articles are reviews of the present extension of long-distance wireless telegraphy, and of the ten years' work of the Company; descriptions of the wireless telegraph installation on the s.s. *Imperator*, and the erection of the wireless station at Kamina (Togo), illustrated with interesting views; and excellent portraits of Count von Arco, Dr. Adolf Franke, and Mr. Paul Mammoth.

Construction work has begun on the large wireless station at Caimito in the Panama Canal Zone, says the *Electrical World* (New York). It will be similar to the station at Arlington, and the aerial will be supported on three 600 ft. towers, arranged in a triangle, 900 ft. apart. The nominal radius for sending and receiving will be 3,000 miles, so that communication with Washington can be maintained.

The official tests of the system of wireless telegraphy invented by the Japanese electrician, Mr. Torikata, in which satisfactory results were obtained at distances of sixty miles, have resulted in the Japanese Government ordering all shipping companies subsidised by it to instal the apparatus on their principal vessels. It is stated that patent rights have been secured in Japan, France and this country, and are pending in Germany and the United States.

On the 21st inst. the Saseho-Darien cable failed, and on the following day notice reached us that secret language was again admitted in telegraphic correspondence with Crete. The Greek office notifies for general information that there is no telegraphic communication with Gumuldjena and Xanthi. —On the 22nd inst. the Salonika-Lemnos cable became interrupted, and telegrams are being sent via Malta at senders' risk. —The Great Northern Telegraph Co., Ltd., announces that on and after the 1st of September next the rates to the undermentioned places in the Far East will be as follows: Hongkong, China and Manilla, 3s. 6d.; Japan and Formosa, 3s. 11d.; Dutch Indies, 3s. 7d.

**ELECTRIC TRACTION NOTES**

The Dublin United Tramways Co. has, during the past week or two, been experiencing some trouble with its motor-men and conductors, some of whom came out on strike; but no difficulty has been experienced in obtaining a sufficient number of men to keep the service running. On Tuesday, however, a number of the Company's cars were deserted by the men in charge of them, who left them standing in the streets, and as the result of the fresh outbreak the Company decided not to run any cars after dark. The Transport Workers' Union, which is at the back of the trouble, has also made a demand for an increase of wages in respect of the Ashton tramway employees and the men in the employ of the Stalybridge, Hyde, Mossley, and Dukinfield Joint Tramway Board.

The Greenock Corporation has decided to give notice of its intention to acquire the Greenock and Port Glasgow Tramways Co. at the end of its lease on May 15th, 1914.

The Llandudno & Colwyn Bay Electric Railway Co. has arrived at an agreement with the Colwyn Bay Council to pay £6,500 towards the cost of the purchase of land to enable the Company's lines to be extended to Old Colwyn. The extension of the line to this point has been a matter of much discussion and negotiation between the Company and the Council for many years past.

The horse tramways in Stirling are the only ones of the kind now in existence in Scotland, but Messrs. Balfour, Beatty & Co. are proposing to take over the horse tramway company with a view to converting the lines to electric traction, provided the new company about to be formed is also able to acquire the Corporation's electricity undertaking.

There was a net profit of £3,792 upon the past half-year's working of the Aberdeen Suburban Tramways Co. It is proposed to add £2,000 to renewal and depreciation account, and to pay a 24 per cent. dividend. The directors have under consideration the running of trolley-buses.

The accounts of the Newport (Mon.) Tramways for the year to March 31st, show a deficiency of £2,327, after meeting capital charges amounting to £10,014. It was estimated at the commencement of the year that the loss would be £2,470. During the year no less than £9,470 were spent upon repairs to the permanent way and the reconstruction of cars.

The Standardisation Committee of the Electric Vehicle

# "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

## Specifications Published August 21st, 1913

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

Names in italics indicate communicators of inventions from abroad.

17,150/12. **Thomas Transmission System.** J. G. P. THOMAS and THOMAS TRANSMISSION, LTD. The two dynamos and the prime mover are connected through a balance gear, so that the three shafts are in line without the use of flexible couplings. Each machine and the balance gear forms a complete independent unit before assembly. One figure.

17,517/12. **Temperature Control in Freight Vans.** ELDERS & FYFFES, LTD., A. W. PRIM, and F. W. ROPER. An axle-driven dynamo feeds both heaters in the air casings, and fans. A uniform temperature is maintained by thermostatic control. Seven figures.

17,980/12. **Resistances.** J. ROTHMAN and FERRANTI, LTD. Compressible resistances are made of graphite, and nickel plates so arranged that the + temperature coefficient of the nickel balances the - temperature coefficient of the graphite. Four figures.

23,273/12. **Variable Speed Dynamos.** H. LEITNER. The machine has its field coils wound in several sections, which are connected in parallel when the machine is to be used as a shunt dynamo and in series with one another and the armature when it is to be used as a motor. The armature may have two sets of windings connected in parallel or in series, according as the machine is used as a series motor or shunt dynamo. Two sets of accumulators may be arranged in series or parallel under these conditions. Four figures.

25,991/12. **Railway Signalling.** H. W. FIRTH and F. W. LEAKE (G. E. Railway). To prevent a signal from being permanently locked in the danger position due to abnormal conditions in the locking circuit, an alternative lock-releasing circuit is provided. This circuit is controlled by the signalman through a protected switch. The lock-indicator mechanism is at the same time screened by a shutter, which, together with the emergency switch, can only be restored by the electrician in charge. Six figures.

27,651/12. **Fire-proof Insulation for Cables.** J. LOEWENTHAL. The cable is passed through an electrolytic bath of aluminium salts, and connected as the cathode, so that a smooth, adhering, fire-proof insulating layer of aluminium compounds, especially aluminium hydroxide, is formed on the cable. One figure.

29,291/12. **Starting Internal Combustion Engines.** ERNST EISEMANN & Co. and E. EISEMANN. For multi-cylinder engines there is a main magneto and an auxiliary magneto put into operation by cranking while the main magneto is automatically disconnected. The primary of the auxiliary magneto contains a make-and-break switch, actuated by the cranking and a switch in the same circuit actuated by the shaft of the main magneto. The circuit is broken by this switch except when the particular piston has passed its dead point. One figure.

7,575/13. **Self-starters for Internal Combustion Engines.** W. C. S. CHAPMAN (A. D. Chapman, South Africa). Compressed air is used, and the valves are electrically controlled through the ignition circuit. One figure.

## Specifications Published To-day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free. Summaries of some of the more important of these patents will appear in our next issue.

**Arc Lamps:** ROUBAL [Electrode manufacture] 10,210/13.  
**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** HANDCOCK, DYKES and DUDELL [Change-over switchgear operated by resonance] 1,395/13; CORTEZ-LEIGH and BROUGHALL [Sealing cable terminals and connections] 7,996/13.

**Dynamos, Motors, and Transformers:** WHITE, DAWSON and HOUGHTON [Brush holders] 18,145/12; PLOHL [Frequency changing] 18,893/12.

**Ignition:** BELL [Engine starting] 20,802/12; ENTZ [Engine starting and lighting for automobiles] 25,386/12; VANDERVELL and MIDDLEY [Engine starting] 4,522/13.

**Incandescent Lamps:** HARRISON, 24,571/12; VEREINIGTE GLANZSTOFF FABRIKEN [Filaments] 2,992/13; A.E.G., 14,048/13.

**Instruments and Meters:** GOTTSCHALK and H. ARON ELEKTRICITÄTS-ZÄHLERFABRIK [Energy meters] 18,809/12; SIEMENS BROS. (Siemens & Halske) [Step-by-step rotation of an armature] 1,277/13.

**Switchgear, Fuses, and Fittings:** HALL [Automatic reversing gear for motors driving machine tools] 10,599/12; COATES and A. REYROLLE & Co. [High-pressure A.C. switchgear] 18,210/12; KNAPTON [Switches] 27,854/12; SAUNDERS [Shade holder]

3,931/13; GRUNBERG [Fuses] 6,156/13; HANCO [Warp stop motions for looms] 7,570/13.

**Telephony and Telegraphy:** BOULT (Denio G.E. Co.) [Fire-alarm signal-boxes for automatic telephone systems] 18,262/12; TULLETT [Holding telephones] 20,671/12; ANDERSON [Telephone receivers] 2,507/13; TELEPHON APPARAT FABRIK E. ZWIETUSCH & Co. [Telephony] 2,700/13; JENSEN [Telegraphy] 6,292/13.

**Traction:** PEHRSSON [Driving gear for dynamos on vehicles] 18,482/12; WARREN and MORT [Trolley pulleys] 22,696/12; R. DEMPSTER & SONS and BROADHEAD [Trolley arms] 24,263/12.

**Miscellaneous:** WILLMOTT [Solder for aluminium] 19,214/12; LAKE (Fabrik Elck. Zunder) [Winding conducting wires for blasting furnaces into skeins] 20,560/12; B.T.-H. (G.E. Co., U.S.A.) [Annealing iron] 25,902/12; BÜNDGENS [Marine mines] 27,630/12.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Distributing Systems, &c.:** SIEMENS-SCHUCKERT [Remote control of synchronous motion] 687/13; [A.C. motor control] 17,589/13.

**Electrometallurgy and Electrochemistry:** SOC. LEFER [Electrolytic iron] 16,565/13.

**Incandescent Lamps:** SIEMENS & HALSKE, 17,416/13.

**Instruments and Meters:** SOC. DES ÉTABLISSEMENTS GAUMONT [Electro-magnetic balances] 16,034/13; LANDIS & GYR [Magnet core] 17,480/13.

**Telephony:** MEYER [Table instruments] 14,780/13; SIEMENS & HALSKE [Circuits] 17,417/13.

**Traction:** BOIBAUT [Connections for railway vehicles] 13,820/13.

**Miscellaneous:** FRASER [Elevator systems] 13,447/13; SEFFT-LEBEN [Submarine mines] 17,441/13.

## Appeal Against Comptroller's Decision

27,521/11 and 28,260/12. **Cinematograph Targets.** J. B. LE MAITRE. The Comptroller required amendments to these specifications (ELECTRICAL ENGINEERING, July 31st, p. 446). This decision is now appealed against.

## Expiring and Expired Patents

The following Patents expired last week, after a life of fourteen years:—

16,960 of August 21st, 1899. **Pressure Operated Liquid Rheostat.** C. DE KANDÓ. This patent covers a construction of a liquid rheostat in which the height of the liquid between the terminal plates is automatically determined by the pressure of compressed air. The air admission is regulated by a throttle valve, while an automatic escape valve comes into use when the resistance is to be increased. An additional valve controlled by a float determines the final short-circuiting of the plates.

16,961 of August 21st, 1899. **Traction Motors.** C. DE KANDÓ. The frame on induction motors direct coupled to the road wheels is cut away on the underside, so that the diameter of the armature can be a maximum.

The following Patent expires during the current week, after a life of fourteen years:—

17,386 of August 28th, 1899. **Snap Switches.** M. GUETT. Constructional details are covered by this patent, including a hinged contact carrier, and a hinged working lever, both connected by a spring. On the lever is a shoulder, and on the contact carrier a lip so arranged that it can engage with the shoulder. Seven figures illustrate the construction.

The following are the more important Patents that have become void through non-payment of renewal fees.

**Arc Lamps:** A. WUNDERLICH and G. A. HUGHES (London Elec. Firm) [Span wire construction] 9,707/08.

**Dynamos and Motors:** B.T.-H. Co. (G. E. Co., U.S.A.) [Commutator insulation] 10,795/06.

**Switchgear, Fuses and Fittings:** EVERED & Co. and S. EVERED [Switch lamp-holder] 10,395/03; F. CONRAD [A.C. overload and reverse current circuit-breaker] 10,172/06; THAMES IRONWORKS Co. and W. H. FLOOD [Quick make and break switches] 9,697/08.

**Telephony and Telegraphy:** S. EISENSTEIN [Wireless transmitting system] 10,019/08; [Condenser] 10,023/08.

**Traction:** W. R. SYKES [Signalling: Track treadles to ensure that same number of vehicles leaves a section as enters it] 10,558/04; C. DE KANDÓ [Cascade connections] 10,648/04; ELEC. & ORDNANCE Co. and R. F. HALL [Train lighting system] 9,479/06.

**Miscellaneous:** J. MACLEAN [Driving gear for rotary hair-brushes] 10,525/04; P. FROMAGET [Remote control of mechanisms] 9,676/08; C. RUTZICKA [Moulded resistor] 9,762/08.

Association of America has under consideration a proposed charging plug of larger size for the heavier commercial vehicles. An attempt is also being made to adopt a standard list of lamp bulbs, because of the many small variations in voltage ratings and deviations in bulb shapes. The Committee is also going to take up the question of a standard method of testing the rating of solid tyres. Because of the wide variation in compounds used, and of the effect this has on both speed and mileage of electric vehicles, this is a very important question.

## LOCAL NOTES

**Aberdeen: Wiring Rules.**—The Electrical Engineer has been authorised by the Electric Light Committee to revise the Corporation's existing wiring regulations in order to bring them into conformity with the Institution Rules.

**Bromley: Mains for Bulk Supply.**—An inquiry has been held by Mr. W. H. Patchell on behalf of the Board of Trade regarding the deadlock which had arisen between the West Kent Electric Power Co. and the Corporation. The Bromley Electric Light Co. supplies the district, and as its station is now practically loaded up to its full capacity, it proposes to take power in bulk from the West Kent Co. Objection was raised by the Corporation, however, to the routes along which the trunk mains are to be laid. The Corporation named alternative routes, but the electric light company claims that as these alternative routes "are not reasonable," the Corporation cannot refuse to consent to the original route, and this is the matter upon which recourse has now been had to arbitration.

**Dewsbury: Position of Electricity Workers.**—In the course of his annual report, Mr. R. H. Campion, the Borough Electrical Engineer, makes a number of suggestions with a view to ensuring greater co-operation on the part of workmen in the Electricity Department in the general interest of the undertaking. Failing a general co-partnership scheme, Mr. Campion suggests a bonus system on the following basis, applicable to the whole staff, and subject to the payment of a minimum wage:—(1) A bonus to be paid to all men employed in the department; (2) A bonus of 2½ per cent. downwards, according to responsibility, on so much of the amount certified by the Borough Accountant to be the net surplus profit for the next financial year ending March, 1914; (3) Men who are absent, from any cause whatsoever, except annual holidays, have a corresponding reduction made in their bonus; (4) Men engaged during the above period are paid a proportionate sum if they have been employed six months; (5) Any employee going on strike, or discharged for insubordination, forfeits all right to any bonus; (6) Anyone discharged for slackness, or who leaves to better himself, obtains the amount due to him at the end of the financial year. The Electricity Committee, however, has not seen its way to adopt any of the suggestions, but has decided upon giving the workmen an increase of ¼d. per hour.

**Dudley: Proposed Sale of Electricity Undertaking.**—There still seem to be difficulties in the way of the transfer of the Corporation's electricity undertaking to the private company, with whom all the necessary arrangements have now been made. Recent correspondence with the Board of Trade shows that that authority is unable to proceed further with the consideration of the matter until proof has been furnished that notice of the proposed transfer has been advertised in a local paper and in the *London Gazette*, as required under Section 59 of the Corporation's electric lighting Order. According to a local paper it is considered probable that a Board of Trade inquiry will be held, although no reason for this is given.

The agreement is with the Birmingham District Power & Traction Co. and the Shropshire, Worcestershire & Staffordshire Electric Power Co., and the purchase-money is to be the balance of loans raised by the Corporation, which amount to £69,400, the sum of £10,500, and a further sum of £3,334, which latter represents the capital expenditure by the Corporation since March 31st, 1912, which is the date of purchase. The agreement is to be in force for forty-two years, at the expiration of which, or of any subsequent ten years, the Corporation may repurchase by giving six months' notice. The prices to be charged by the Power Co. are not to exceed those at present in force, but with the consent of the Corporation they may be increased at the end of three years. Should

the Corporation withhold its consent, arbitration is provided for.

**Glasgow: Electricity Accounts.**—On p. 461 of our issue for August 7th, we gave the financial result of the past year's working of the Corporation's electricity undertaking. From the report of the Committee we notice that a contract for a 6,000-kw. turbo-alternator has recently been given to the British Westinghouse Co. for the Port Dundas power house, and a similar contract to Messrs. Howden for the Pollokshaws Road station. When these plants are installed, the respective capacities of the two power stations in question will be 36,000 and 30,000 h.p. These are more or less temporary measures pending the erection of the new power station which is now under consideration. In a memorandum regarding the progress of the undertaking during the past twenty-one years, it is pointed out that the average price received per unit has uniformly fallen from 7d. to 1'286d.

**Greenock: Electricity Profits.**—At the last meeting of the Corporation, the Chairman of the Electricity Committee called attention to the satisfactory state of affairs in the Electricity Department, which had enabled it to put on record a net profit for the past year of over £5,000. This makes a total net profit of about £20,000 during the past four years.

**Navan (Ireland): Electric Lighting.**—As the result of a letter from the Board of Trade asking what steps had been taken to carry out the Council's electric lighting Order, the Lighting Committee recommended that application be made for a loan of £7,000 to carry out the scheme. In the Council, however, this recommendation was rejected in favour of one asking the Board of Trade for an extension of time.

**Newport (Mon.).**—There was a loss of £1,093 upon the electricity undertaking for the past year compared with an estimated loss of £1,779. This result is arrived at after writing off £2,471 for superseded plant, and providing £350 for renewal of the battery, in addition, of course, to meeting capital charges. The general progress of the undertaking on the business side has been most satisfactory. The gross receipts show an increase of £1,162, whilst the working expenses increased only by £238.

**Stirling: Proposed Purchase of Electricity Undertaking.**—As mentioned in our Electric Traction Notes, a proposal has been placed before the Council for the purchase of its electricity undertaking in conjunction with the conversion of the existing horse tramways to electric traction.

**Sale of Electrical Fittings.**—Several local wiring contractors have written to the Council regarding the sale of electrical fittings by the Electricity Department, and also as to the drafting of specifications by the Borough Electrical Engineer for intending consumers. Whilst the firms were unanimous that the Council should not indulge in the sale of electrical fittings, there was some difference of opinion as to the desirability of the Borough Electrical Engineer advising consumers, and one firm, at any rate, agreed that it was more satisfactory if this practice were continued. Having considered the matter, the Electricity Committee recommended the Council to co-operate with contractors in securing and extending electrical installations, but that the Electrical Engineer be instructed to adhere to his present practice of advising intending consumers and making out specifications when requested to do so. At the same time it was indicated that the Town Council does not give up in any way its statutory right to supply electrical accessories, although the sale of these for the present is not to be pushed. These recommendations have been adopted by the Council.

**Whitehaven: Combined Lighting and Heating Tariff.**—In view of possible developments in more economical electric lamps, the Borough Electrical Engineer has suggested a scheme whereby, instead of having, as now, a separate meter for heating and cooking purposes, a tariff shall be designed giving a combined rate for lighting, heating and cooking. The Borough Electrical Engineer's report on the question, however, has not been sufficiently considered by the Electric Lighting Committee to enable it to place a recommendation before the Council at the moment.

FOR  
STEAM JOINTS  
USE



JOHN HUDSON & CO.'S SUCCESSORS, Mansell St., London, E.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

### Generating Stations, Sub-Stations, Mains, &c.

**London: Hammersmith.**—High- and low-tension cables; high-tension substation switchgear. Chief Electrical Engineer. September 24th. (See advertisement on another page.)

**Penwortham.**—Electricity is to be substituted for oil power at the Council's sewage works.

**Southampton.**—Steam boiler at electricity works. Borough Electrical Engineer. September 8th. (See advertisement on another page.)

**Waterford.**—Mr. E. M. Lacey, of London, has been appointed Consulting Engineer in connection with the Council's electric lighting scheme.

### Wiring

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Aberdare.**—Cottage hospital at Aberaman. Architect, G. Kenahole, Bargoed.

**Battle.**—It has been decided to light the workhouse by electricity.

**Birmingham.**—New post office and telephone exchange at Moseley. H.M. Office of Works, 42 Paradise Street, Birmingham.

**Bradford.**—Residential school for the blind. City Architect.

**Cambridge.**—Extensions to Isolation Hospital (£8,570).

**Halifax.**—Hospital and pavilion at Sanatorium, Green Lane Hall.

**Kingston-on-Thames.**—New Coliseum.

**London.**—New offices for Board of Trade, Whitehall Gardens. H.M. Office of Works.

**Manchester.**—Electric lighting of the Municipal School of Domestic Economy, High Street, September 3rd. Town Clerk.

Elementary school, Liverpool Road, Irlam.

**Skewen (S. Wales).**—Electric light installation at Free Library. Clerk to Council.

**Stoke-on-Trent.**—Additions to hospital. Architect, E. Jones, 10 Albion Street, Hanley.

**Stretford.**—Infants' school, Victoria Park. Architects, Woodhouse & Howard, 88 Mosley Street, Manchester.

### Miscellaneous

**Aberdeen.**—The installation of portable electric winches at the fish market is under consideration.

**Brazil.**—There is a proposal to construct an underground electric railway in the centre of Rio de Janeiro. This news comes from the Acting British Consul-General in that city.

**Melbourne.**—Alternating- and direct-current recording meters, and maximum-demand indicators. Messrs. McIlwraith, McEacharn & Co., Biliter Square Buildings, London, E.C. September 9th.

Electrical machinery for operating pneumatic tube services. Deputy Postmaster-General, Melbourne. Copy of specification at 72 Victoria Street, or 73 Basinghall Street, London.

**Morecambe.**—The Borough Electrical Engineer has been instructed to prepare a scheme for the conversion of the tramways on the front to electric traction.

## TENDERS RECEIVED AND ACCEPTED

**Liverpool.**—The contract for the lighting of the new Arts Building at the University has been placed with Messrs. Fred Wilkins & Brother, Ltd., 27 to 35 Duke Street, Liverpool.

**London: L. & S.W. Ry.**—In connection with the short article on the contracts for the London & North Western and London & South Western Railways published in our last issue, the Leskole Co., Ltd., inform us that sixteen sets of their electric distance thermometers were specified by Messrs. Kennedy & Jenkin for the power house of the latter line, and have been ordered by the Babcock & Wilcox Co. for superheat readings on the fronts of the sixteen boilers.

## APPOINTMENTS AND PERSONAL NOTES

Some time ago a recommendation by the Dublin Electric Lighting Committee to increase the salaries of the City Electrical Engineer and the Deputy Engineer, as well as the Chief Engineer of the Distribution Department, was postponed for six months. Last week, however, a resolution was moved in the Council to consider the case of the Deputy Engineer, Mr. L. J. Kettle, on its merits, and it was recommended that he be granted an increase of from £400 to £600 per annum by £50 increments. There was considerable opposition to this, particularly on the part of the Lord Mayor, who, according to a local paper, mentioned incidentally that Mr. Mark Ruddle, the City Electrical Engineer, might be retiring within the next two years. Eventually the resolution for the increase of Mr. Kettle's salary was carried by thirty votes to fourteen.

Switchgear fitters and improvers are required by the Igranic Electric Co., Bedford.

Six demonstrators are required for the Model Electrical House at the Ideal Home Exhibition, Olympia. (See advertisement on another page.)

## MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. G. Smith & Son, of 5, Philpot Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night, was £73 to £73 10s. (last week, £72 15s. to £73 5s.).

**Record Electrical Co.**—Messrs. Edmiston, Brown & Co., 290 St. Vincent Street, Glasgow, have been appointed agents for the whole of Scotland for the Record Electrical Co., Mr. C. E. Hart having joined this firm.

## COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &c.

**Newcastle and District Electric Lighting Co.**—An interim dividend at the rate of 3 per cent. per annum, has been declared on the ordinary shares for the June half-year.

## NEW COMPANIES

**W. PARSONS & CO.**, Regent Street, Leamington. Capital, £2,000. Electrical and general engineers.

**CLONES ELECTRIC LIGHT & POWER CO.**, Fermanagh Street, Clones. Capital, £2,000.

**PORTARLINGTON ELECTRIC LIGHT & POWER CO.**, 66 Victoria Street, S.W. Capital £3,500. To adopt an agreement with Messrs. Foote & Milne, Ltd.

**BETULANDER AUTOMATIC TELEPHONE CO.**, Marconi House, Strand, W.C.—Capital, £400,000. To acquire from Marconi's Wireless Telegraph Co. the right and patents relating to the Betulander automatic system. We gave particulars of the system in ELECTRICAL ENGINEERING, May 15th, 1913, p. 277.

**LISNASKEA ELECTRIC LIGHT CO.**, Main Street, Lisnaskea.—Capital, £1,000.

**Gas and Electric Mains Breakdown in the City.**—Shortly before midnight on Wednesday last week, workmen repairing the road in Fenchurch Street in the City of London, cut through a large gas main, and also through a 0.5 sq. in. feeder belonging to the City of London Electric Lighting Co. The result was a rather serious fire in the street, which it took some time to extinguish, and the fire spread to a neighbouring Post Office street box as well. Fortunately no interruption to the electric supply was caused, either by the accident itself or during the subsequent repairs. We understand that there are also mains of the Charing Cross Co. in the same street, but these were at a greater depth, and were not damaged.



# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 349 [Vol. IX., No. 36]  
*All rights reserved.*

THURSDAY, SEPTEMBER 4, 1913.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES AND TECHNICAL COLLEGE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

*Other Advertisement Rates on Application.*

### Latest Time for Receiving

Letters for Insertion, Tuesday first post.

Small Advertisements and Official Announcements, Wednesday first post.

Displayed Advertisements, Tuesday first post.

Corrections in Standing Advertisements, Monday first post.

All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 208-209, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Circling, Fleet, London."

Telephone No.: 5509 Holborn.

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

RATHER startling results have been obtained in some experiments upon the effect of globes and reflectors upon the mechanical strength and life of large incandescent lamps. Owing to the rise in temperature of the air surrounding the lamp it is found that the filament becomes less strong, and that the life is considerably shortened. The glass is said to become porous, and this lowers the vacuum. It is recommended that high-candle-power lamps should be run without globes or reflectors. (Page 498.)

A PAPER was read at the meeting of the Iron and Steel Institute in Brussels by Mr. Otto Frick, in which the induction furnace designed by the author was described. It has a rotating cover, small bath inclination, low energy consumption, and a lining giving a regular life of between two and three months. Two of these furnaces are in use in Germany for melting cold scrap. (Page 499.)

THE reports of the Divisional Inspectors of Mines for 1912 which have so far been published show a substantial increase in the number of electrically-driven coal-cutters in use and also in the number of electric safety lamps. Mr. W. Walker (Inspector for the Scotland District) urged the greater use of these lamps. (Page 500.)

THE results of some tests on the crystallising properties of electro-deposited iron are summarised in a Paper by Dr. J. E. Stead and Dr. H. C. H. Carpenter. (Page 501.)

THE patents of special interest to mining electrical

engineers and electrometallurgists which have been issued last month relate to miners' lamps, shaft signalling, the prevention of fires after blasting, and an electrical process for making high-grade pig-iron from phosphorous ores. (Page 502.)

FURTHER particulars of the exhibition of the half-watt Mazda lamp briefly reported in our last issue will be found on page 503.

A CONDUIT pipe clip for surface wiring, an indicating fuse, and a suction cleaner are illustrated and described. (Page 504.)

SOME points relating to air-space telegraph and telephone cables for railway working and other matters are discussed in our Questions and Answers columns. (Page 505.)

WE give particulars of the 110,000-volt transmission lines of the Mississippi River Power Company from their large water turbine power-house at Keokuk, on the Mississippi. The line is some 144 miles long, and consists of a double line on single steel towers about 800 ft. apart. The capacity of the sub-station at St. Louis is 66,000 h.p., and it supplies the railway and lighting companies. (Page 506.)

THE scope of the old International Photometric Commission has been enlarged, and it is now called the International Illumination Commission. Mr. C. C. Paterson (National Physical Laboratory) has been elected first Hon. Secretary. (Page 507.)

ENORMOUS progress has been made in the extension of telephony in Canada. (Page 507.)

REFERENCE is made in our "Electric Traction Notes" to American practice in connection with frequency-changers.—An all-night service is started to-day on the Manchester tramways.—In spite of the strike riots in Dublin, the tramway service has apparently been maintained. (Page 507.)

THE specifications published by the Patent Office last Thursday include one by the A.E.G. for a metal filament lamp, in which, by the introduction of a foreign substance into the bulb an atmosphere of oxygen at low pressure is produced. An increased efficiency is obtained. In another specification by F. and F. L. Harrison a renewable metal filament lamp is described, while F. Coates and A. Reyrolle & Co. claim a no-voltage release for high-pressure switchgear without the necessity of intermediate transformers. An important patent for a submarine telegraph relay by S. G. Brown has expired. (Page 508.)

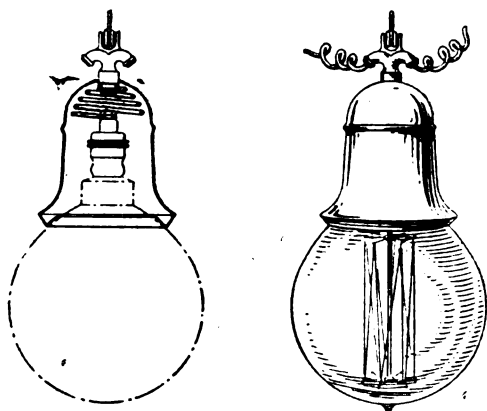
A SMALL station with two 100 h.p. semi-Diesel sets has been started at Portishead, near Bristol, by a private company.—The Aberdeen accounts show very large increases in the power and heating loads.—The electricity supply at Bognor, which will be furnished by the Gas Company, is expected to be started up at the end of the month. (Page 509.)

A LOAN of £79,700 has been sanctioned for extensions of the Sheffield Electricity Works.—Smaller ex-

tensions are to be made at Hornsey, Accrington, Haslingden, and Bingley (Yorks).—It has been decided to extend the generating stations at Belfast and Newport (Mon.).—Concessions for electricity supply have been granted to a number of gentlemen in Cuba.—The proposed electrification of some Argentine railways is reported. (Page 509.)

### THE INFLUENCE OF GLOBES AND REFLECTORS ON THE LIFE OF METAL FILAMENT LAMPS

USERS of metal-filament lamps of high candle-power, such as are employed for street lighting, may have noticed considerable differences in the life of such lamps when enclosed in different forms of globe. A similar effect, though not so pronounced, is often observed with lamps of low candle-power. It appears that this is due to the different temperatures of the air immediately surrounding the lamp, and a Swedish engineer, Herr Gustaf Sundén, of Ludvika, has carried out experiments over a very long period in order to investigate this. The experiments are described in the *Elektrotechnische Zeitschrift* of August 28th, and are of a



SECTION AND ELEVATION OF 100-1,000 C.P. LAMP FITTED WITH SPECIAL HOOD.

most conclusive nature. A large number of new drawn filament lamps of first-class make were run under three different conditions. One group was run without globes or reflectors

of any kind under normal conditions in a room in which the air temperature was constant at 20° Centigrade. The second group were run in a heat-insulated metal chamber in which a steady temperature of 200° C. was reached in a very short time. The third group was run in the open and cooled by flowing water with a constant temperature of only 2·5 C.

The lamps were taken after various durations of burning, and tested on a Müller impact apparatus for determining their mechanical strength. The results are given in the form of curves. The lamps burning under flowing water showed absolutely no decrease in mechanical strength after a hundred burning hours, the curve being a perfect straight line. Those burning at the room temperature of 20° C. showed a decrease in mechanical strength of 25 per cent. after 100 hours, and 37·5 per cent. after 200 hours, the reduction in strength being less rapid as the lamp burned until the life of 2,000 hours was reached. Those burning in the hot air, however, dropped over 50 per cent. in strength after ten hours' burning, and burnt out at 40 hours.

The candle-power was not actually measured, but it was noticed that the lamps burning under the cold-flowing water did not lose in brilliancy after even a long period, while those at the room temperature did. The lamps running in the hot air lost considerably in brilliancy even during their 40-hour life.

The author gives rather a remarkable explanation of the behaviour observed. He ascribes the reduction in strength to the lowering of the vacuum as a result of the glass becoming porous when heated continuously. On the basis of these experiments, the author recommends that large metal-filament lamps should have no globes. In an ordinary clear-glass globe, with a 20 mm. diameter hole at the bottom, the temperature, after a run of 35 minutes, was found to be 70° C. With a matt or dusty globe much higher temperatures are reached, and the life of the lamp is shortened accordingly.

The author recommends the use of a small hood, as shown in the figure. A reflector, he holds, raises the temperature of the surrounding air, and is unnecessary, as little light is thrown by a metal-filament lamp in an upward direction. The absence of a reflector also enables the bulb to be cleaned by rain. The hood is of copper sheet 0·6 mm. thick, and the porcelain lamp socket is attached to a strong spiral spring, which presses the flange of the hood down on to the bulb, and prevents the lamp from becoming detached from the socket and falling out. Besides being conducive to long life, the design illustrated is put forward as being both cheap and pleasing to the eye.



The London B.T.-H. Team with the New Rugby Football.

## ELECTRICAL ENGINEERING IN THE MINING AND METAL INDUSTRIES

### STEEL REFINING IN AN INDUCTION FURNACE

A PAPER entitled "The Electric Refining of Steel in an Induction Furnace of Special Type" was read on Tuesday at the meeting of the Iron and Steel Institute in Brussels by Mr. Otto Frick. The Paper deals with the future development of the electric furnace, especially the induction furnace designed by the author. Two of these furnaces are at work in the Krupp works at Essen. The first came into regular operation in August, 1908, and the second, which was originally of the Kjellin type, has been rebuilt. Each is a 10-ton furnace and is used with good cold scrap. The actual working capacity is 8.5 tons and the weight of casts 6.5 tons. Each furnace is designed for 736 kw., but the average power used is 650 kw. The supply pressure is 5,000 volts single-phase and the frequency 5 cycles per second. The power factor at 8.5 tons is 0.53, and the average duration of one heat 6 hours 45 minutes. The theoretical power consumption per ton is given as 432 kw.-hours, so that the average losses are: electrical, 4.5 per cent., and radiation, 160 kw., giving an average total efficiency of 70 per cent. Figs. 1 and 2 give an idea of the design of these furnaces.

As previously mentioned, the Frick furnace is a modified Kjellin induction furnace. The iron being treated is contained in a crucible, formed round an iron core, which carries the primary winding, supplied with single- or two-phase current at a low frequency. The eddy-currents in the molten metal cause it to revolve. Returning to a consideration of the 10-ton furnaces, the original type with a rotating cover was chosen, as this allows of an even distribution of the cold scrap throughout the whole crucible, as well as facilitating supervision of the charge and of the furnace walls. Additions of slag and alloys are also easily made.

Comparing the properties of the Kjellin and Frick furnaces, the author deduces that the radiation losses are 48 per cent. greater in the former. On a run of six weeks, and with current at 0.43d. per unit, the cost of production per ton of metal, excluding interest and depreciation, is estimated at 41.1s. and 33.7s. respectively.

At the Krupp works a Girod furnace of 1,200 kw. and 12 tons capacity is also installed, and, comparing average results, the power required per ton of steel treated in the Girod furnace is about 1,000 kw.-hours, and in the Frick furnace about 600 kw.-hours. Assuming 7½ minutes between heats in the Frick, and 55 minutes and 1 hour 25 minutes in the Girod furnaces (these longer intervals being necessary for

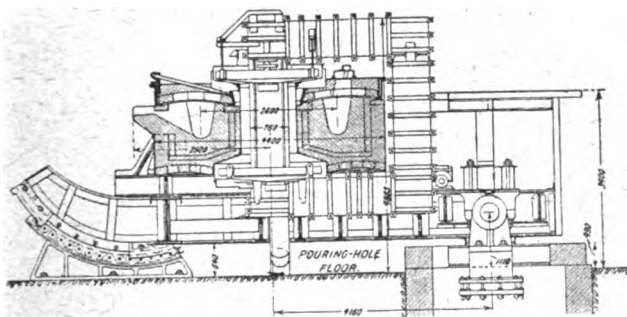


FIG. 1.—10-TON 1,000 H.P. FRICK FURNACE.

charging, which has to be completed before the current can be switched on), the average losses are about 186 kw. and from 567 kw. to 594 kw. respectively, i.e., the loss in the Frick furnace is three times as little as the loss in the Girod furnace, although the capacity is only 20 per cent. less. It is also pointed out that the highest temperature attained in the Frick furnace is 1,680° C., while a maximum of over 2,500° C. is reached in the Girod furnace. The electrodes in the latter also serve to conduct the heat from the furnace, and the author concludes that in melting cold scrap the efficiency of an arc furnace cannot exceed 50 per cent., while in the Frick furnace it is over 70 per cent. The efficiency of a single-ring 20-ton furnace only varies from about 81 per cent. at 1,500° C. to 78.8 per cent. at 1,600° C.

Owing to the ring shape of the induction furnace crucible, difficulties are experienced with regard to cracking, while repairs cannot be so easily effected, as the walls are almost vertical. The lining developed by the author consists of magnesite of as high a quality as possible, and contains 93 per cent. of MgO without any binding agent. It is compact and strong and has no temperature coefficient. As all basic slags contain up to 10 per cent. of MgO, it is concluded that they saturate themselves up to this amount. Crushed magnesite of no use for other purposes is therefore introduced into the furnace so as to form a heap in front of the inner wall, against which it is pressed by the inclination and rotation of the bath. Fig. 3 shows a section through the lining and the bath, with its surface inclined towards the inner wall.

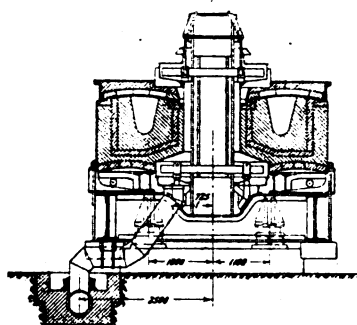


FIG. 2.—10-TON 1,000 H.P. FRICK FURNACE.

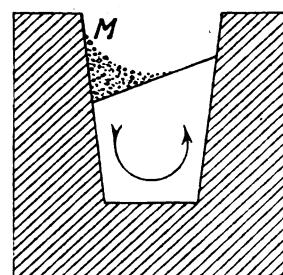


FIG. 3.—SECTION THROUGH LINING AND BATH.

The slag additions, mixed with magnesite, are shown as a heap M, and the rotation of the bath is indicated by an arrow. By this means the cutting of the lining has been prevented, as the silicon and phosphorus in the steel absorb the necessary amount of MgO and CaO before they reach the furnace wall. The linings so treated give a life of from two to three months regularly. As about two tons of metal are left in the furnace after tapping for the maintenance of the electric circuit, the magnesite has to be added immediately. The rotating cover of the furnace facilitates the distribution of the magnesite along the inner wall, the additions being fed along a small channel of sheet-iron at one of the openings during the rotation of the cover. It is found that the inclination of the bath surface is only between 4° and 5°, against 24° in the Kjellin furnace, so that the bath surface is kept economically covered with a minimum amount of slag.

Where furnaces are required for refining, as against melting from cold stock, special designs of doors for the quick handling of the extra slag are necessary. Tools are inserted through these doors to push the slag towards the spout and to prevent the formation of slag bridges. The doors are in the sides of single-ring furnaces and in the roof of double-ring furnaces. (A double-ring furnace is one in which the crucible is in the form of a figure eight, with one loop embracing each limb of the core.) The successes of the large furnaces in Essen has warranted the building of still larger types, up to 20 tons capacity, as single-ring furnaces; and double-ring furnaces up to 40 tons have been designed. All furnaces will preferably work with single-phase current, although the double-ring type may also be made to take a two- or three-phase current.

As induction furnaces have a very low power factor at the normal frequencies of 25 to 50 cycles, it is only in exceptional cases advisable to connect them directly to existing plants. It will in no case be economically justifiable to connect furnaces for steel of over 3 tons and for ferro-manganese of over 6 tons capacity to a supply system of 25 cycles, as the higher price of the furnace and extra power exceed the cost of the converting equipment. A double-ring single-phase furnace, compared with a two-phase furnace, shows that the extra cost of the iron core in the latter case is greater than the extra cost of the dynamo in the former. The induction furnace above two tons capacity is best suited to a frequency of between 5 and 15 cycles per second. Furnaces for melting ferro-manganese are smaller, and 25 or 50 cycles may be

used. The author has found that the apparent resistance of the furnace coils increases by about 7 to 7.5 per cent. for each cycle. The voltage may be anything up to 5,000. Comparing the costs of refining steel by the induction and arc furnaces respectively, the author's figures show that, allowing £50 per day for current, repairs, labour, interest and depreciation, the costs per ton are 4s. and 6s. 3d.; equivalent to a saving of £28 per day by the use of the induction furnace, not even taking into account the cost of the electrodes. The author looks to the electric furnace becoming chiefly used in combination with the Bessemer acid and basic processes. He thinks that the open-hearth furnace will soon disappear from those districts where ores suitable for acid or basic working are found, as the costs vary between 6s. and 12s. per ton for the production of Bessemer steel, and between 5s. and 8s., or possibly 10s., per ton for electric steel produced in the induction furnace. For the melting of ferro-manganese the melting costs vary between 20s. and 30s. per ton, or between 10 and 15 per cent. of the value of the FeMn. By pre-melting the FeMn in the electric furnace, not only an improvement of the quality of the steel, but also a saving in cost, may be gained, varying between 5 and 30 per cent. of the value of FeMn, say 10s. to 60s. per ton of FeMn.

A considerable portion of the Paper is given over to a consideration of metallurgical reactions, and the opinion that a thin and liquid slag is unnecessary in the induction furnace is upheld. Particulars of the following reactions, which may be readily carried out, are also given:—Decarburisation, desiliconising, dephosphorisation, deoxidation, rephosphorisation, desulphurisation, recarbonising, and alloying with silicon, manganese, nickel, chromium, tungsten, etc. In the latter case the gentle rotation of the bath ensures a perfect distribution. Deoxidation by the old method with ferro-silicon is considered to be the most satisfactory in the induction furnace. During the process of desulphurisation it is shown to be bad economy to try to produce calcium carbide in the steel furnace.

## REPORTS OF DISTRICT INSPECTORS OF MINES

IN accordance with our usual custom, we give below a *résumé* of the published reports for 1912 of the various District Inspectors of Mines in so far as they relate to the use of electricity. It will be noticed that satisfactory increases are shown in the number of electric safety lamps in use, as well as in the number of electrically-driven coal-cutting machines. The decrease in the number of accidents due to electricity is also satisfactory. There was, however, an explosion due to the sparking of a signalling bell at Bedwas Colliery (South Wales district). The bell was carried too near to the coal face.

### Scotland District

Mr. W. Walker reports that there has been an increase since 1911 of 92 electrically-driven coal-cutting machines, and an increase of three driven by compressed air. The total number of machines in use at the end of the year was: compressed air, 178; electric, 595. Of the latter 392 were disc type, 177 bar, 12 chain, 9 percussive, and 3 rotary heading.

There were 282 electric safety lamps in use, compared with 155 in 1911. Of these 127 were Sussman-Gray, 94 C.E.A.G., 45 Float, and 16 various. The total number of safety lamps (both oil and electric) in use was 34,758, compared with 35,098 in 1911. Of these 9,146 were magnetically locked, compared with 7,924 in 1911, while 10,710 were ignited by electricity, compared with 8,592 in 1911.

The aggregate horse-power in motors installed on the surface was: Winding, 1,666; ventilation, 2,363½; haulage, 2,527; coal-washing or screening, 5,515; miscellaneous, 6,944½; for underground working the figures are: haulage, 22,813½; pumping, 36,143½; portable machinery, 17,367; miscellaneous, 3,018½. Thus the totals are 19,014 and 79,343 respectively.

The report states that one person was killed by electric shock, and nine were injured. Mr. Walker remarks that this is a record for the Scotland district, and is very satisfactory in view of the large amount of electric machinery in use. The result, he says, is "to some extent due to the good work which is being done by the Association of Mining Electrical Engineers in Scotland, and which has resulted in a better class of colliery electricians being employed at the majority of the mines, with the result that the supervision is more careful than was the case in former years."

The fatal accident was due to a coal-cutting machine in a wet situation being badly earthed. Three-phase current at 440 volts was used. Mr. R. Nelson (Electrical Inspector of Mines), found that the earth-wire at the surface was fastened to a short length of rusty rail buried some 3 ft. in the ground. The earth cable was so slack that some earth had forced itself between the head of the bolt and the web of the rail. There was also an intermediate earth plate dipping into water in a sump, whereas the Special Rules state that earth plates should be sunk in the ground. Of the non-fatal accidents, three were due to abrasion

of the insulation of unarmoured cables, three of failure of the insulation of trailing cables, while the remainder were due to "casual and careless methods of working." In connection with Section 32 of the Coal Mines Act, which requires that the whole of a seam, in which an explosion of inflammable gas occurs causing any personal injuries, must be worked with safety lamps, Mr. Walker writes: "The use of safety lamps at present is not popular, either with owners or the persons employed, and every possible argument is used against their use, and, in particular, that other classes of accidents will be increased. Having had considerable experience in this and other coal fields, I do not agree. . . . With portable electric lamps a better light is obtained than is obtained with a naked light. It is often urged that the weight of the electric safety lamps is excessive, but I would point out that this should not prevent their being used, as it is probable experience gained from practical use will remedy this defect." An explosion occurred while some gas was being "bottled up," probably by an oil safety lamp being knocked over, and Mr. Walker says: "The stopping was eventually completed by firemen using electric portable lamps. If this precaution had been adopted at first, the accident probably would not have occurred." There were two prosecutions of miners for contravention of the electricity special rules.

### Newcastle District

According to Mr. J. B. Atkinson's report there has been an increase since 1911 of five electrically-driven coal-cutting machines, and an increase of 40 driven by compressed air. The total number of machines in use at the end of the year was: compressed air, 304; electric, 51. Of the latter 24 were disc type, 12 bar, 14 chain, and one rotary heading.

There were 1,522 electric safety lamps in use, compared with 871 in 1911. Of these 1,487 were Sussman-Gray, 15 Oldham, 12 Mecco, and eight various. The total number of safety lamps in use was 61,841, compared with 61,864 in 1911. Of these, 22,187 were magnetically locked, compared with 21,143 in 1911, while 25,594 were ignited by electricity as against 24,107 in 1911.

The aggregate horse-power in motors installed on the surface was: winding, 3,159; ventilation, 4,402½; haulage, 2,333; coal-washing or screening, 3,318; miscellaneous, 5,511; for underground working the figures are: haulage, 11,361½; pumping, 13,128½; portable machinery, 1,627½; miscellaneous, 2,309½. Thus the totals are 18,723½ and 28,427 respectively.

There were three fatal accidents, resulting in three deaths, attributed to electricity, and two non-fatal, in which two persons were injured. One of the fatal accidents was due to an electrician not knowing that a switch was alive, another was due to a metallic casing on a coal conveyor switch not being earthed (the mine manager was prosecuted but not convicted), and the third was due to a haulage motor starter having an exposed live part. The pressure was 450 volts D.C.

### Durham District

Mr. A. D. Nicholson reports an increase of four electrically-driven coal-cutting machines, and seven driven by compressed air. The total number of machines in use at the end of the year was: compressed air, 90; electric, 59. Of the latter 23 were disc type, 20 bar, 14 chain, and 2 percussive. The report continues: "A start has been made in the district to use machines driven by low pressure electricity of 220 volts, and the method adopted is now working very well at Messrs. Bolckow, Vaughan & Co.'s collieries. I trust that in time the use of higher pressures for coal-cutting machines will give place to low pressure, as the risk from shock is thereby reduced to a minimum."

There were 3,573 electric safety lamps in use, compared with 2,075 in 1911. Of these 3,543 were Sussman-Gray, 15 Oldham, and 15 various. The total number of safety lamps in use was 67,351, compared with 64,146 in 1911. Of these 30,745 were magnetically locked, while 37,826 were lighted by electricity, compared with 34,731 in the preceding year.

The aggregate horse-power in motors installed on the surface was: winding, 2,149; ventilation, 6,224; haulage, 3,748; coal-washing or screening, 6,080; miscellaneous, 9,409; for underground working the figures are: haulage, 15,918; pumping, 17,988; portable machinery, 1,550; miscellaneous, 700. Thus the totals are 27,610 and 36,156 respectively.

One fatal accident occurred underground on a 250 volt A.C. lighting circuit. Part of the wire was bare, but it was over 6 ft. from the floor. There was one fatal accident on the surface, also on a 250 volt circuit, and this accident "would not have happened if ordinary precautions had been observed by the deceased."

### Manchester and Ireland District

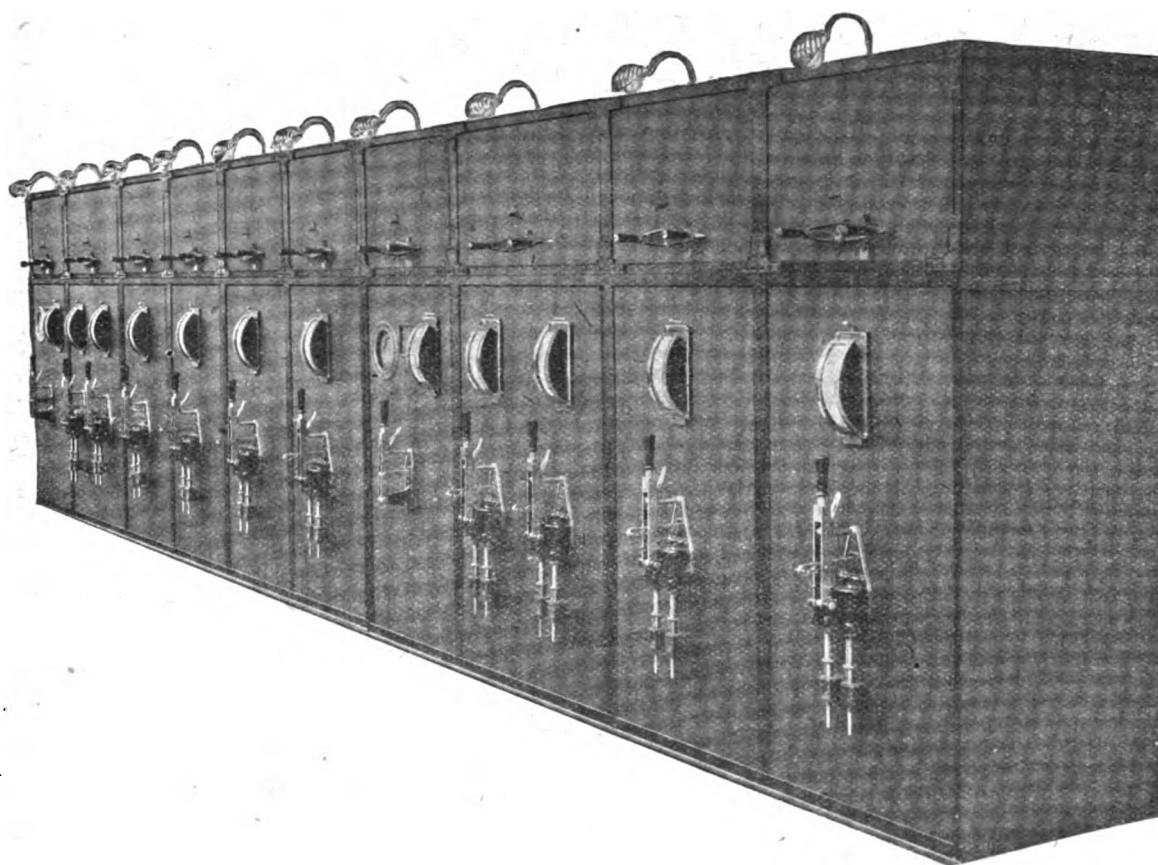
Mr. J. Gerrard's report shows an increase of two electrically-driven coal-cutting machines, and 19 driven by compressed air. The total number of machines in use at the end of the year was 150 compressed air and nine electric. Of the latter six were of the bar-pick-quick type, and two of Hopkinson chain type.

There were 373 electric safety lamps in use, compared with 103 the previous year. The total number of safety lamps in use was 46,945, compared with 46,221. Of this number 5,411 were magnetically locked, compared with 5,167 in 1911, and 9,247 were ignited by electricity, as compared with 9,133.



# SIEMENS

## MINING SWITCHGEAR



**HIGH-TENSION DISTRIBUTION BOARD**  
 SUPPLIED TO AN INDIAN COLLIERY.  
 SUPPLY:—3-PHASE, 2,200 VOLTS, 50 FREQUENCY.

### SIEMENS BROTHERS DYNAMO WORKS LIMITED.

**Head Office:**  
 CAXTON HOUSE, WESTMINSTER, S.W.  
 Telephone: GERRARD 860.  
 Telegrams: "SIEMBRALOS VIC LONDON."

**Supplies Dept. & Stores:**  
 38 & 39, UPPER THAMES STREET, E.C.  
 Telephone: CITY 5350.  
 Telegrams: "SIEMOTOR CENT LONDON."

**"Tantalum" Lamps & Fittings:**  
 TYSSEN STREET, DALSTON, N.E.  
 Telephones: CENTRAL 8387/9 & DALSTON 2440.  
 Telegrams: "SIEMODYN KINLAND LONDON."

**Works: STAFFORD.**

#### BRANCHES:

AUCKLAND (N.Z.)	CALCUTTA	DURBAN	MANCHESTER	OSAKA	SHANGHAI	TOKYO
BIRMINGHAM	CAPE TOWN	GLASGOW	MELBOURNE	PEKIN	SHEFFIELD	TORONTO
BOMBAY	CARDIFF	HONG KONG	MEXICO	PENANG	SINGAPORE	VALPARAISO
BRISTOL	DELHI	JOHANNESBURG	MONTREAL	RANGOON	SOUTHAMPTON	WELLINGTON (N.Z.)
BUENOS AYRES	DUNEDIN (N.Z.)	MADRAS	NEWCASTLE	RIO DE JANEIRO	SYDNEY	WINNIPEG

*When corresponding with Advertisers, please mention "Electrical Engineering."*

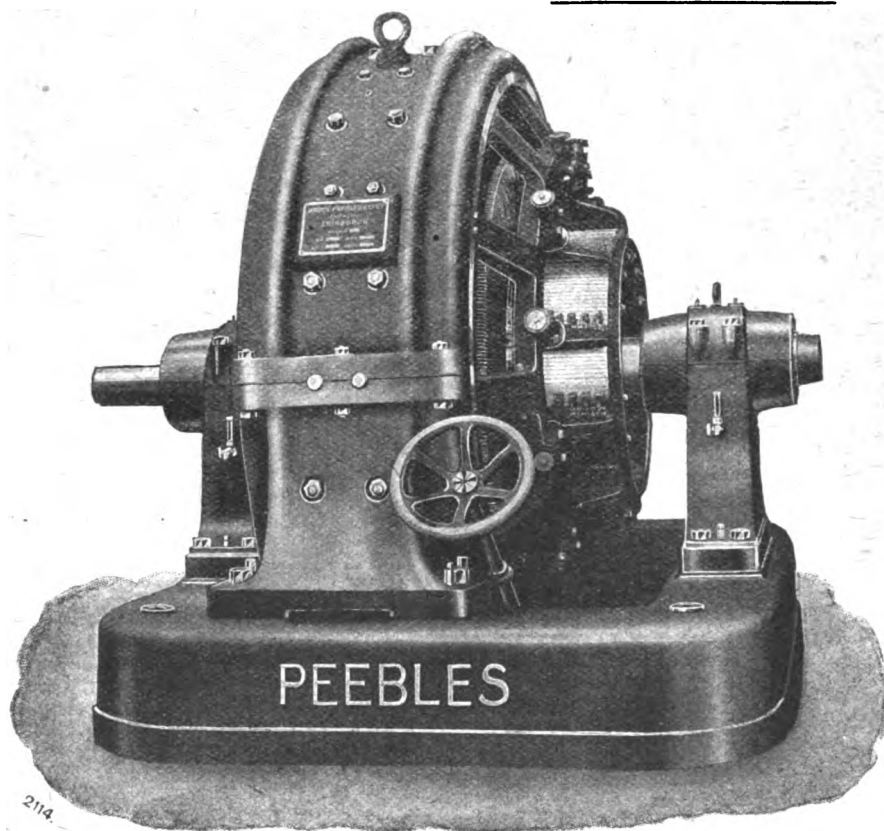
**PEEBLES**

**DYNAMOS**

(OPEN TYPE)

Listed in Sizes  
from 20 to 1400 k.w.

Sound Electrical and  
Mechanical Design.



— 500 k.w. Peebles Open Type Dynamo for Japan. —

**BRUCE PEEBLES & CO. LTD.**  
**ENGINEERS** **EDINBURGH**

Send for Detailed Catalogue—  
Pamphlet No. 18 B.

*When corresponding with Advertisers, please mention "Electrical Engineering."*

The aggregate horse-power in motors installed on the surface was: winding, 110; ventilation, 830; haulage, 246; coal-washing or screening, 1,167; miscellaneous, 2,052½; for underground working the figures are: haulage, 2,666; pumping, 3,097½; portable machinery, 234; miscellaneous, 437. Thus the totals are 4,405½ and 6,434½ respectively.

No accidents due to electricity are reported.

#### Liverpool and North Wales District

Mr. J. R. R. Wilson reports an increase of seven electrically-driven coal-cutting machines, and three driven by compressed air. The total number of machines in use was: compressed air, 124; electric, 24. Of the latter 12 were bar type, seven disc, four chain, and one percussive.

There were 204 electric safety lamps in use, compared with 188 in 1911. Of these 167 were Sussman, 18 Oldham, eight C.E.A.G., while the remainder were of various other makes. The total number of safety lamps in use was 66,817, as against 65,472. Of these 21,325 were ignited by electricity, and 10,258 were magnetically locked. In 1911 the numbers were 21,074 and 10,579.

The aggregate horse-power in motors installed on the surface was: winding, 25; ventilation, 1,111½; haulage, 255; coal-washing or screening, 1,304; miscellaneous, 1,309; for underground working the figures are: haulage, 5,686; pumping, 4,132; portable machinery, 409; miscellaneous, 820½. Thus the totals are 4,04½ and 11,048 respectively.

No accidents in coal mines due to electricity are reported.

#### South Wales District

Dr. W. N. Atkinson reports that the number of electrically-driven coal-cutting machines has increased by seven since 1911, while the number of compressed air machines has decreased by six. The total number of machines in use was: compressed air, 64; electric, 50. Of the latter 37 were of the bar type, seven disc, four chain, and two percussive.

There were 71 electric safety lamps (20 were of the Float type) in use, compared with six the previous year. The total number of safety lamps in use was 183,985, compared with 177,517. Of this number 104,685 were ignited by electricity, compared with 105,336, and 88,443 were magnetically locked, compared with 81,690.

The aggregate horse-power in motors installed on the surface was: winding, 16,129½; ventilation, 11,299½; haulage, 11,696; coal-washing or screening, 7,075½; miscellaneous, 24,711½; for underground working the figures are: haulage, 32,733½; pumping, 45,638½; portable machinery, 926; miscellaneous, 1,183½. Thus the totals are 70,911½ and 78,481½ respectively.

Ten non-fatal accidents due to electricity were reported, as well as one fatal accident on the surface. The earthing of the cable in the latter case was defective. An explosion of fire-damp was also caused by the sparking of a signalling bell. Dr. Atkinson states: "No great force was developed by the explosion, but indications of flame could be traced for a distance of about 70 yards along the level; 20 yards in-by, and 50 yards out-by from the electric bell. The level was rather damp, and was practically free from coal-dust. The electric bell of trembler type was worked by an induction coil, and a battery of eight Leclanche cells placed near the bell. The battery produced current at 11½ volts pressure when tested after the accident. It was afterwards proved experimentally, that sparks from this bell when rung by a current at 11½ volts would ignite an explosive mixture of lighting gas and air; and the mixture was also fired by sparks from signalling wires produced by a current of only four volts pressure. I believe this explosion at Bedwas Colliery to be the first recorded case of a colliery explosion caused by sparks from signalling apparatus, and it is curious that another (non-fatal) explosion due to the same cause, occurred at another colliery later in the year. It has become the practice recently to carry the electric signals nearer to the working faces than was formerly done, this increasing the probability of fire-damp coming in contact with the bells or wires. The new electrical special rule, No. 15, requiring extra precautions where gas is likely to occur, partly meets the danger, and should be strictly observed in fiery mines."

Some mystery also surrounds an explosion in a shaft at Mark ham Colliery, though it is thought that it was probably due to the cable for connecting a lighting battery with a lamp cluster being fitted with a simple three-pin plug and socket. Two accidents due to the premature explosion of electric blasting fuses were also reported.

### THE CRYSTALLISING PROPERTIES OF ELECTRO-DEPOSITED IRON

A PAPER with this title was read at the Brussels meeting of the Iron and Steel Institute on Tuesday, by Dr. J. E. Stead and Dr. H. C. H. Carpenter. As the result of extensive tests, the authors find that electro-deposited iron sheet of a high degree of purity—over 99.95 per cent. of pure iron—exhibit remarkable recrystallisation effects when heated rapidly to a certain temperature and then rapidly cooled. The coarse crystals so produced are sometimes "equi-axed" and some-

**FOR  
BRITISH  
MANUFACTURED  
PAPER  
INSULATED  
CABLES  
THE  
UNION  
CABLE  
CO., LD  
DAGENHAM DOCK,  
ESSEX.**

times "radial." Frequently both types occur on the same specimen. There is no reason for thinking that they are constitutionally different, and they are most probably  $\alpha$ -iron. These crystallisation effects are only obtained when the thickness of the iron sheet or strip does not exceed a certain critical figure, which is between 0.011 and 0.012 inch. The most striking results are produced at a thickness of 0.009 to 0.01 inch. These coarse crystals cannot be destroyed except either by cold mechanical work, or by heating and quenching at certain temperatures, and the results give no support to the view that there is any crystallographic difference between  $\beta$  and  $\alpha$  iron. It is interesting to note that the very heat treatment that produces coarse crystals in the electro-deposited irons refines wrought iron and very mild steel that have been rendered coarsely crystalline by "close-annealing" between 700° and 800° C. On the other hand, annealing at 700° to 800° C. has no effect in coarsening the structure of the electro-deposited iron which has been refined by cold mechanical work. The authors' view is that the recrystallisation phenomena of the pure electro-deposited iron can be most satisfactorily explained on the assumption that the iron changes direct from the  $\gamma$  to the  $\alpha$  condition.

**Contravention of Home Office Electrical Mining Regulations.**—On Saturday, August 9th, before the Ashby-de-la-Zouch (Leicestershire) Petty Sessions, 18 summonses for continued neglect of the Home Office special rules for the use of electricity in mines were preferred by the Home Office against the Measham Collieries, Ltd., and also against Mr. T. Watson, who was at the time the mine manager, but who now holds a similar position at Wigan. Of the alleged offences, nine were for failing to earth switch and junction boxes, five were for unscreened fuses, two for cables from which the insulation had been torn off, and two for not providing buffers to prevent abrasion of the insulation. Mr. Watson contended that he was not liable, as he had been hampered by not being allowed to order what was necessary to remedy the defects, which he had brought to the notice of the director, Mr. R. D. Waddell, who in turn denied that there was any restriction on Mr. Watson's expenditure except as to new plant. He had told Mr. Watson to get the equipment in order. The Bench decided to acquit Mr. Watson, but convicted the Colliery Company on all the summonses. They imposed a fine of £105 and £19 4s. costs.

## ELECTRIC MINING AND METALLURGICAL PATENTS OF AUGUST

THE following patent specifications, published during August, are of particular interest to mining electrical engineers. No. 14,385, of 1912, by J. L. Hudson (Newcastle-on-Tyne), describes a locking device for miners' electric safety lamps, in which the upper end of a bolt engages a socket in a cap screwed to the upper end of the casing, and traverses a tube inside the casing. The bolt is in contact with a guard in a lower cover, screwed on to a gallery below the casing, and pressed upward by a spring on to the bolt. On the withdrawal of the guard by a magnet, the bolt falls by gravity out of the socket in the cap. Thus the cap and lower cover are unlocked from the casing. No. 14,547 of 1912, by A. Paxton (Cardiff), deals with the electric lighting of oil safety lamps, and covers a construction of lighting generator in an independent flame- and gas-proof case, combined with a switch and key. The actual ignition device is contained in the safety lamp, and there is a locking arrangement which prevents the switch from being closed, unless the lamp is properly connected up to the generator.

A method of signalling between a mine cage or skip and the mouth of the shaft is described in specification No. 4,256 of 1913, by G. A. Loudon (London). The haulage cable has formed with it, or serves as, the conducting line, and, connected with it on the winding drum, is the signalling bell. In specification No. 16,441 of 1912, G. Kahler and F. Junker (Germany) describe how the spread of fires and explosions may be stopped by the automatic action of water-sprinklers on the products of combustion after a blasting charge is fired. The sprinklers are put into operation through an electro-magnet in the firing circuit, and also by an independent mechanism worked by the wave of air preceding the gases. In specification No. 20,560 of 1912, by W. E. Lake, as communicated by the Fabrik Elektrischer Zunder, of Germany, an improved machine for preparing the conducting wires of blasting fuses, in which the wires are drawn off reels

and are wound by an arm several times consecutively round two or more pins, is claimed.

The specifications of special interest to electro-metallurgists include No. 25,974 of 1912, by P. L. T. Héroult (U.S.A.), in which a process for making high grade pig iron from phosphorus ores is described. The liquid iron is treated in an electric furnace, at a low temperature in a non-oxidising atmosphere, with a basic slag containing much limestone and a little iron oxide, so that the slag combines with the phosphorus without altering the carbon content. To eliminate sulphur, the first slag may be removed, and a highly basic slag free from iron oxide introduced.

In specification No. 4,595 of 1913 a magnetic separator is described by the Friedr. Krupp Aktiengesellschaft Grusonwerk. The magnet poles rotate within a stationary ring-shaped armature, while the material to be treated is conveyed through channels rotating with the magnet poles.

**Colliery Fatality.**—On the night of August 15th two men, named E. Clarke and E. Spaulton, lost their lives at the Moor Green Pit, belonging to Barber, Walker & Co., of Nottingham, owing to an accident to a coal-cutter which they were driving. It appears that it could not be properly run up to full speed, and the deceased sent a third man to find the electrician in charge, who, on his arrival, found that both men had in the interval been killed by shock, while one had also come in contact with the cutter wheel. The inquest was opened on August 18th, but was adjourned for the Home Office to be represented. The Notts Miners' Association desired that a thorough examination of the scene of the accident should be made by two competent workmen. At the adjourned inquest Mr. L. G. F. Routledge (chief electrician to the colliery company), said that on the day following the accident, on opening the box containing the motor, he found a broken stator barrel contact in the controller, and a burned out earth connection on the pummel. To these he attributed the accident and the death of the two men. Inspections were made weekly, but were not reported unless a defect was found. Mr. R. Nelson (Electrical Inspector of Mines) attached no blame to anybody, but he thought a report should be made when machines were found to be in order as well as when they were found to be defective.

# BABCOCK & WILCOX, Ltd.

## ELECTRIC CRANE DEPARTMENT:

GOLIATH CRANES, TRANSPORTERS, PORTAL CRANES, JIB TRAVELLING CRANES, WINCHES & CAPSTANS, COAL HANDLING CRANES, FOUNDRY CRANES, LADLE CRANES, SCRAP MAGNET CRANES, PIG BED CRANES, SECTION HANDLING CRANES, BOX HANDLING CRANES, OPEN HEARTH CHARGERS, VERTICAL INGOT CHARGERS, HORIZONTAL INGOT CHARGERS, &c.

**Head Office: ORIEL HOUSE, FARRINGDON STREET, LONDON, E.C.**

Telegrams—"Babcock, London."

Works: RENFREW, SCOTLAND.

Telephone No. 5540 Holborn (8 lines).

## "ALDRA" Fire-Proof Insulated Aluminium Wire

For the manufacture of coils for **continuous and alternating current** of any voltage. Our aluminium wires with inorganic insulation are distinguished by their **fireproof quality**, so that a coil can be subjected to temperatures up to 500° C. without damage.

The insulation **resists chemical action**.

The insulation has a **high dielectric strength**, so that there can be a maximum pressure of about 500 volts between two adjacent wires.

**Excellent space-factor** almost equal to that of bare wire.

**Large saving in weight and price** compared with copper coils.

GESELLSCHAFT für ELEKTROTECHNISCHE INDUSTRIE M.B.H. 88 BELLE-ALLIANCE STRASSE, BERLIN S.W., GERMANY.

*When corresponding with Advertisers, please mention "Electrical Engineering."*



## THE MAZDA "HALF-WATT" LAMP

AS mentioned in our last issue, the British Thomson-Houston Co., Ltd., exhibited specimens of their new half-watt lamp to representatives of the Press last week. In making the announcement, Mr. F. W. Willcox said:—

GENTLEMEN: On behalf of the British Thomson-Houston Company I have the pleasure of welcoming you to-day and presenting you with some information regarding an important and far-reaching development in electric lighting—the new Mazda half-watt lamp. It is the privilege of the British Thomson-Houston Company, through their associates in America—the General Electric Company of New York, to be closely identified with this important development, and this meeting has been arranged in order that we may rightfully place the credit for this invention where it belongs, and establish the position of the Mazda lamp and the British Thomson-Houston Company with reference to it.

I may be pardoned for reminding you that it was just two years ago this time that we had the privilege of meeting you and other Press representatives at Rugby on the occasion of a previous important lighting development. This you will remember was the drawn-wire tungsten filament, first developed with and supplied in the Mazda lamp. The developments since that time have fully justified the claims then made for the drawn-wire filament, which has greatly improved the strength and durability, and promoted a much wider application and use of the tungsten filament lamp.

Marked progress has been made in the advancement of the quality of the drawn-wire Mazda lamp. As now manufactured, the drawn-wire lamp is much more rugged in construction, and, with greatly improved efficiencies, yet gives actually longer service than the lamps at lower efficiencies formerly made. As a result of the improvements in efficiencies, the user has been continually receiving lamps that produce more light for the same power consumption and cost. It is not too much to say that Mazda lamps have advanced more in efficiency in five years than carbon filament lamps have advanced in twenty years. These improvements have been made only as a result of improved methods of manufacture, and have not been made at the expense of the life of the lamps, which has not suffered by such changes. The drawn-wire filament has also permitted lamps to be made with much greater accuracy as regards voltage, candle-power, and current rating.

The British Thomson-Houston Company and their associates in America are in the fortunate position of having the most extensive lamp manufacturing facilities in the world, supported by a tremendous volume of lamp business, and backed by a fund of experience and technical knowledge that is unequalled. Both on this and on the other side of the Atlantic there are at present some 15 lamp factories at work producing more than a million Mazda lamps a week. As is well known, all the Mazda lamps for the British market are British made at our lamp works at Rugby.

An organisation of such magnitude, as this can afford, and the policy has been, to expend regularly large sums of money in scientific research and investigation, and in the purchase of new equipment and plant for the production of the latest improved lamps. This policy of scientific research and lamp development work has been steadily, constantly, and persistently pursued for a period of years, and the development we show you to-day is the latest result of this far-seeing policy. It is no haphazard result or sudden discovery, but is the product of some years of persistent research and development.

This research and development work is carried on in a number of electrical laboratories owned by the associates of the British Thomson-Houston Company. In these laboratories a staff of more than 50 research experts, and as many more technically trained assistants, are constantly working to make Mazda lamps better and cheaper. The principal laboratory is located at Schenectady, New York, and it was at this laboratory, under the direction of Dr. W. R. Whitney, that the new half-watt Mazda lamp has been developed. Although announcements of the half-watt lamps have already appeared from the Continent, and in this country, we have made this an occasion for the purpose of recording the fact that the invention of this lamp is the result of a most carefully planned series of investigations, carried out during the past two years by the research laboratory of the British Thomson-Houston Company's associates in America—the General Electric Company of New York.

The lamps we are to show you to-day have been manufactured at our lamp works at Rugby, under the patent rights which the British Thomson-Houston Company is entitled to from their American associates. Although these lamps evidence the fact that the invention is past the experimental stage, it will require some time yet before they can be placed in regular production for the British market.

The first lamps to be supplied will be of high candle-power sizes, running from about 300 to as high as 1,500 candle-power or more. The efficiency of the lamps to be shown you to-day will average about half a watt per candle on the British standard

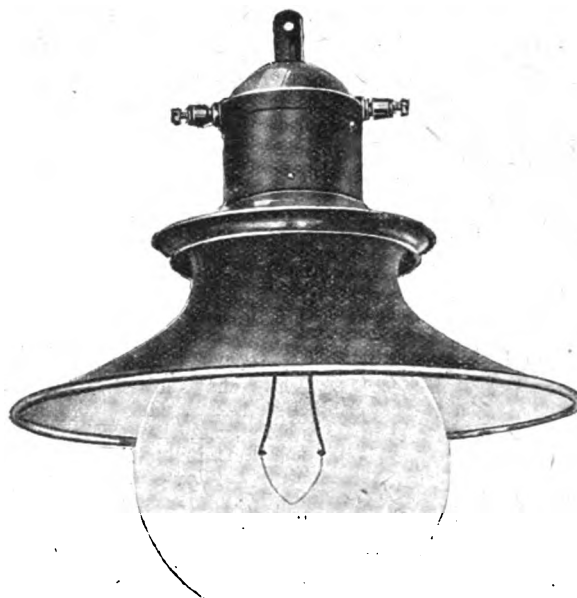
candle-power basis, and the useful light at this efficiency will run as high as 1,000 hours.

The lamp is substantially the same in general construction as the ordinary incandescent lamp, the chief points of difference being the form of the filament (which is drawn-wire tungsten), and the employment of a gas-filled bulb.

Four lamps were exhibited, with the following amperage (at 80 volts), candle-powers, and efficiencies:—

No.	Amperes (at 80 volts)	British Standard Candle Power.	Watts per British Standard Candle Power.
1	9.2	1,400	0.52
2	9.15	1,375	0.53
3	9.1	1,260	0.535
4	10.0	1,600	0.50

One of these lamps is illustrated below. The shape of the filament differs from that of the present



1,600 c.p. MAZDA LAMP.

(10 amperes at 80 volts = 0.5 watts per candle.)

metal filament lamps, being a closely-wound helix, the close turns of which, however, are not perceptible on the photograph or when the lamp is lighted. The bulb is stated to be filled with an inert gas, such as nitrogen, and we are informed that it is the action of this gas which enables the enormous efficiency of illumination to be obtained. Reasons connected with the filing of patents render it undesirable to enter into further details at present, but we hope on some future date to be able to present our readers with more particulars.

Another interesting exhibit was one of the earliest experimental half-watt lamps made at the laboratory of the General Electric Co., Schenectady, New York. This was a 25-volt lamp, taking 20 amperes, and giving 1,200 c.p. at 0.4 watts per candle.

**A New Publication.**—A book by Mr. W. Perren Maycock, entitled "Electric Circuit Theory and Calculations," will be published at the end of the month by Whittaker & Co. The properties of the electric current are dealt with, and machinery, distribution, and illumination problems are touched on. A section is devoted to the principles of arithmetic. The book is especially intended for contractors, wiremen, and students.

**American Water-Powers.**—The Canadian Conservation Commission has condemned the projected scheme to dam the St. Lawrence River, at Long Sault Rapids, in a recent report. According to *The Times* a charter had been obtained from the New York State, but not from the Canadian Government. The damming of the river would be contrary to the Ashburton Treaty of 1845, says the report, as this provides that the channels shall be free and open to Great Britain and the United States and no constructions which might interfere with navigation can be erected without the consent of Great Britain.

### A NEW PIPE CLIP

**I**N first class surface wiring work it is frequently necessary (especially in hospitals and similar institutions) to carry the pipe containing the wires a short distance from the wall. Among the latest clips for this purpose which has been brought to our notice, is one manufactured by Smith & Davis (Beacon Works, Hampton Street, Birmingham), which we illustrate. As will be seen, it can be fixed to be used for either horizontal or vertical runs, and also for ceiling work. The bolt and nut fastening enables it to adjust itself automatically and to allow for slight variations in the thickness of the pipe. The clip is made of heavy gauge sheet-metal and its price is moderate.



### THE "KARTRET" INDICATING FUSE

**W**E recently had an opportunity of inspecting an ingenious indicating fuse made by the Kartret Engineering Co. (for which firm Messrs. Nathan & Allen, of Queen Anne's Chambers, Westminster, are selling agents). Both the fuse holder itself and the indicating device are extremely ingenious, and, as they are strong and well-made, they should be extremely popular. Fig. 1 shows a plain "Kartret" fuse holder, without indicating device, and the construction of the terminals (in which no screwing down of the fuse wire is required) is also seen in Fig. 2. The fuse-wire is simply threaded through the holder and the shutters at the end—shown, both open in Fig. 1, and one closed and one open in Fig. 2—bend the wire down over the

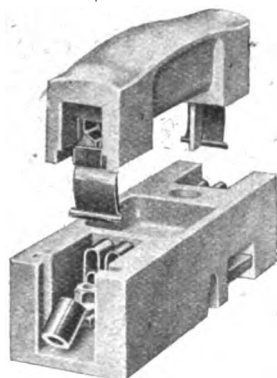
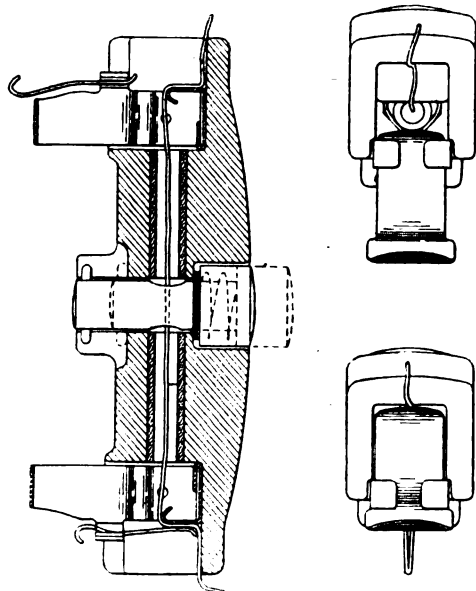


FIG. 1.—"KARTRET" FUSE HOLDER WITHOUT INDICATING DEVICE.

terminal blocks and hold it securely. The shutters are slightly curved, so that, when pressed down through the clips which hold them, they are very secure, and neither ordinary vibration nor A.-C. currents will work them loose. Both



SECTION OF INDICATING FUSE HOLDER,  $\frac{1}{2}$  SCALE. END ELEVATION, SHOWING SHUTTER OPEN AND CLOSED.

Fig. 2.

the shutters and the clips are of phosphor-bronze, so that they are elastic and retain their shape.

In the indicating fuse-holder shown in Fig. 2, a loose plunger of insulating material passes through a hole in the

centre of the porcelain bridge, and, when no fuse is in, it is pressed above the level of the top of the porcelain by a weak helical spring. To insert the fuse, the plunger is pressed down and the fuse threaded through a hole in it, and the two ends of the fuse wire are gripped by closing the shutter fastenings as in the ordinary fuse. The fuse wire then holds down the plunger, which rises, however, to the position shown in the dotted lines as soon as the fuse blows. An incidental advantage is that the fuse that has blown can be found in the dark by passing the hand over the row of fuse-holders and feeling for the projecting button.

### A NEW DESIGN OF SUCTION CLEANER

**A** CONVENIENTLY arranged suction cleaner for ordinary household work has been introduced by Simplex Conduits, Ltd. (116 Charing Cross Road, W.C.) at the low price of £6 10s. The machine, which is of the broom-handle type, is only 8 lbs. in weight, and is provided with a "pistol grip" handle and control switch. The overall height is very small, enabling the apparatus to be used in intricate corners, &c.

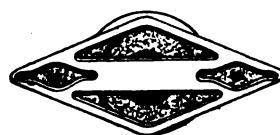


FIG. 1.

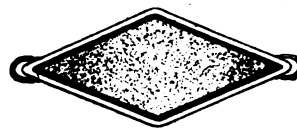


FIG. 2.

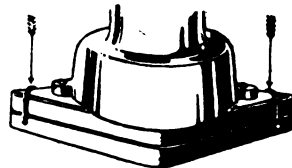


FIG. 3.

DESIGN OF NOZZLES.

The suction is produced by a quiet motor-driven high-speed fan. A new design of nozzle giving a large actual working area, is provided; this is shown in Fig. 1. It is lozenge-shaped so as to penetrate into difficult positions, and is said to give a minimum of wear and tear on the carpets. For cleaning hard wood, linoleum, &c., the nozzle shown in Fig. 2 is used. It is seen that the slot through which the dirt is drawn always precedes the felt pad necessary to give the suction effect. The dust bag is easily removed, and replaced on the handle by a simple spring clip, while the various nozzles are easily detachable, as shown in Fig. 3. Besides this machine, known as the "Diamond," a more powerful machine, called the "Diamond Special," using  $\frac{1}{2}$  h.p. and intended for larger establishments, has been designed. The motor runs at nearly 8,000 r.p.m. Demonstrations are given at the Simplex Company's branches, and neat overprinted booklets can be had on application by contractors and other retail houses.

**Industrial Lighting.**—This is the title of a new illustrated book of 22 pages, dealing with the important question of efficient mill and factory lighting, which is published by the British Thomson-Houston Co., Ltd. (Mazda House, 77 Upper Thames Street, E.C.). The book should prove of great benefit to owners and managers, as the subject is presented clearly and logically. It is first shown why good lighting is necessary, then, the results which accrue from improved lighting, and thirdly, how good lighting may be obtained. The book contains a number of illustrations of mills and factories which have been lighted in an up-to-date and scientific manner by the British Thomson-Houston Company. One important advantage of improved lighting is indicated in the statement that "experts give 1 per cent. as the average gross spoilage in our total manufactures, an item, in the year 1907, of approximately £12,560,000. Of this large amount of spoilage 75 per cent. is estimated to have occurred under artificial light, and expert opinion indicates that 25 per cent., or £2,355,000 of this, could have been avoided by good illumination." Two charts, which tell graphically the story of the loss which results from inadequate light are given. In one is shown the average ratio between darkness, cloudiness, and sunlight. In the other is set forth the "curve" of fatal industrial accidents in three successive years, as reported from 80,000 industrial plants. These charts show that fatal accidents increase during the dark periods of the year, and decrease as the days get longer. It will be appreciated from this that good illumination is an important factor in the prevention of accidents. As most of our readers are aware, the Company has organised an illuminating engineering department, equipped with modern facilities and appliances for the design and testing of lighting apparatus and the preparation of installation schemes.

# QUESTIONS AND ANSWERS BY PRACTICAL MEN

## RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

## QUESTION No. 1,354.

WHAT are the advantages gained by the adoption of electrical over steam driving for sheet rolling mills, and are there also any disadvantages? If possible, state the saving derived per ton of sheets rolled by electrical driving compared with steam driving.—"MORGAN MORGAN."

(Replies must be received not later than first post, Sept. 11th.)

## ANSWERS TO No. 1,352.

I HAVE recently become responsible for laying air space telegraph and telephone cables, and should be glad to have some information on the following points:—(1) Is desiccating apparatus absolutely necessary? (2) Give a design for a really accessible test box having high insulation, for use in railway signal boxes. (3) What is a satisfactory way of securing a lead-covered cable when it has to be carried straight up a wall? (4) Is any harm likely to accrue if a 4-in. sag is allowed in an armoured cable supported on hooks 6 ft. apart? (5) What is a satisfactory form of lightning protector?—"POTHEAD."

The first prize (10s.) has been awarded to "E. M. F." for the following reply:—

(1) With very dry climate, faultless cable jointing, and perfectly reliable workmen, one can manage without desiccating apparatus; but as all these stipulations can never be guaranteed in practical work, "Pothead" will do well to provide himself with at least a hand desiccator—or with a petrol-driven one, if the cable system is at all extensive—in order that low insulations may be quickly corrected.

(2) Accessibility and high insulation are two conditions not easily complied with in test-boxes, to be placed in positions where damp air may have access, and it may be found advisable to instal two types of box. Fig. 1 shows a type suitable for large signal boxes, where the conditions are good, and where trouble may not be anticipated from a

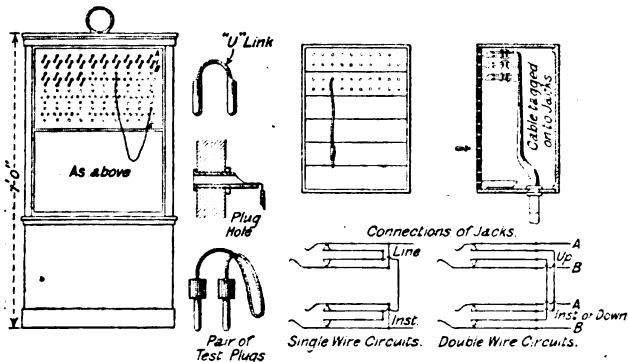


FIG. 1.

FIG. 2.

deposit of moisture on the slate panel. The circuits terminate on metal plug holes, and U links are employed for permanent connections. For temporary cross connections, earthing, testing, &c., a special pair of plugs is used. The

lower half of the box is used for tagging up the "inside" cables. In damp low-lying country a box of the type shown in Fig. 2 will be found necessary for maintaining high insulation. In this case the circuits terminate on jacks supported in an air-tight space behind the front ebonite panel. The connections are obtained by inserting plugs in the jacks through holes in the front panel. The connections are shown for a double wire telephone circuit, and for a single wire telegraph or signalling circuit. It will be seen that, in this type, the circuits are "through" for normal working, with no plugs inserted, and the stopping up of all the plug holes in the panel with dummy plugs allows of the interior being kept very dry. As a safeguard a saucer of chloride of lime should be kept inside the case and renewed when it becomes moist.

(3) For light cables up to about an inch diameter, simple wooden cleats, Fig. 3, secured by long coach screws to wall plugs, will be found to be all that is necessary. For heavier cables, light rag bolts, carrying a wooden bearer and iron clamp, form an excellent fixing. In both cases it should be borne in mind that with air space cable it is not sufficient to support the weight of the lead cover only. The conductors

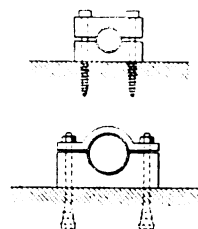


FIG. 3.

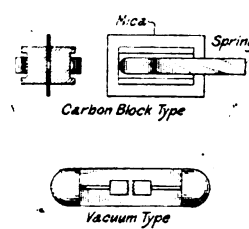


FIG. 4.

must also be well gripped, and for this purpose short lengths of split wrought-iron piping can with advantage be inserted inside the clamp to surround the cable.

(4) No harm is likely to accrue with this sag, if the supporting hooks are fitted with broad bearers, having a curved upper surface and rounded edges. Sharp edges at the supports should be avoided.

(5) The best form of lightning-protector is the vacuum serrated type, in which two blocks of carbon, having opposing furrowed surfaces, are carried inside a glass tube containing a vacuum, and fitted with metallic end plates for making connection to the circuit on a protector frame. A cheaper form, and one which is reasonably satisfactory, consists of two carbon blocks laid together with a thin sheet of mica between, the mica being punched with one or more small holes. One block is earthed, and the other joined to the line by insertion of the pair into a spring clip carried in the frame. This type is illustrated in Fig. 4.

With regard to (1), it may be mentioned that, in the early days, many dry-core cables were laid and used before drying-out by pumping dry air through the cable became the usual practice. Every precaution was taken by the jointers to keep the paper dry during jointing, and the joints were heated in dry unslaked lime before the lead sleeve was drawn over and soldered. Of course, the lead joint had to be perfect, and the endboxes or pot-heads had also to be moisture-tight. For short lengths of dry-core cable, desiccating apparatus is not essential. "E. M. F.'s" test-boxes described in (2) might with advantage be supplemented in damp places by pot-heads at the end of the dry-core cables, from which rubber tails would be brought to the test-box. With regard to (5), it may be added that several good lightning-protectors are on the market, and that it would be unnecessary to use a home-made one.

No reply of sufficient merit has been received to enable us to make a second award.

With regard to the answers to Question No. 1551, published in our last issue, W. R. J. (who was not a competitor) writes us that while he agrees to a certain extent with the views expressed in the two answers selected for awards, he wishes to point out that in Leeds alone there are a number of makers of single-phase motors who would be prepared to guarantee efficiencies comparing quite favourably with D.C. motors. Where

constant speed is not objected to, and means could be taken to ensure starting against light loads, he contends that this type of motor would be at least as, if not more, satisfactory than a D.C. motor. "As regards variation of speed," he continues, "there are now on the market quite a number of lines of motors, with characteristics in every way similar to those of a shunt-wound interpole D.C. motor. I may mention, for instance, the machine built by Messrs. F. Parkinson & Co., Leeds, under Punga-Creedy patents, wherein a speed variation by shunt control of 3 to 1 can be obtained, and that with an efficiency of a fairly high value. As regards the power factor, this, as a rule, only interests the supply company, and it is not worth the consumer's while to go to great expense to avoid low power factor." His particular objection to the use of a motor-generator for the case in question, is its losses at light load. W. R. J. writes well, and we hope that he will now enter the lists frequently on our Questions and Answers page, but not, as in this instance, merely as a correspondent *ex post facto*.

## THE MISSISSIPPI HYDRO-ELECTRIC SCHEME

### 2. High Pressure Switchgear, Transmission Lines, and Sub-stations at St. Louis

WE now supplement the general description of the large generating station at Keokuk, on the Mississippi, which appeared in *ELECTRICAL ENGINEERING* for August 14th on p. 467, by some particulars of the transmission system and the large sub-station at the end of the line at St. Louis.

The main transmission line extends to St. Louis, a distance of about 144 miles, while the towns of Hannibal, Quincy, Fort Madison, and Burlington are on the route. The line consists of heavy twin circuits carried in parallel vertical planes on a single set of steel towers. The conductors are of copper, 300,000 circular mils section. Each cable consists of 19 strands of hard-drawn copper, giving an overall diameter of 0.625 in. The spans are about 800 ft., so that it is calculated that there is ample margin in strength, as the ultimate strength is 14,000 lbs., while with a half-inch ice coating in a 60-mile gale at 0° F. the loading would be about 7,000 lbs. The corona point is 148,000 volts. The steel towers used on the straight sections are 79 ft. high with a 20-ft. square base. They weigh 3½ tons, and each leg is bolted to a reinforced concrete foundation weighing 2 tons extending 6 ft. down. Every tenth tower, as well as those at railway and river crossings, &c., is an anchor tower. These are 4 ft. high, with bases 24 ft. square, and weigh 5 tons. They are set on four concrete foundation legs, extending 8 ft. down, and each leg weighs 7½ tons. They are designed for a dead-end side pull of 50,000 lbs. In addition to the six main conductors, which are arranged in two vertical planes and are suspended from 7-part insulators tested up to 440,000 volts dry and 330,000 volts wet, an earth wire of 0.5 in. galvanised Siemens-Martin steel is carried on the peaks of the structures. To prevent the crushing of the separate strands of the copper lines, a special open-hearth steel clamp with a waved groove was devised. At anchor towers all the conductors are dead-ended through eight disc strings of insulators. The span across the Mississippi where the line leaves the power-house is 2,800 ft. in length and is supported by special strain towers 135 ft. high. The conductor here consists of a 0.625 in. core of special high-tension steel, with an outer stranding of 20 copper wires, making a total diameter of 0.875 in. The conductors are mounted on a horizontal plane at 20-ft. distances, and each conductor is held by a bank of six parallel strings of insulators through a system of load equalising levers. The ultimate strength of the conductors is 52,000 lbs., and of the insulator groups 60,000 lbs., though it is not anticipated that even under the worst conditions the actual stress will exceed 24,000 lbs. Above each conductor is an earth wire of ½-in. steel, which supports the telephone lines on bracket hangers and also serves as a runway for the inspection cars.

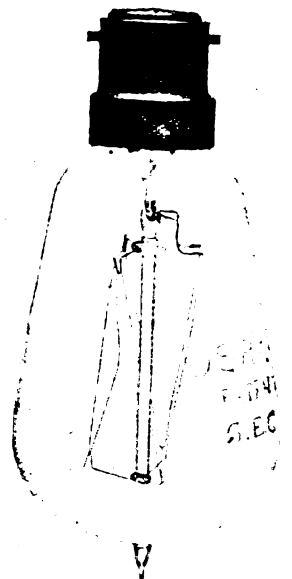
Substations are situated at various places, but the largest is of 60,000-kw. capacity at St. Louis, at the end of the line in a southern direction. The building is of brick and is fire-proof throughout. It is of T plan, 219 ft. long, 63 ft. high, and 150 ft. wide at its widest section. All the high-pressure equipment is installed in the stem of the T, while the apparatus used by the Union Electric Light and Power Company and the United Railways Company of St. Louis is situated in the transept. Since the supply has to be given from separate bus-bars, the sub-station is divided into four separate units, each consisting of three 5,000-kw. 110,000/13,200-volt transformers, which may be operated separately or together. Thus each company can obtain supply over both transmission lines, either of which,

however, is sufficient to take the maximum load of about 66,000 h.p. The incoming lines are supported on a steel framework on the roof, and are thence led to the insulated roof bushings through motor-operated air-break switches. Horn gap lightning arresters are used. In a gallery inside the building are the four groups of oil-switches operated by selective relays in case of trouble on their respective lines. The bus-bars consist of 1-in. copper tube divided into four sections by three oil switches supported from the roof by suspension insulators similar to those used on the transmission line. On the ground floor are seven groups of three single-pole oil switches—four for the transformers and three for the bus-bars. All the high-pressure oil switches are rated at 300 amperes, enclosed in cast-iron cases. They are closed by solenoids energised from a 110-volt storage battery and they open by gravity. Above each of the seven oil switches on the main floor are steel frames supporting switches for isolating the transformer and bus-bar oil switches from the high-pressure bus-bars. The switch rods slide vertically and engage cone slips in the closed position, in which they can be firmly locked by means of bayonet joints. The transformers are rated at 5,000 kw. 95,000/13,800 volts, and are oil immersed and water cooled. They are situated in four separate compartments, each housing three transformers, on one side of the building. Each transformer is set on a truck, so that it may be readily removed from the building for inspection or repair. Each transformer holds about 5,000 gallons of oil and weighs 52 tons, of which the cores account for nearly 30 tons. The connections are delta-delta. Four sets of aluminium cell lightning arresters, one for each 100,000-volt unit, are installed in the gallery.

The low-pressure oil switches are under the gallery on the main floors. The 13,200-volt leads from the transformers are carried on insulating racks beneath the floor to the low-pressure transformer switches. Four bus-bar switches are connected on the low-pressure side of the transformers, and additional oil switches are connected between the bus-bars and the four distributing panels, each of which has five circuits. Part of the energy will be transformed down, or converted to direct current before it leaves the station. Along part of the building occupied by the railway and lighting companies is a switch gallery, giving an unobstructed view of the high- and low-pressure apparatus. Desk-type switchboards are exclusively used. The railway company is installing air-cooled transformers and two 2,000-kw. rotary converters to reduce the pressure to 600 volts direct current, and the lighting company are about to instal a 5,000-kw. 25/60-cycle frequency changer set, in conjunction with which will be a group of 13,200/4,400-volt 60-cycle transformer, aggregating 9,000 kw.

### AN OSRAM IN THE SEA

THE illustration here given shows a 50-volt Osram metal filament lamp, which was recently found in the surf at Langstone Harbour Shore, Portsmouth, by Mr. G. G. H. Ogburn, who was out fishing at the time. The finder noticed that the filament was intact and took it home to test, when he found that the lamp was quite in burning order. He writes, in a letter to the General Electric Co., Ltd. (67 Queen Victoria Street, E.C.): "The lamp had evidently been dropped or washed overboard from some vessel, and had been blown and knocked about till it reached the shore. At the time I rescued it, it was blowing rather hard and consequently the sea was rough."



**University College of South Wales.**—The next session of the engineering department of the University College of South Wales and Monmouthshire, which is a Constituent College of the University of Wales, will begin on October 7th. The courses in electrical, civil, and mechanical engineering qualify for the engineering degree of the University of Wales and the College diploma. For full particulars application should be made to the Registrar, Mr. D. J. A. Brown, University College, Cardiff.



REALLY  
HIGH-CLASS!  
SPECIFY

# IGRANIC

## SWITCHGEAR

IGRANIC ELECTRIC CO. LTD.  
LONDON

Works:  
BEDFORD

### AN INTERNATIONAL ILLUMINATION COMMISSION

THE International Photometric Commission (sometimes spoken of as the Zurich Commission) was founded in 1900 by representatives of the Gas Industries of America, Austria, Belgium, France, Germany, Great Britain, Holland, Hungary, Italy, and Switzerland. At a session held in Berlin from August 27th to 30th, its scope and powers were amended so that it will now be representative of all institutions and societies associated with the science and practice of illumination. The British delegates in Berlin were Dr. Colman and Mr. Butterfield (Institution of Gas Engineers); Mr. Duddell and Mr. Edgecombe (Institution of Electrical Engineers); Mr. Gaster and Mr. le Maistre (Illuminating Engineering Society), and Mr. C. C. Paterson (National Physical Laboratory).

The Commission is now to be called "The International Illumination Commission." Representation is to be through the medium of National Committees on Illumination in all countries affiliated with the Commission. Each country will have only one vote in all international decisions irrespective of the number of delegates sent, and the contribution from all countries is to be identical in amount. All formal resolutions and documents will be drafted and published in French. Translations may be made into any language by an international committee. English, French, and German are allowed in all discussions. Arrangements were made for appointing committees to consider various technical subjects, so that the real work of the Commission may begin as soon as the new constitution has been approved by the bodies which appointed the delegates.

The officers of the Commission are elected for three years. M. Vautier (Lyons) was elected first President, Herr Weiss (Zürich) becomes Treasurer, and Mr. C. C. Paterson (National Physical Laboratory) was elected Hon. Secretary, so that the Bureau of the new Commission will be located in London.

### CATALOGUES, PAMPHLETS, &c., RECEIVED

**OPAL REFLECTORS.**—A card from Benjamin Electric, Ltd. (117 Victoria Street, S.W.), brings to notice a new design of "Marabella" opal reflectors for use with lamps from 17 to 110 watts capacity. They require no gallery, and are obtainable for concentrating or distributing effects.

**"WIRELESS" DIRECTORY.**—A book entitled "Directory of Amateur Wireless Stations" has been issued by A. W. Gamage, Ltd. (Holborn, E.C.). It contains particulars of amateur experimental wireless stations in Great Britain for both sending and receiving. A copy will be sent to any amateur supplying details of his station.

*Readers desiring copies of catalogues or pamphlets should apply to the firms in question, referring to the notice in "Electrical Engineering."*

**PRAT INDUCED DRAFT SYSTEM.**—A leaflet giving particulars of the induced draft system of ventilation for boiler furnaces as developed by Louis Prat (29 rue de l'Arcade, Paris), has been sent us by Mr. S. Utting (4 St. Mary Axe, London, E.C.), who is the British representative of M. Prat. Besides an inducing fan a peculiarly designed chimney of small dimensions is employed. The system is in considerable use on the Continent.

**The Wiremen's Strike at H.M. Office of Works.**—The wiremen employed by the contractors to H.M. Office of Works are still out on strike, and at the time of our going to press the situation is much the same as reported in our last issue. The total of engineering and other electrical workmen on strike is slightly over 300, and, so far as we can ascertain, no serious inconvenience has been caused.

### TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

The annual report of the Meteorological Committee acknowledges the important part played by wireless telegraphy in modern weather forecasting. In this connection 81 messages were received from British warships, and 5,385 from Atlantic liners.

The inspection of the Australian Government's wireless stations at Melbourne, Hobart, and Brisbane has now been made by the Marconi Company under the recent order of the High Court in connection with the pending patent action.

The Telephone and Telegraphic branch of the Department of Railways and Canals in Canada has issued statistics which show that there are now about 400,000 telephones in the Dominion, compared with 200,000 a year ago. The total number of telephones in use works out at one for every 19 persons in the Dominion. The length of telephone wires in use has increased by 200,000 miles during the year, so that the total length is now nearly a million miles. There are 683 companies making statistical returns, compared with 537 the previous year.

The Salonika-Lemnos cable was put into working order again on August 26th last, and on the following day the Cape St. Jacques-Doson cable became once more active. It is not often that telegraph rates are increased in these go-ahead days, but this actually took place in the case of Republic of Colombia, where the rate to places other than Buenaventura was put up 5d.

### ELECTRIC TRACTION NOTES

Frequency changing sets, as referred to in the article on the power supply of single-phase railways in *ELECTRICAL ENGINEERING* of last week, are discussed in some detail in the *General Electric Review* for August. Mr. J. B. Mahoney, of the Connecticut River Transmission Co., Mass., writes that his company is now installing three 3,000-k.v.a. synchronous motor sets in one of the sub-stations for converting the three-phase 60-cycle current of the supply to single-phase 25-cycle current for railway supply. He strongly favours synchronous sets rather than induction motor sets, on account of the better power-factor and the possibility of reversing the operation. Mr. A. E. Pope, of the Power Construction Co. of Mass., describes the use of two exactly similar sets installed in the station of the Boston & Maine Railroad Co. for the supply of power to the Hoosac Tunnel single-phase line. He prefers synchronous motors to induction motors for such frequency changers on account of their corrective effect on the power-factor, and also in the present instance because of the stability of the large 60-cycle system in maintaining the frequency on the tunnel circuits during high momentary overloads. This railway has up to the present been supplied by its own steam station generating single-phase current, but can apparently purchase current transformed from three-phase to single-phase cheaper than it can generate it.

On Monday the Metropolitan Railway Company formally took over the Great Northern and City (Tube) Railway. The extension from Moorgate Street to Lothbury, which was authorised in 1902, will now probably be expedited. The stations are to be renovated, and the service further accelerated.

The linking-up of the District, Bakerloo, Hampstead, and Highgate railways at Charing Cross is expected to be completed by January next.

An hourly all-night service over certain sections of the Manchester tramway system is to be inaugurated to-night.

A special committee is considering the proposals of Balfour, Beatty & Co. for converting the Stirling tramways to electric traction.

## "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

### Specifications Published August 28th, 1913

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

17,867/12. **Detonating Alarms.** W. A. TUFIAEFF and A. DOMANEWSKY. An automatic detonating alarm is arranged so that the strikers have a working movement of about 90°. They are worked by a spring, but are held in check by an electromagnetic lock. A number of cartridges in a drum are struck successively. Eight figures.

18,210/12. **High Pressure A.C. Switchgear.** F. COATES and A. REYROLLE & Co. A condenser is connected in series with the no-voltage release, and a small spark gap is arranged in parallel with the no-voltage coil. Thus step-down transformers are not required. One figure.

18,893/12. **Increasing Frequency of Alternating Current.** M. PLOHL. By a modification of the arrangements described in specification No. 15,744/12 (ELECTRICAL ENGINEERING, June 12th, p. 346), the current with doubled frequency produced in the secondary induction field is introduced in the primary windings to produce a further increase in frequency. These currents are drawn off through tuned circuits. One figure.

19,214/12. **Aluminium Solder.** C. WILLMOTT. A mixture of tin and bismuth is used in proportions between the limits of 12 to one and four to one. The proportions of six to one are generally best. No flux is required.

24,571/12. **Renewable Metal Filament Lamps.** F. HARRISON and F. L. HARRISON. The leading-in wires are continued through the whole length of the stem. The spider has hooked arms at the cap end and specially designed spring gripping arms at the pip end. If hair-pin filaments are used a broken section can be replaced by opening up the pip end of the lamp bulb and inserting a new filament section. Four figures.

25,386/12. **Self-Starting and Lighting System for Automobiles.** J. B. ENTZ. The cell-charging dynamo has sectioned series and shunt windings connected to a multi-contact switch, so that the regulating effect of the series winding may be controlled, and when starting the engine the field windings assist each other without reversal of the connections. One figure.

27,630/12. **Submarine Mines.** F. BÜNDGEUS. The mine is electrically fired by the influx of sea-water when the mine is struck forming an electrolyte for the firing batteries. One figure.

1,395/13. **Resonance Operated Switchgear.** H. W. HAND-  
COCK, A. H. DYKES, and W. DUDDELL. The switches are electro-magnetically operated, and give a positive pull in both "on" and "off" directions by the control circuits being tuned for two different frequencies. A centrally pivoted armature with a magnet at each end may be used. Two figures.

4,522/13. **Self-starters for Internal-combustion Engines.** C. A. VANDERVELL and A. H. MIDGLEY. A belt is driven by an electric motor, and at the same time is brought into contact with the engine flywheel. One figure.

6,292/12. **Telegraph Order Signalling.** H. O. A. JENSEN. The transmitting station contains a primary circuit—battery, key, induction coil—and a secondary circuit connected to the line. A reversing key is used, so that a signal consists of a + and - impulse. Three figures.

10,210/13. **Arc Lamp Electrode.** J. ROUBAL. The electrode has high emissivity, and is not easily oxidised when burnt in an enclosed, but not air-tight, lamp. The carbon, before or after pressing, is impregnated with a mixture of sodium or potassium aluminium phosphate and graphite containing earthy admixtures. Preferably, also, baked calcium saccharate is added to the core.

14,048/13. **Metal Filament Lamps.** A. E. G. To improve the efficiency of metal filament lamps, a substance capable of giving off oxygen at a low pressure when the lamp is burning is introduced in the bulb before exhaustion. Suitable substances are oxides, peroxides, nitrates, nitrites, chlorates, perchlorates, chromates, bichromates, &c., but manganese superoxide and barium chlorate are found specially suitable. The only reaction product is tungsten trioxide, which is practically colourless, and even when deposited on the bulb cuts off but little light. As it is non-volatile, no increase in pressure takes place in the lamp.

### Specifications Published To-day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free.

Names in italics indicate communicators of inventions from abroad. Summaries of some of the more important of these patents will appear in our next issue.

Cables and Wires, Insulating Materials, &c.: SIEMENS DYNAMO WORKS (*Siemens Schuckert*). [Manufacture of insulated cables or coils] 6,647/13.

Dynamos, Motors and Transformers: BROLT, LTD., BROOKS and HOLT, 18,913/12; A. E. G. [Regulation] 23,372/12.

Electrometallurgy and Electrochemistry: ISLAND [Fixation of nitrogen, 11,363/12; JANSEN [Water sterilizing] 18,207/12.

Heating and Cooking: MARKS (*Landers, Frary and Clarke*) [Heating] 15,958/12; BELLING [Radiator elements] 19,054/12; PIPER and BRIDGWATER [Ovens] 19,064/12; BENNETT [Liquid heating] 28,270/12.

Ignition: LAKE (*J. B. M. Elec. Co.*) [Ignition, starting and lighting systems for automobiles] 18,444/12.

Meters: ELSTER, 4,847/13.

Storage Batteries: RICHARDS [Cases] 223/13; McDougall [Plates] 770/13.

Switchgear, Fuses and Fittings: LAKE (*Le Carbone Co.*) [Connections] 20,357/12; B. T. H. Co. (*A. E. G.*) [Oil switches] 21,867/12; TIRHILL [Regulators] 22,419/12; OTWAY, ORMROD and PURDUE [Shade carrier] 23,520/12; BRITISH WESTINGHOUSE Co. (*American Westinghouse Co.*) [Means for interrupting circuits] 26,809/12; FUSS [Pressure regulators] 28,061/12; TURNER and ROBERTS [Switches] 30,060/12; KRUPP, A. G. [Switches] 3,825/13; DECKER [Motor controllers] 8,878/13.

Telephony and Telegraphy: SHEPARD and McKECHNIE [Alarms for wireless] 11,479/12; SIBLEY [Wireless] 18,422/12; WILLIAMS [Duplex and multiplex wireless] 28,042/12; SCHON [Transmitters for wireless] 5,040/13; MAJORANA [Telephone relay] 10,154/13.

Traction: PERRY [Automatic railway signalling] 4,190/13; PERHSSON [Driving dynamos on vehicles] 16,979/13.

Miscellaneous: B. T. H. Co. (*G.E. Co., U.S.A.*) [Vapour electric devices] 18,371/12; LANGE [Secondary clock alarm] 18,479/12; PARKER [Pendulum and switch for clocks] 21,115/12; SMITS [Restoring equilibrium of inclined bodies] 21,832/12; HARTMANN & BRAUN A.G. [Gyroscope compasses] 6,570/13.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

Distributing Systems, &c.: KETTERING [Control] 7,544/13.

Heating: SIEMENS-SCHUCKERT [Flat irons] 17,665/13.

Instruments and Meters: ROGOWSKI [Measuring magnetic potential between two points] 18,103/13.

Miscellaneous: SCHÜMANN [Alarm for locks] 15,259/13; STANLEY [Insulated receptacles] 17,832/13.

### Expiring and Expired Patents

The following Patent expired this week, after a life of fourteen years:—

17,786 of September 2nd, 1899. **Telegraph Repeater.** S. G. BROWN. A Morse repeater for submarine cables is described. A sliding rotary clutch is combined with a continuously revolving spindle and an arresting device so designed as to retransmit and curb the signals and to interpolate any of the original signalling impulses missed during transmission by a system of positive and negative cams and levers. A tape punching apparatus in which the length of blank tape is limited is also described. There are nine detail drawings.

The following are the more important Patents that have become void through non-payment of renewal fees.

Distributing Systems, &c.: A. E. TANNER and E. A. CLAREMONT [Minimising risk of cable armouring fusing] 11,044/07.

Dynamos and Motors: JOHNSON-LUNDELL ELEC. TRACTION Co. (*R. Lundell, U.S.A.*) [Brush-gear for compounding without sparking] 11,125/03.

Electrochemistry and Electrometallurgy: J. Y. JOHNSON (*Wellman-Scaver Eng. Co., U.S.A.*) [Motor-driven furnace charging gear] 8,665/00; NEW IGNITION SYNDICATE and W. L. SANDY [Electrolyte for primary cell] 10,520/08.

Ignition: A. GAUDIN and E. TELLIER [Gas lamps] 11,301/07.

Incandescent Lamps: B. T. H. Co. (*G.E. Co., U.S.A.*) [Wire sealing-in machine] 10,904/06; H. J. HADDAN (*Bergmann A.-G.*) [Mounting metal filaments] 11,178/07; B. T. H. Co. (*A.E.G.*) [Supporting metal filaments] 10,341/08; H. KUZEL [Metal filaments inflexible when cold] 25,044/08.

Switchgear, Fuses, and Fittings: M. NORDEN [Adjustable combination switch for illuminating signs or signals] 10,856/02; J. H. TRUCKER [Tumbler switches] 11,459/07 and 11,520/07.

Traction: F. C. NEWELL [Combined electro-magnetic rail and wheel brake gear] 9,059/00 and 9,061/00; E. W. TYMMS [Electro-magnetically operated points and signals] 10,962/04.

Miscellaneous: H. W. BUTLER [The capacity of primary cells in which a semi-liquid electrolyte is used is increased by the addition of hemp-cotton, asbestos, &c.] 8,827/00; G. N. HARDEN & SONS and A. V. RUSHWORTH [Watchmen's tell-tales] 10,692/08.

Serious riots have occurred in Dublin, partly owing to the tramway strike. Although there have been secessions of tramway employees in Dublin, and intimidation has been practised to a considerable extent, it appears that an efficient service of trams has been maintained.

The York Electricity and Tramways Committee recommends some extensions to the tramway system. It is also proposed to run trolley omnibuses to Heworth and from Nessgate to Haxby Road.

The receipts from the Newcastle Tramways for the year ending March 31st were £235,321, against £223,565 for the previous year. The traffic expenses increased from £60,663 to £64,493, the general expenses from 17,730 to £18,674, while the cost of general repairs and maintenance decreased from £27,122 to £25,943. The number of passengers carried increased from 49 to 52 millions.

By the addition of three curved junctions, the centre of the city of Liverpool will be connected by an alternative route with the North docks. These alterations were approved by the Tramways Committee last Friday.

A provisional agreement between the Dewsbury Corporation and the National Electric Construction Co. for linking up the Dewsbury Moor and Shaw Cross tramway systems has been approved by the General Purposes Committee, and will be submitted for the confirmation of the Town Council to-day.

The directors of the Aberdeen Suburban Tramways Co. have in view the extension of the system by trolley omnibuses, or else by motor-omnibuses.

## LOCAL NOTES

**Aberdeen: Increase in Power and Heating.**—During the year which ended May 31st last, the h.p. of the motors connected to the mains increased by 1,061, to 7,661, and the number of units supplied to them actually increased by 97 per cent., reaching a total of 2,043,376, exclusive of power to tramways. The supply for heating and cooking increased 36 per cent. to 58,805 units; no less than 743 heating, cooking, and similar devices are let on hire, including 287 irons. A profit of £2,235 was placed to reserve fund.

**Bognor: New Electricity Works.**—The electricity supply, which will be furnished by the Bognor Gas Light & Coke Co., is expected to be ready by the end of the month.

**Clonakilty (Ireland): Local Enterprise.**—The U.D.C. received two tenders for the lighting of the town by 50 50-c.p. lamps. Before these were opened, at the last meeting of the Council, application was made by a solicitor on behalf of a number of townspeople "who had wealth, brains, and great business capacity," and were forming a company, that they might be allowed to tender. This was agreed to.

**Darwen: Combined Power and Lighting Tariff.**—Power of 100 h.p. and upwards will be charged only 1d. per unit for lighting, up to five per cent. of the monthly consumption of power. Above that the ordinary lighting rate of 4½d. will be charged.

**Plymouth: Relief of Rates Again.**—Out of the net profit of £2,542 on the electricity undertaking for the year ended March 31st, £1,000 has been allotted to relief of rates, and the balance to reserve fund. £1,836 spent on mains was paid out of revenue.

**Portishead: Inauguration of Electric Supply.**—Last Thursday a small supply station was started at Portishead, near Bristol. Current is generated by two 100-h.p. Petter semi-Diesel sets. The station will supply both public and private lighting. Distribution is partly underground and partly overhead. The works belong to the Clevedon, Portishead, and District Supply Co., Ltd., whose engineers are Messrs. Christy Bros. & Co., of Chelmsford.

**Stirling: Proposed Purchase of Electricity Undertaking.**—A special committee has now been appointed to consider the question of the proposed transfer of the electricity undertaking to Messrs. Balfour, Beatty & Co., who will also convert the horse tramways to electric traction. It is proposed to acquire the whole electricity undertaking for a cash payment.

**Warrington: St. Helens-Sankley Canal Bridge.**—The Warrington Corporation have been asked to supply power for working this bridge, and are seeking consent of the intervening smaller Local Authorities to lay the necessary mains through their areas.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

### Generating Stations, Sub-Stations, Mains, &c.

**Accrington.**—The Corporation is about to apply for sanction to borrow £3,050, of which £2,500 is for consumers' high-tension sub-station equipments, switchgear, transformers, and service cable. Sanction has been received to borrow £1,060 for main and £940 for switchgear and transforming plant.

**Australia (Sydney, N.S.W.).**—100 3-pole contact and suspension gears for "Metroflame" arc lamps for City Council.

**Belfast.**—The Council has decided to enter into a preliminary agreement with the Belfast Harbour Commissioners to lease a large amount of additional ground for extensions of the electricity works.

**Bingley (Yorks.).**—An L.G.B. inquiry has been held in connection with a proposed sub-station for electricity supply and tramways. Power in bulk will be taken from the Keighley Corporation.

**Cuba.**—A number of concessions to instal electric generating plant have been granted to various gentlemen in Cuba. The *Gacetas*, containing further information, may be seen at the Commercial Intelligence Branch of the Board of Trade.

**Galashiels.**—The Council has considered it inadvisable to lay down a municipal electricity works, but the Galashiels & District Electricity Supply Co. has been now formed, and will apply for a Provisional Order. It is anticipated that a considerable amount of power will be required by the mills in the district.

**Haslingden.**—The Electricity Committee is about to obtain estimates for laying a cable to Helmshore.

**Hornsey.**—An L.G.B. inquiry is to be held to-day regarding the proposed purchase of land for a sub-station at Fortis Green.

**Knaresborough.**—On the recommendation of the Gas Committee, the U.D.C. have agreed to the erection of a small turbine electricity supply station on the River Nidd.

**Newport (Mon.).**—The L.G.B. inquiry with reference to the proposed extensions of the electricity works was held last week. A 25-year loan was asked for, but the Inspector (Mr. T. C. Ekin) said that the generating plant, foundations, and switchboard would only carry 17 years, and the motor-generator 15 years.

**Plymouth.**—Various cable extensions.

**Russia.**—The St. Petersburg Electric Lighting Co. has formed a subsidiary company to develop the supply in Petersburg-Semstvo.

**Sheffield.**—The L.G.B. has sanctioned a loan of £79,700 for extensions at the Neepsend electricity works.

**Sileby.**—In view of the high price of gas, inquiry is to be made as to the cost of electric supply for public and private lighting and power.

**Tyldesley.**—Certain streets are to be lighted by metallic filament lamps.

### Wiring

The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.

**Barmouth.**—Sanatorium. Executive Committee of the Welsh National Memorial to King Edward VII.

**Belfast.**—Extensions to Royal Victoria Hospital. Architects, Young and Mackenzie.

**Burnley.**—New schools for Education Committee.

**Bury.**—New police station, &c.

**Chelmsford.**—106 artisans' dwellings. Town Council.

**Darlington.**—Extensions at Workhouse. Board of Guardians.

**Droylsden (near Manchester).**—An electric lighting installation is proposed for Droylsden Church. The Rector.

## THE RECORD ELECTRICAL Co., Ltd.

LONDON OFFICE:  
CAXTON HOUSE,  
WESTMINSTER, S.W.  
Telephone:  
3087 Victoria.  
Telegrams: "Infusion"  
London.

MEASURING  
INSTRUMENTS.

RECORD'S PATENT.

Write for Prices & Particulars.

WORKS:  
BROADHEATH,  
MANCHESTER.

Telephone:  
164 Altrincham.

Telegrams & Cablegrams:  
"Infusion."  
Altrincham.

**Dublin.**—Premier Picture Palace (Dublin), Ltd. Secretary, John Carley, 42 Dame Street.

**Eastbourne.**—Hospital at Gildredge Underhill. W. C. Field, Borough Surveyor.

**Garstang.**—New hospital. Rural District Council.

**Glasgow.**—Large hospital (£60,000) at Robroyston. Corporation Health Department.

Extension of Municipal Buildings.

**Grantham.**—New Council school. Borough Surveyor.

**Leigh (Lancs.).**—118 cottages to be erected by Corporation.

**London: Islington.**—The Board of Guardians have appointed a Committee to inspect workhouses in other districts to obtain information on electric lighting.

**Harrods' Stores.**—New buildings costing £150,000.

**Middleton.**—Proposed hospital, to cost £20,000.

**Mossley.**—Proposed Livingstone School. Architects, Winder & Taylor, Oldham.

**Nelson.**—Proposed Corporation abattoirs, to cost £20,000.

**Penzance.**—Council school at Lesendjack.

**Rotherham.**—Miners' Institute and Hall, Parkgate. Architect, J. Platts, High Street, Rotherham.

**Stockport.**—Extension, Co-operative Drapery Department, Chestergate. Architects, Messrs. Wrathmell & Blackshaw, Stockport.

**Sunderland.**—New Bede Collegiate Boys' School. Council.

### Miscellaneous

**Argentine.**—Mr. P. Farquhar, of the Argentine Railways Combine, is reported to have stated that his syndicate intends to electrify the North-West Argentine Railway, which belongs to the Cordoba Central Company.—The Central Uruguay Railway has applied for permission to electrify its line between Cordon and Manga.

**Australia.**—Ammeters, voltmeters, &c.; telephone parts; switchboard parts. Deputy Postmaster-General, Sydney, October 15th. Particulars from High Commissioner in London for the Commonwealth, 72 Victoria Street, S.W.

Preparations are being made by the Chillagoe Co., Ltd., to equip the Mount Mulligan (Q.) coal mines with electrical hauling and other plant.

**Dundalk.**—A number of extra 75-c.p. lamps for public lighting are required. Mr. P. A. Spalding estimates the entire annual cost per lamp to cover current and maintenance at £4 10s.

**Hong Kong.**—The American Consul-General reports increasing demands for all classes of small electrical apparatus and supplies, particularly fans and heaters. 100-volts A.C. 72 cycles. Also strong demand for self-contained electrical installations from 60 to 30,000 lights.

**Italy.**—Electrification of the Genoa-Ovada-Asti railway.

**Russia.**—According to the *Torgovo Promyshlennaya Gazeta* (St. Petersburg), P. A. Popov and A. N. Rukin are seeking sanction to form a company for a 35-mile electric railway from Moscow to Voznyesensk.

**Salisbury (Rhodesia).**—The Municipal Council has established a showroom for domestic electrical appliances, and invites manufacturers to send samples for exhibition. Further particulars from the London agents, Davis & Soper, 54 St. Mary Axe, London, E.C.

### TENDERS RECEIVED AND ACCEPTED

**Accrington.**—The following tenders have been accepted:—W. T. Glover & Co., Ltd., for 0.1 and 0.05 sq. in. extra high-tension three-core paper lead-covered armoured cable; British Thomson-Houston Co., Ltd., for switch panels; Bruce, Peebles & Co., for a 250-kw. motor converter; British Westinghouse Electrical Manufacturing Co., Ltd., for two 100-k.v.a. 6,000:400-volt static transformers and one oil switch.

**Australia.**—The tender of Willams & Robinson for condensing plant, turbo-alternators, transformers, and motors for the Perth (W.A.) Power Station has been accepted. Four sets of rotary converters have been ordered from the British Westinghouse Co., and Babcock & Wilcox have obtained the order for boilers and equipment.

The tender of Siemens Bros. Dynamo Works for arc lamp carbons has been accepted by the Sydney (N.S.W.) Council.

**Rotherham.**—Siemens Bros. Dynamo Works have obtained through Messrs. Smith Bros., Rotherham, a yearly contract for the supply of "Tantalum" traction lamps for the Rotherham Corporation Tramways.

**South Africa.**—The tender of the B.T.H. Co. for a turbo-alternator, condenser, kinetic pumps and accessories, and of Bruce, Peebles & Co. for a motor-converter, is recommended for acceptance for the Cape Town Electricity Works.

### APPOINTMENTS AND PERSONAL NOTES

The salary of Mr. A. J. Beckett, Borough Electrical Engineer, Bridlington, has been increased from £350 to £400.

Lecturer in Electrical Engineering required for Queensland (Australia) University. (See advt.)

Linemen and Assistant Linemen required with experience of trolley line work. (See advt.)

### MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. G. Smith & Son, of 5 Philpot Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night, was £74 to £74 10s. (last week £73 to £73 10s.).

**Nathan and Allen.**—Messrs. F. B. Nathan and F. S. Allen have opened an office and showroom at Queen Anne's Chambers, Westminster, S.W. They represent the Kartret Engineering Co., who manufacture switchgear, and the Wardle Engineering Co., Ltd., makers of lanterns and fittings for streets, ships, and works.

**Change of Address.**—Brotherton Tubes & Conduits, Ltd., have moved into larger premises at 4 Carr Street, Blackfriars, Manchester, under the management of Mr. T. A. Nunwich, who also represents the Wandsworth Electrical Manufacturing Co., Ltd., and Messrs. Pritchetts & Gold, Ltd., in Lancashire, Yorkshire, and Cheshire.

**Removal.**—Messrs. L. E. Wilson & Co. (20 Cross Street, Manchester) are moving on September 8th to 10 Corporation Street, Manchester. Their telephone number will be City 344, and telegraphic address "Telephony" Manchester, as at present.

**Companies Struck off Register.**—The names of the following have been struck off the register of joint stock companies:—Dynelectron Syndicate, Ltd., Electrical and Mechanical Exhibition, Ltd., Electric Coin Freed Meter Dimming Syndicate, Ltd., Electric Tramways Trust, Ltd., Hirst Magneto Co., Ltd., Schreiber Electric Battery Co., Ltd., Vulcan Dynamo and Motor Co., Ltd.

**Liquidations.**—A general meeting of the Gilbert Arc Lamp Co. will be held on October 7th, at 3 Fenchurch Street, E.C., at 3 p.m., to hear the Liquidator's report.—A general meeting of the Doncaster Electrical Co., Ltd., will be held on October 8th, at 37 Manor Road, Bradford, at 11 a.m., to receive the Liquidator's report.

**The Producer Gas Plant at Accrington.**—We regret that the output of the new producer gas-driven alternators at the Accrington Electricity Works was given as 12,000 to 15,000 units per week, instead of 120,000 to 150,000 in the detailed description of the plant in our last issue.

**University College, London.**—A course of post graduate lectures on "Conductors for the Electrical Transmission of Energy," will be delivered by Professor J. A. Fleming at University College (Gower Street, W.C.), on Wednesdays at 5 p.m., commencing on October 29th. These lectures may be attended by members and non-members of the University, and the subject is divided into two parts: (1) deals with telegraphy and telephony, and (2) deals with light and power.

**The Advantages of Ozonisers.**—Physiological and psychological tests undertaken by the Society of Heating and Ventilating Engineers in America have shown that a roomful of school children can work at full efficiency and comfort, says the *Electrical World* (New York), breathing the same air three hours or more at a time, if that air is properly circulated and deodorised by being passed through an ozoniser. These experiments are thought to place on a scientific basis the fact long suspected that the usual empirical allowance for ventilation has no relation whatever to the actual physiological needs of the human system.



# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 350 [Vol. IX., No. 37]  
*All rights reserved.*

THURSDAY, SEPTEMBER 11, 1913.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES AND TECHNICAL COLLEGE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

*Other Advertisement Rates on Application.*

### Latest Time for Receiving

Letters for Insertion, Tuesday first post.

Small Advertisements and Official Announcements, Wednesday first post.

Displayed Advertisements, Tuesday first post.

Corrections in Standing Advertisements, Monday first post.

All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 208-206, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Circling, Fleet, London."

Telephone No.: 5509 Holborn.

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

SOME notes on the arrangements for the next session and other matters relating to the Universities and Technical Colleges are given. (Page 512.)

THE strike of electrical wiremen engaged by contractors to H.M. Office of Works has collapsed, and the men have resumed work. (Page 512.)

THE Annual Report of the International Electro-technical Commission for the year 1912 has been published. The Commission has just held its second plenary meeting in Berlin. (Page 512.)

A 30,000 volt underground cable distributing system has been installed by the Berliner Elektrizitäts-Werke for the supply of Greater Berlin. It comprises 144 miles of cable, connecting up fifteen sub-stations, transforming down to 6,000 volts for the secondary underground networks. Particulars of the sub-stations and of the cable are given. (Page 513.)

SOME new shades and reflectors and a new design of radiator are described and illustrated on page 514

WE publish a description of the alterations which are to be made in the switchgear of the L.C.C. tramways power house at Greenwich. Interesting features are the use of three single-core cables for the generators to the switchboard, so as to do away with trifurcating boxes, and the application of reactance coils to diminish the effects of surges. (Page 515.)

THE change of connections necessary to effect the reversal of rotation of an induction motor without changing over the mains is dealt with. (Page 516.)

WE give some details of a new system of electric traction which will be put into operation in the United States shortly. Current will be supplied to the locomotives at 11,000 volts 25 cycles, and will be converted to 2-phase 750 volts for the motors.—The Bristol Corporation are recommended to apply for powers to work the electric tramways with a view to taking over the local company's undertaking.—The Municipal Tramways Association Conference will be held at Sheffield from Sept. 23rd to Sept. 26th. (Page 517.)

THE Western Electric Co. has received a tender for a number of full automatic telephone exchanges in New Zealand.—An exchange on the Western Electric Co.'s system will also be opened shortly in Darlington.—The Pacific Cable Board's accounts for the year to March 31st show a balance of £14,157 to be carried forward.—The Australian Government has spent £40,000 of the £50,000 voted for wireless telegraph purposes. (Page 517.)

A NUMBER of patent specifications relating to different phases of wireless telegraphy were published by the Patent Office last week. A new design of mercury vapour lamp has been protected by the B.T.-H. Co.—A specification by C. R. Belling describes a strong heating element, and another by H. J. Piper and R. A. Bridgwater describes a thermal storage oven.—An improved construction of Tirrill regulator is also covered by a patent. (Page 518.)

IT is proposed that the Leeds Corporation shall purchase the Roundhay Electric Lighting Co.—Messrs. Balfour, Beatty & Co. have been asked for details of their offer to purchase the Stirling electricity works.—It is once more suggested that the Redditch electricity undertaking should be sold.—A sum of £300 is to be transferred to relief of rates from electricity profits at King's Lynn.—A Board of Trade inquiry is to be held concerning cable breakdowns at Hebburn.—The Middleton Corporation has agreed to the Lancashire Electric Power Co. supplying a large consumer in their district. (Page 519.)

GENERATING plant and mains extensions are contemplated at Carlisle (£4,300); Eastbourne (£3,000); Plymouth (£5,500); Bacup (£1,800); Cardiff (£30,500); Salford (£2,000); and Leek.—A complete power station equipment is required at Ilkley, and electric lighting schemes are under consideration in a number of places.—A wet-air filter is to be installed at Worcester, and electrically-driven centrifugal pumps at Wolverhampton.—Electric cranes are required in Greece, and telephone material in Australia. (Page 519.)

AN interim dividend at the rate of 6 per cent. per annum has been declared by the British Electric Transformer Co.—Considerable progress continues to be shown by the Clyde Valley Electric Power Co. (Page 520.)

## UNIVERSITY AND TECHNICAL COLLEGE ANNOUNCEMENTS

THE prospectus of part-time (evening and apprentices' day) courses in electrical and mechanical engineering at the Manchester Municipal School of Technology shows that a very complete course of instruction in general electrical work may be undertaken in the evenings by students engaged in practical engineering during the day. The evening "Associate Course" is arranged to cover a year's training, and each year's course is more advanced than the preceding one. Certificates are granted on the satisfactory completion of one of the many prescribed courses. These certificates are endorsed by the Board of Education. The examinations of the City and Guilds of London Institute may also be taken. Special courses on telephony and telegraphy, wireless, and wiring and fitting are also provided, and the theoretical instruction is well amplified by work in the extensive laboratories of the College. Professor Miles Walker is head of the electrical engineering department, and the Principal is Mr. J. C. Maxwell Garnett. The part-time courses will begin on September 22nd.

The evening classes at the Borough Polytechnic Institute (Borough Road, London, S.E.) will reopen on September 22nd, when wiremen's work and electrical design and workshop practice may be studied. In addition there is a four-years' course beginning with general principles (for beginners) and leading to a study of alternating-current work, including instruments and machines, &c. The head of the department is Dr. John Henderson. Further particulars may be obtained on application to Mr. C. T. Millis, who is the Principal of the Institute.

## THE INTERNATIONAL ELECTROTECHNICAL COMMISSION

THE second plenary meeting of the International Electrotechnical Commission was held in Berlin last week, and some 70 delegates were present. Dr. E. Warburg presided in the absence of Dr. Budde, and Dr. Lewald welcomed the Commission on behalf of the German Government. The list of 80 definitions proposed by the Nomenclature Committee was adopted, and German and Spanish equivalents are to be added. The recommendations mentioned below as to a standard of copper were adopted, and on the recommendation of the Italian engineers, certain definitions dealing with the terminology of water-power plants were agreed to, together with a list of symbols. There was a prolonged discussion on the question of rating of electrical machinery, and some outstanding points have been referred back to the National Committees. M. Maurice Leblanc was elected President for the next two years, and the Hon. Sec., Col. Crompton, and the General Secretary, Mr. le Maistre, were re-elected.

The fourth annual report, which covers the year ended Dec. 31st, 1912, has just been issued. The actual report, in English and French, is prefaced by a frontispiece consisting of a reproduction of a portrait of Faraday painted by Beatrice Bright, in possession of Dr. E. Budde, the present President of the Commission. The report sketches the history of the Commission from its inception in 1904, and refers to the meeting held last week in Berlin and the forthcoming meeting in 1915 in San Francisco. Committees are now established in twenty-one countries, and several other countries are taking interest in the work. Mention is also made of the special committees on nomenclature, symbols, rating and prime movers, and brief summaries are given of the nature of the work which is being taken by each. The question of an international standard for copper is being considered, and recommendations have been drafted by the Directors of the National Laboratories at Berlin, London, Paris and Washington. An important proposal that was brought forward for ratification at Berlin was that the kilowatt should be adopted as the industrial unit of mechanical as well as electrical power. The symbols committee has already definitely adopted the letters I, E, and R for current, E.M.F. and resistance, and has standardised the counter clockwise direction for advance of phase in circle diagrams. A good deal of information as to the constitution and activities of the various national committees is included in the report.

**Half-watt Lamps.**—We are asked by the General Electric Co., Ltd., of 67 Queen Victoria Street, E.C., to state that the Osram Works are at the present time manufacturing half-watt lamps under full patent rights, and will be in a position to place these lamps on the market in the very near future—"at least as early as any of the other firms entitled to manufacture this type of lamp."

## THE WIREMEN'S STRIKE

THE strike of wiremen employed by the contractors to H.M. Office of Works, came to a conclusion on Monday, and the men on strike returned to work on the same conditions of pay, &c., as before they went out on strike. This course was decided upon by a ballot among the strikers on Saturday, which gave a considerable majority in favour of the resumption of work. It is stated that the men were handicapped by want of funds, and that regular strike pay was not distributed. The causes of the strike were fully given in an article which appeared in our issue of August 28th. There had previously been some dissatisfaction among the engineering labourers, who had applied for an increase of pay from 7d. to 7½d., which was recently accorded to the builders' labourers. The Office of Works offered to refer the matter to the Board of Trade for arbitration, but in the meantime the painters' strike occurred, and the engineering labourers struck "in sympathy," and the wiremen came out with them. We understand that the arbitration with regard to the engineering labourers' wages will be proceeded with in the ordinary course.

Last Thursday a number of daily newspapers published a communication which had been sent them by the Strike Committee, to the effect that the wiring of the official residences of the Prime Minister and the Chancellor of the Exchequer in Downing Street had been left in a dangerous condition owing to the strike. We regret to say that *The Times*, *Daily Telegraph*, and other papers of good repute, published this statement without first taking the precaution to ascertain whether it was correct. *The Morning Post*, however, made inquiries at the Office of Works, where they were informed that the statement in question was untrue.

The work that is being done at the two houses in question is to modernise the electrical installations, which are about twenty years old, but their insulation resistance was good and there was absolutely nothing in them which constituted a serious fire risk. Had there been any risk of this sort, it is fairly obvious that the officials at the Office of Works would have simply drawn the fuses.

Apparently among the majority of daily newspapers any news which has to do with "electrical" subjects is only suitable for publication if it is of a sensational character, and accuracy takes a second place, or no place at all. The daily Press already knew by that time that they had been misled previously by the strikers' deliberately incorrect announcements, and yet they accepted this piece of "news" on the same authority without any endeavour to obtain confirmation of it. We referred to some of the previous misstatements in our issue of August 28th: another will possibly amuse our readers. It was announced that, in some of the rooms of the L.G.B. Offices, work was done by candle-light, owing to the electric supply being cut off. On inquiry we find that in one room only (in which one or two female typists are employed) candles were requisitioned, and examination showed that the cause of the "electric light failure" was merely that the circuit switch was off.

**The Co-ordination of Electric Supply.**—Under the auspices of the Industrial Committee of the Institution of Electrical Engineers, Dr. Klingenberg, of Berlin, will deliver an address on Thursday, December 4th, on the "Co-ordination of Electric Supply in Big Cities with special reference to Chicago, New York, Berlin and London." Although the address will be followed by a discussion it is not regarded as an ordinary paper, and will not be printed in advance.

**Obituary.**—We have to record with regret the death from heart failure on Aug. 29th, at a sanatorium at Homburg, at the age of sixty-eight, of Prof. H. Aron, whose name is so well known in connection with electricity meters. Prof. Aron established the Elektrizitätszählerfabrik of Charlottenburg. He had been for many years a worker in electro-technical matters, but is best known for the differential pendulum type of meter which bears his name. He also developed a system of electric clocks, and a design of taximeter for cabs. He was a native of Posen, but was educated chiefly in Berlin, where for ten years he held the post of lecturer in electrical measurements. He was also at one time a teacher of physics in the Artillery and Military Engineers' School.

**An Electrical Fatality.**—A curious case is reported from America, in which a motor-car running at a very high speed collided with a telephone pole alongside some overhead power lines. The pole is reported to have been carried some 30 feet, and the car became mixed up with the power lines which had been brought down, with the result that one of the occupants received a fatal shock and others were taken unconscious to the hospital.

## THE 30,000-VOLT CABLE DISTRIBUTION SYSTEM OF GREATER BERLIN

IN order to reach the outlying districts of Berlin in an economical manner, the Berliner Elektrizitäts-Werke have a 30,000-volt underground cable distribution network comprising 144 miles of three-core cable ( $8 \times 0.0775$  sq. in.), in the form of two ring mains, one north and the other south of the Company's large power station at Oberspree, Oberschöneweide. The following description of the system and the cable itself have been compiled from articles which have appeared in the *Elektrotechnische Zeitschrift* and *Elektrische Kraftbetriebe & Bahnen*. The south ring has three branch mains, two of which are connected at their extremities, forming a third ring. There are fifteen large (30,000/6,000-volt) transformer stations connected into these circuits, and a number of small (6,000/220-volt) stations on

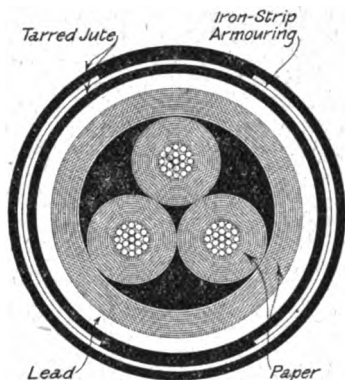


FIG. 1.—SECTION OF 30,000-VOLT ( $3 \times 0.0775$  sq. in.) CABLE. HALF SIZE

the secondary networks. The total number of substations is 240, of which 195 are in the form of kiosks containing each two 60-kw. transformers stepping down from 6,000 volt to 220 volt. Both the 6,000-volt and 220-volt networks are underground cable.

The generating pressure at Oberspree is 6,000 volts, and this is stepped up to 30,000 volts for the above system in a transformer house, which has been erected adjacent to the station. This building is constructed for a total transformer capacity of 32,000 k.v.a., but at present only three of the six transformers are installed. They are three-phase transformers, oil-insulated, and as clean water was not available, all the transformers, both those in the step-up substation and those in the fifteen step-down substations, are provided with forced-draught ventilation. The transformer oil-tank of corrugated iron is surrounded by a sheet-iron cylinder, and air

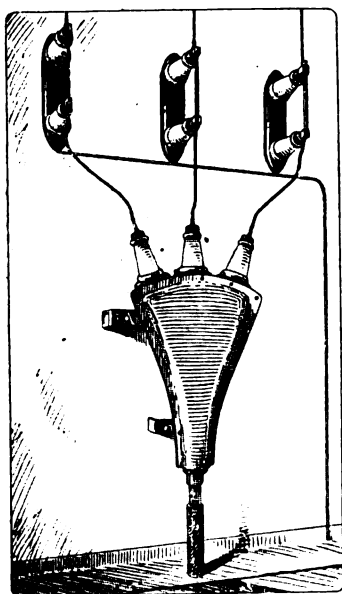


FIG. 2.—30,000-VOLT CABLE DIVIDING BOX.

is blown through the intervening space. At the main substation there are three sets of ventilators each delivering 1,000 cubic meters of air per minute into an air duct, with a

branch to each transformer. Dampers are provided so that the air flow can be regulated or stopped entirely in case of fire. The air is drawn through a rough filter consisting of ninety-five boxes of wood-wool arranged (in parallel) in a steel frame. The 6,000-volt sides of the transformers at the step-up substation are connected direct to the main station bus-bars, and only the 30,000-volt switchgear is in the transformer house. The transformers are in separate fire-proof cells with roller-shutter doors opening on to an outside platform, from which the transformers can be run off on to a truck for transporting to the repair shop. In each transformer, the temperature of the oil is registered by a thermometer in the power station.

The 30,000-volt bus-bars on the first floor of the building are divided into three divisions, from each of which two cables go out, one to the north ring and one to the south. In the oil switches, which are on the ground floor, the contacts for the three phases are in separate oil chambers. The circuit is made and broken through resistances connected to auxiliary contacts, the resistances being arranged outside the oil chambers. The switches are closed by hand through chain gearing, but are opened by direct-current releasing gear.

A system of differential protection has been adopted for both transformers and cables, but no details are given. It is mentioned, however, that the capacity current of the pilot cable in event of a short circuit on the system was so great that it operated the relays, although the cable protected by this pilot cable was intact. This effect was prevented by the installation of reactance coils. An apparatus is installed in connection with these differential relays to indicate at the power station when any cable section has been cut out; there is a different indication for each section, and the fault is easily located.

The 30,000 volt cable itself is illustrated in Fig. 1. Its three conductors are each  $19/1.84$  mm., giving 50 sq. mm. section. The radial thickness of the impregnated paper insulation between cores and between core and lead is 1.6 mm., and the thickness of the lead 3.6 mm., giving a diameter over the lead of 74.7 mm. The total diameter over the jute-covered strip armouring is about 90 mm., or 3.55 inches. Each length, after immersion in water for 24 hours, was put under a test pressure of 75,000 volts three-phase for half an hour, and this was tested for the same period at 75,000 volts (single-phase) between the three cores and the lead covering. A momentary test was also made at 90,000 volts, i.e., three times the working voltage. Insulation tests were made on each length before and after these high-voltage tests to see that they had not affected the dielectric. Tests on 10-metre lengths of cable under oil showed that the application of 250,000 volts for a short period did not puncture the insulation. The constants of the cable per kilometre and per phase at  $15^{\circ}$  C. were:—Resistance, 0.35 ohm. (0.564 ohm per mile); three-phase capacity, 0.13 microfarads; self-induction, 0.36 millihenry; insulation resistance, 700 to 1,000 megohms.

After the whole cable system was laid, a 60 km. ( $37\frac{1}{2}$  miles) section was run for half an hour at 50,000 volts, this pressure being obtained by over-exciting a generator at the Oberspree station, thus running the whole plant, comprising generator, switchgear, transformers, and cable network, at 66 per cent. excess pressure. It is interesting to note that the transformers were so highly saturated at this pressure that the magnetising current compensated for the capacity current of the cable system, and the generator actually worked with a lagging current. To determine the power-factor of the cable and the dielectric losses, a Duddell-Mather (torsion-dynamometer) wattmeter was employed. At 30,000 volts, 25 cycles, the charging current of the 60 km. length of cable was 44 amperes, the apparent power 2,280 K.V.A., and the watt-power 45 kw., corresponding to a power-factor of only 0.02, or 2 per cent., but after deducting the estimated value of the C<sup>2</sup>R loss due to the charging current, the dielectric hysteresis loss is estimated at only 5 kw.

The short-circuit test showed that the resistance to alternating current at 25 cycles was 1.8 per cent. greater than for direct-current; at 50 cycles some 6.5 per cent. greater. A temperature test, running 24 hours at 90 amperes, 24,000 volts A.-C. (i.e., a current density of 1,160 amperes per sq. in.), showed a temperature rise as measured by resistance of only  $7^{\circ}$  C.

The whole 30,000 volt system has been in operation for nearly two years without mishap. A landslide produced two bad kinks in the cable at one point, but the cable held out for weeks, until that section was relaid.

The capacity current of the whole 30,000-volt network is 162 amperes, corresponding to an apparent load of 8,350 k.v.a. This enormous capacity current has a highly beneficial influence on the power factor of the system during working hours. The step-down substations are similar in design to the substation described, except that 65-volt storage batteries of 37-ampere-hour capacity are installed for operating the switch-releasing gear. These are charged by small motor-generator

sets. The substation lights can be switched over to the battery in cases of emergency. There are in all thirty-six dividing boxes on the 30,000-volt system. As shown in Fig. 2, these are of ample size, with long smooth porcelain insulators which will not collect dust, and give a long creepage surface. Bare copper rods run from these to the isolating links which are on similar insulators.

The cable is laid direct in the ground, about 3 ft. deep, and the telephone and pilot wires are laid in the same trench. It is protected by a ferro-concrete casing. 1,500 straight-through connecting boxes of the pattern illustrated in Fig. 3 are used on the network.



FIG. 3.—30,000-VOLT CABLE CONNECTING BOX.

This comprises a sweated-up lead sleeve enclosed in a split cast-iron box. The cores at the joint are not separated by distance pieces, as has been usual, but are enclosed in cylinders of impregnated paper. Both the inner lead sleeve and the outer iron box are filled with insulating compound. Special joints made in this way were tested for hours at three and four times the working pressure before the method was applied to the joints on the system.

Great care was exercised, in the installation of both these and of the dividing boxes, to exclude all air before filling up, and a vacuum apparatus was employed for the purpose.

### NEW VELURIA GLASSWARE

SOME new designs of shades made of the pleasing "Veluria" white translucent glass have recently been placed on the market by the British Thomson-Houston Co., Ltd. (Mazda House, 77 Upper Thames Street, E.C.). Two of these are illustrated below.



The two patterns illustrated have raised decorations of a distinctly novel appearance, and they are made for Mazda lamps of from 10 to 40 watts. Another pattern has the same contour and reflective characteristics as the standard "intensive" type of Veluria shade, but has the addition of an etched floral design. This reflector is made in four sizes to take Mazda lamps ranging from 10 to 100 watts.

### CATALOGUES, PAMPHLETS, &c., RECEIVED

**THE I.C.S. STUDENT.**—The September number of this little publication, which, as many of our readers already know, is published monthly by the International Correspondence Schools, Ltd. (Kingsway, London, W.C.), for circulation among their old and new students, contains considerable information which should prove of use to those concerned. Among the articles of electrical interest we notice one entitled "Notes from a Wireless Operator's Diary."

**RAILOPHONES.**—The von Kramer inductive wireless system of telephoning and telegraphing to moving trains from a fixed point is fully dealt with in a publication which has been issued by International Railophones, Ltd. (Prudential Buildings, Corporation Street, Birmingham). The system was illustrated and described in *ELECTRICAL ENGINEERING* for July 11th, 1912, p. 395. A section of line has been experimentally equipped in Germany, and the company invite the British railway companies to try

some of the various modifications of the system over a short length of track.

**"G.E.C. MONTHLY LIST."**—As the General Electric Co., Ltd. (67 Queen Victoria Street, E.C.), have found it difficult to keep their customers posted with all the latest information regarding the introduction of new patterns, alterations in designs, &c., they have decided to issue monthly a gummed and perforated list so that the recipient may insert the various parts against the particular pages of the G.E.C. sectional catalogue to which they refer. The list this month deals with a new pattern of "Geeko" double-line auto-reset inter-communication telephones for wall or table, some new trembler bells, and also wall nails for wiring work.

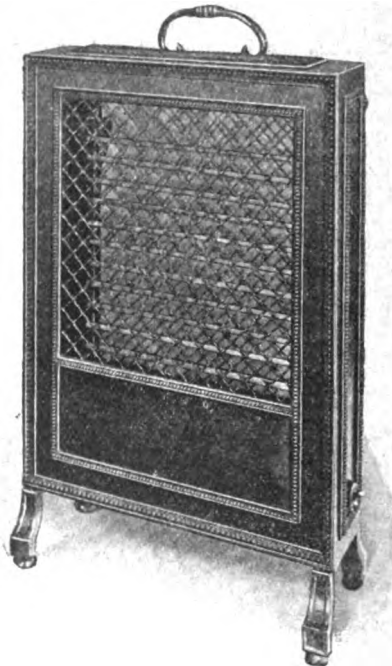
*Readers desiring copies of catalogues or pamphlets should apply to the firms in question, referring to the notice in "Electrical Engineering."*

**ELECTRIC LIGHT FITTINGS.**—Some very artistic designs of electric light fittings are contained in a catalogue of Dutch hand-made art metal ware from the "Cuprera" Art Metal Works at The Hague. The sole agents for Great Britain and the Colonies for these products are D. N. Dobson & Co. (93 Aldersgate Street, E.C.).

**SHADES AND REFLECTORS.**—A new leaflet is being circulated by Siemens Brothers Dynamo Works, Ltd. (Tyssen Street, Dalston), dealing with a new style of opal reflector under the name of "Marbella." These reflectors have a pleasing appearance, and are very efficient; they eliminate glare, and give a pure, soft, white light. Owing to their design and the fact that there are no frosted or ground surfaces or angular corners, they are exceedingly easy to clean, and do not collect dust. They are made in concentrating and distributing types. Galleries are unnecessary, as these reflectors have a  $1\frac{1}{2}$  in. hole fitting. The leaflet also calls attention to the "Holophane Benjamin" steel reflectors, which are specially adapted to industrial purposes.

### A NEW DESIGN OF HEATER

WE have received from the Edison & Swan United Electric Light Co. (Ponders End, Middlesex) particulars of a new design of quartz heater, made under the Bastian patents, which they are introducing for the coming season. This heater, which is contained in a well-made brass case of elegant design, is suitable for use in drawing-rooms, boudoirs, first-class state-rooms aboard ship, or any superior apartment. It is usually fitted with two switches and twelve Bastian glowers of 1,500 watts capacity, but the same pattern



NEW DESIGN OF BASTIAN HEATER.

can be supplied fitted with eight glowers only of 1,000 watts capacity. Each heater is supplied with 2 yds. of flexible. The overall height is 19 in., the depth is 5 in., and the breadth 12 in. The weight is only 10 lb. The twelve glower pattern takes from  $\frac{3}{4}$  to  $1\frac{1}{2}$  kw., and the eight glower pattern takes from  $\frac{1}{2}$  to 1 kw. Our illustration gives a good idea of the neat appearance.

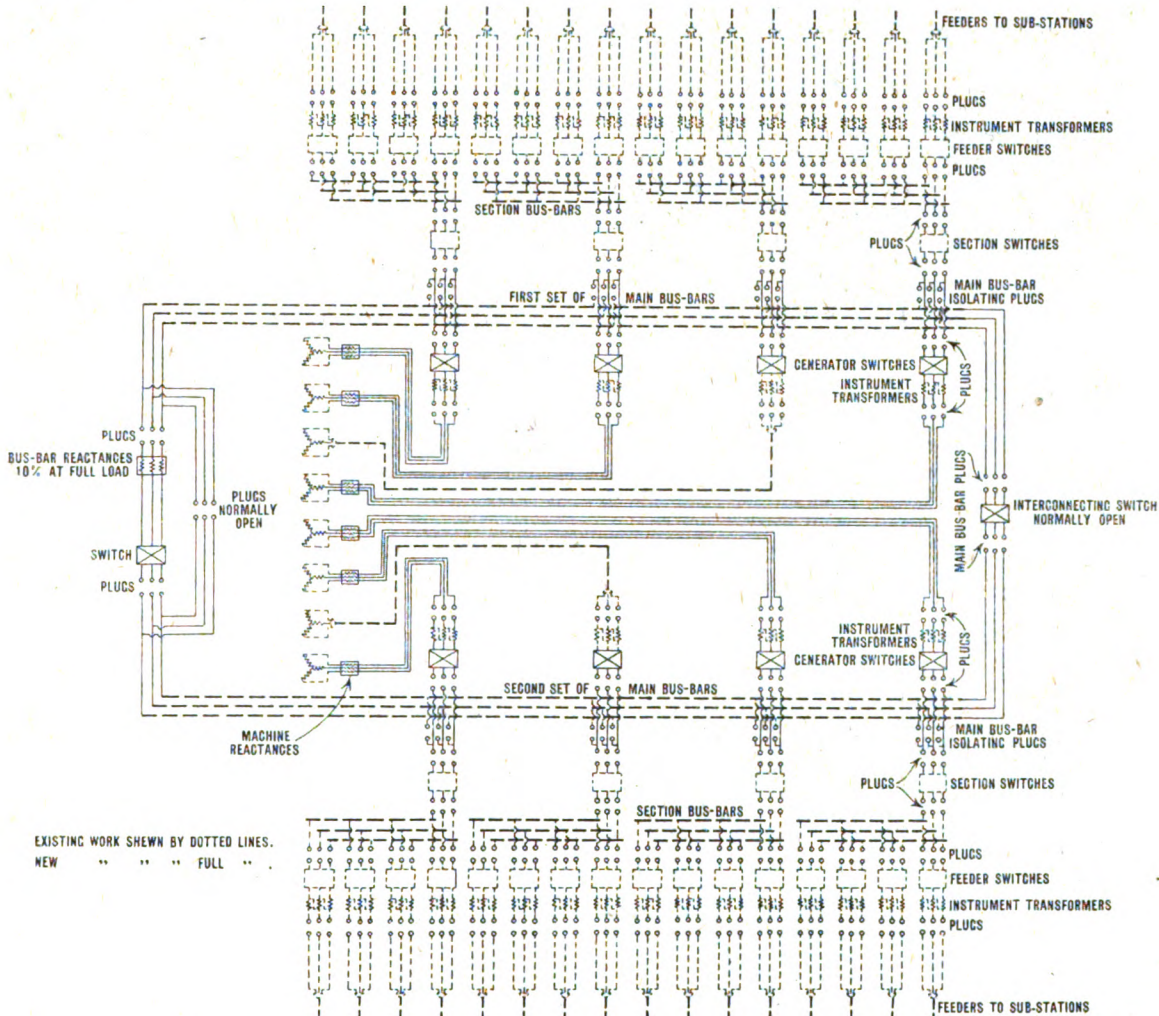


## SWITCHGEAR ALTERATIONS AT THE GREENWICH GENERATING STATION OF THE L.C.C. TRAMWAYS

AS announced in our issue of August 21st, the London County Council have invited tenders for a somewhat extensive alteration to the main switchgear at their generating station, Greenwich, and an outline of the modification proposed may be of interest. The switchgear was constructed in 1905 and at the time was considered one of the finest examples of high-tension gear, and it may be somewhat surprising to find that modifications are required so soon. Through the courtesy of Mr. Fell we have obtained a copy of

thickness of 0.4 inch. Although each phase is thus surrounded by a metallic sheath, the induced currents in the lead at a frequency of 25 cycles per sec. are found to be negligible, and the segregation of the conductors into three separate cables adds to the safety of the system by removing the necessity of providing trifurcating boxes and by eliminating joints on all three phases in close proximity to each other. An inspection of the diagram will show that, in the cases of Generators 3 and 4, the original cables are being retained, but when these engine generators are discarded and turbo-generators are substituted, machine cables of the same character will then be provided.

The capacity of the generator oil switches is being



the specification outlining the work for which tenders are now invited, and place before our readers the salient features of the scheme.

The switchgear was originally laid out in 1903 for eight generators of 4,000 kw. capacity each, and four of these generators were originally installed. At a later period, when extensions became necessary, turbo-generators of 5,000 kw. capacity were fixed in place of the reciprocating units originally contemplated. In common with most users of turbo-generators of large size, the Council's engineers have experienced trouble on short circuit, and the effect of 30,000 kw. plant capacity behind the short has been in several cases somewhat disastrous, so much so that a modification of the switchgear has been considered desirable.

A general lay-out of the switchgear of the station is shown on the diagram above, and the alterations are also indicated. In the first place, the existing three-core lead-covered cable and cable boxes connecting the machines to the switchgear, and the various parts of the switchgear to one another, are being replaced by single-core cables insulated with paper to a radial

increased to render them capable of breaking heavy currents on short circuit. This is being done for each generator, and at the same time two massive oil switches are being provided for interconnecting the two halves of the bus-bars. It will then be possible to run the two halves of the station as separate systems, and duplicate synchronising gear will be required for coupling the halves together. One of these interconnecting switches will normally be kept open, but the other will be used for dividing the system in cases of accident, and to render the disrupting effect under short circuit less harmful, reactance coils will be provided in series with the switches.

These reactance coils take the form of three single-phase coils, wound upon laminated cores with an air-return circuit, the coils being immersed in oil and provided with water cooling tubes. This form of reactance was chosen, as the coreless type wound upon concrete spiders was inadmissible owing to the large amount of structural steel work in the station which would become heated due to the stray fields. The



coils will have a combined reactance at full load of 10 per cent.\* under the very worst conditions. Thus the current rise on short circuit will not exceed ten times the normal full load current.

In a similar manner, external reactance coils are being provided in each of the six turbo-generator circuits, which, with the internal reactance of the machines themselves, provide a total reactance of from 12 to 13 per cent., sufficient to limit the instantaneous short circuit to a figure not exceeding seven to eight times normal full-load current.

The machines at present are controlled by reverse-current relays which have not in every case proved satisfactory, and in order to disconnect a machine on the development of a short circuit, and before there has been time to damage the windings materially, balanced current relays will be provided on each machine circuit, with an additional inverse time relay to trip on heavy overloads.

As an additional precaution, and to prevent damage being done whilst a crippled machine is being shut down and is still running owing to the inertia of the revolving parts, short-circuit switches will be provided for short-circuiting the fields of the exciters. These switches will be automatically operated whenever the above-mentioned relays trip.

In addition, various other apparatus of a minor character will be provided, but the most intricate part of the work will be the safe substitution of the new apparatus for the old, in a station normally running twenty-four hours per day, and to enable this to be done various expedients have been devised.

\* That is to say, at full load current, the voltage across the reactance will be 10 per cent. of the voltage per phase: in this case 380 volts, as the voltage between phases of the (star-connected) generators is 650.

## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,355.

Ventilation is required in a static transformer chamber to keep the transformer as cool as possible. Show how the size of openings is determined, how the difference in level between inlet and outlet louvres will effect the size, and how the cubic contents of the chamber affects the question. Assume two 200 k.v.a. oil-cooled transformers in a chamber 10 ft. by 8 ft. by 12 ft. high. Calculate the size of nett opening required, and show the difference if a chimney is built to a height of 20 ft. above ground.—"AIR SUPPLY."

(Replies must be received not later than first post, Sept. 18th.)

### ANSWERS TO No. 1,353.

A three-phase induction motor with squirrel-cage rotor runs clockwise. Another similar motor, from the same makers, runs anti-clockwise; both are coupled up to a star delta switch, and to same sketch, which is standard. Having a quantity of these

motors running, it is desired not to change over the mains at the starter. Can the right rotation be obtained by altering any of the six connections at motor end, and run satisfactorily with load?—"MOTOR."

The first award (10s.) has been made to "H. J. E." for the following concise reply:—

Assume first, for the connections as shown in Fig. 1, that the motor starts up, and runs in the wrong direction. In order to alter the direction of rotation, the ends of two of the phases must be changed over, as in Fig. 2,

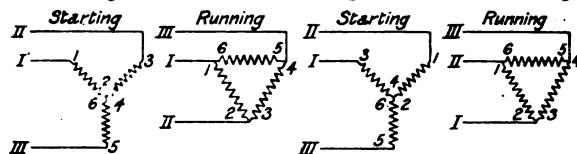


Fig. 1.

Fig. 2.

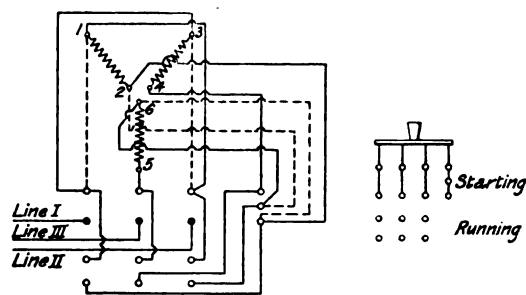


Fig. 3.

where ends 1 and 3 of phases 1,2 and 3,4 have been interchanged. Moreover, in order that the connections for the running position of the switch shall be correct, the star ends 2 and 6 of phases 1,2 and 5,6 must be changed over. This is shown by the full lines in Fig. 3; the dotted lines indicating the old connections.

The second award (5s.) has been made to "W.R.S.," whose reply, slightly abbreviated, is as follows:—

The normal connections are shown in Fig. 4. The stator windings A, B, C, are connected to fixed fingers, and when these fingers are engaged by the movable contacts along the line s, the windings are star-connected, as in Fig. 6, the fingers 4, 5, 6, being connected together to form a neutral point. When the contacts engage along the line d, the windings are connected in delta, as in Fig. 7. Reversal of rotation can be secured by changing the connections, as

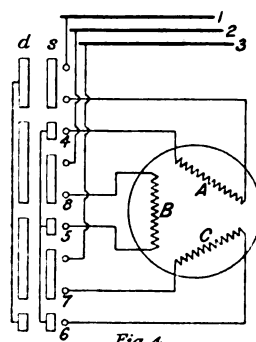


Fig. 4.

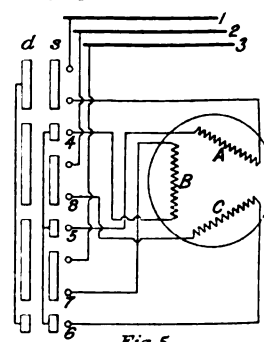


Fig. 5.

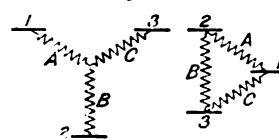


Fig. 6.

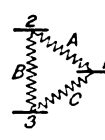


Fig. 7.

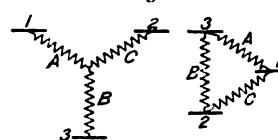


Fig. 8.



Fig. 9.

shown in Fig. 5. The winding A is disconnected from its neutral-point finger 4 and connected to the neutral-point finger 5. The leads from the winding B are crossed; one goes to the neutral-point finger 4, and the other to the finger 7, to which the winding C was previously connected. The winding C is connected to the finger 8 in place of the winding B. With the switch in the position s, the windings are star connected, as in Fig. 8, and in the position d they are delta connected, as in Fig. 9. The change of connections is equivalent to interchanging phases 2 and 3 at the switch. If the switch employed is of a different type, the connections will be similar, and the necessary changes may be traced easily from Fig. 5.

HAVE THE  
BEST!

**SPECIFY**

# IGRANIC

## SWITCHGEAR

IGRANIC ELECTRIC CO. LTD.  
LONDON

Works:  
BEDFORD

### ELECTRIC TRACTION NOTES

A report on a recent tramcar accident in Newcastle has just been issued by Lieut.-Col. P. G. Von Donlop. While a car with a handbrake, which, owing to a broken link in the chain, could only be worked from the rear end, was being taken to the car-sheds, it got out of control and ran into a car ahead of it. Owing to the trolley having been taken off the line, the magnetic brake was inoperative, and the car started away from rest on a gentle incline, and the handbrake was not applied by the conductor, nor did the driver exercise any supervision on the conductor's action. The report points out the advisability of the Westinghouse magnetic slipper brakes being workable by hand as well as electrically.

An entirely new system of electric traction will be put into operation on the Norfolk & Western Railway, West Virginia, U.S.A., next January. Current will be supplied to the locomotives at 11,000 volts, 25 cycles, and a combination of a transformer and a rotating induction machine on each locomotive will convert this to two-phase 750 volts for the motors, which will be of the normal synchronous polyphase type without commutators. There will be four motors on each locomotive, with a total continuous rating of 1,300 h.p. at fourteen miles per hour. Each motor will have windings for producing either four or eight poles, giving two synchronous speeds of twenty-eight and fourteen miles per hour respectively. The wound rotors will give, further, a synchronous speed of seven miles per hour, with cascade connection, and allow of resistance being inserted for starting and for intermediate speeds. Two of these 130-ton locomotives will be used for each train of 3,250 tons weight. These trains carry principally coal from the Pocahontas coalfield. The motors will be geared in pairs through a jack-shaft crank and eccentrics to the driving wheels, the gear ratio being 18 to 85, and the driving wheels 62 in. in diameter. The contract with the Westinghouse Co. provides for twenty-six such locomotives, together with track equipment, transformer substations and 27,000 kw. in generating plant. These polyphase motors were chosen as against single-phase commutator motors on account of space limitations and lower cost, and the possibility of regenerative and safer braking on the heavy down grades.

The single-phase commutator motor designed by Mr. F. F. W. Alexanderson, of the General Electric Co., U.S.A., some particulars of which were given in a paper before the American Institute of Electrical Engineers in 1908, has given such satisfaction on motor coaches of the New York, New Haven & Hartford line, that new equipments of the same design have been ordered. The motor is fully described in an article by Mr. Alexanderson himself in the *Elektrotechnische Zeitschrift* of September 4th. It is a repulsion motor at starting. The heavy starting current is induced in the rotor, this reaching 1,200 amps. with a current of only 500 amps. in the contactor circuit. After a certain speed is reached, the windings are changed over to a combined series-repulsion connection, giving a better efficiency at high speeds. These motors are designed for 25-cycle operation, and it is stated that at this frequency the life of the brushes is as good as is obtained with a normal direct-current traction motor. The rotor acts as a ventilating fan, sucking air in through openings in the stator, and blowing it out at the commutator end. This method of cooling is said to keep the motor both cooler and cleaner than that of forced ventilation from outside. A locomotive with four 400-h.p. motors of the same design has just completed a several months' test satisfactorily.

The twelfth Annual Conference of the Municipal Tramways Association will be held at Sheffield on Sept. 23rd to 26th. On Wednesday, 24th, after the reception by the Lord Mayor, Mr. A. R. Fearnley will deliver his presidential address, and Papers will be read on Platform Fare Collection, by Ald. S. Flint (Leicester), and on Maintenance of Paving, by Councillor W. C. Fenton (Sheffield). The Paper down for the Thursday

is "Urban Passenger Transport," by Mr. J. B. Hamilton, General Manager Leeds Tramways. Visits to works will be paid in the afternoon, and the annual dinner is fixed for the evening.

With reference to the note on page 493 of our issue for August 28th, a revised scale of wages for motormen and conductors upon the Ashton Corporation tramways and the Stalybridge Joint Board's lines has been agreed upon, and the long dispute between the employees and the Corporation has now come to an end.

The Special Committee recently appointed by the Bristol Corporation to consider as to whether they should take over the Bristol Tramway Co.'s undertaking has called in Mr. J. B. Hamilton and Mr. J. F. C. Snell to advise them on the matter. As the result of the report of these two gentlemen, the Committee recommends the Corporation to apply to Parliament for powers to work the Company's undertaking if it should decide subsequently, as it may do, to acquire it.

### TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

The accounts of the Pacific Cable Board for the year ended March 31st, 1913, which have just been published, record a total expenditure of £200,170 (including an annuity payment for the replacement of capital of £77,545, a contribution of £2,048 to a provident fund, and £30,000 transferred to cable repair, reserve and renewal fund), and the receipts were £167,901 (of which £166,027 were actual traffic receipts), to which must be added the Government grant in aid of £27,645 and £18,782 brought forward from last year. There was thus the slightly lower balance of £14,157 to be carried forward. The aggregate capital expenditure now stands at £1,993,534. The report states that the cable and landline extensions described in last year's report between Australia and New Zealand have been duly completed by the India Rubber, Gutta Percha and Telegraph Works Co. and Siemens Bros. & Co., at a cost of about £177,730, which sum was drawn from the renewal fund. New electric light and refrigerating plant is being installed at Fanning Island. Some slight readjustments of tariff have been made, and in all 2,670,575 words have been dealt with in the messages transmitted during the year. The Hon. Thomas Mackenzie, High Commissioner for New Zealand, has been appointed to fill the vacancy on the Board caused by the retirement of Sir W. Hall-Jones, and Mr. A. S. Baxendale, London Manager and Secretary, has resigned his position, but the vacancy had not yet been filled at the date of the report.

It is stated that of the £50,000 voted by the Australian Commonwealth Government for the construction of wireless telegraph stations in Australia, £40,000 has already been expended. Stations have already been completed, and business is being transacted at Melbourne, Sydney, Fremantle, Adelaide, Hobart, Brisbane, Thursday Island, Port Moresby, Rockhampton, Cooktown, Geraldton, Mount Gambier and Esperance. A number of others are nearing completion.

In a few months' time it is expected that the Post Office will be opening a full automatic telephone exchange in Darlington which will have an equipment of 800 lines, this being supplied by the Western Electric Co.

In New Zealand automatic telephony is also making considerable progress. The New Zealand Government has accepted the Western Electric Company's tender for full automatic telephone exchanges in the chief towns. At Wellington three central exchanges will be erected successively for 1,300, 600 and 2,800 lines, and in addition there will be three sub-exchanges. At Auckland the exchanges and sub-exchanges will total 6,810 lines; in Blenheim, Hamilton, and Oamaru 600-line exchanges will be erected, and at Masterton an 800-line exchange. These will all be on the Western Electric Company's own system, similar to the one which is being equipped in this country at Darlington as mentioned above.

## "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

### Specifications Published September 4th, 1913

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

Names in italics indicate communicators of inventions from abroad.

11,479/12. **Alarms for Wireless Stations.** W. H. SHEPARD and A. E. McKECHNIE. The alarm is constructed so that an audible signal is given when a message is about to be received, but which is inoperative during the reception of the message. This is provided for by the connections to the telephone switch arm. A metal ball or pivotted weight is normally held up by an electromagnet which, when the message is signalled, is released, but is returned when the telephone switch hook is moved. Three figures.

18,371/12. **Mercury Vapour Lamps.** B.T.-H. Co. (*G. E. Co., U.S.A.*). A silica envelope of limited volume free from idle condensing space, contains a solid anode and a mercury cathode. Some liquid mercury is contained in a pocket near the anode, so as to be vapourised by it. Five figures.

18,422/12. **Alarm Signals for Wireless Stations.** J. T. SIBLEY. Alarm signals are sent only when required, depending on the length of the signals transmitted. The alarm circuit is closed by a solenoid whose action is retarded by a dash-pot or brake for a predetermined time, equal to the length of the alarm signals chosen. Two figures.

18,444/12. **Starting and Lighting System for Automobiles.** W. E. LAKE (*J. B. M. Elec. Co., U.S.A.*). The dynamo has two armature windings and a subdivided shunt field winding and an opposing series winding. For engine starting one armature winding is used, and for running as a dynamo the other winding is used. Control is effected through regulating vibratory switches and hand switches. One figure.

19,054/12. **Heating Elements.** C. R. BELLING. The resistor is wound on a former of china clay or other fireproof material with notched flanged edges, so that an air space exists between the wire and the former. The former is made with ribs at the back for strength, and it may be mechanically strengthened by an embedded crimped iron wire. Distance pieces between the edges may also be provided. Three figures.

19,064/12. **Thermal Storage Ovens.** H. J. PIPER and R. A. BRIDGWATER. The oven is made airtight and the double walls contain slag wool or a similar bad heat conductor. Metal masses heated by radiators in the walls have sufficient heat capacity to maintain a cooking temperature for a considerable time after the current is cut off. Six figures.

22,419/12. **Tirrell Regulators.** A. A. TIRRELL. A contact lever actuated by a coil energised from the circuit to be regulated is provided. This lever is connected to another lever which is oscillated by a coil, not directly dependent on the variations in the exciter circuit, so as to engage and disengage the contact lever and its fixed contact. Two relays are controlled by the regulator. One of these varies a shunt to a resistance in the exciter field circuit, and the other controls the main coil of the regulator. Five figures.

26,809/12. **D.C. Circuit Breakers.** BRITISH WESTINGHOUSE Co. The trip-coil of a D.C. circuit-breaker is connected in series with a condenser, and as a shunt to the circuit to be protected. Two figures.

28,042/12. **Multiplex Wireless.** S. D. WILLIAMS. In a non-synchronous system of duplex, duplex, or multiplex wireless telegraphy or telephony, a continuously rotating commutator with sets of contacts for putting the aerial in direct communication for periods of equal duration alternatively with the transmitter and receiver is used. One figure.

1,948/13. **Warning Signals on Railways.** R. W. PEARSON. On the approach of a train to a distant signal a bell is rung in the signal cabin or at a level crossing. A bell and visual signals may also be provided in the cab of the engine. The switch controlling the alarm circuits is actuated by the wheels of the train. Five figures.

5,040/13. **Wireless Transmitters.** C. SHOU. The signals sent out by a transmitting station are controlled over a telegraph line by a number of relays of the kind in which an iron armature is retained in its inoperative position by residual magnetism, and can be released by weak telegraphic currents. These currents are distributed to the relay through commutators, so that each single relay has a longer time for the performance of its functions than if a single relay were used.

10,154/13. **Telephone Relay.** F. MAJORANA. The telephonic currents pass through an elastic conductor stretched across a magnetic field. The resulting movements of this conductor produce changes in a microphonic contact or in the resistance of a liquid jet through which the main circuit to be controlled is closed. It is anticipated that this relay may also be used with oscillatory systems in wireless telephony. One figure.

### Specifications Published To-day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free.

Summaries of some of the more important of these patents will appear in our next issue.

**Arc Lamps:** BALFOUR and HITCHEN, 19,264/12; B.T.-H. Co. (*G.E. Co., U.S.A.*), 27,526/12.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** B.T.-H. Co. (*G.E. Co., U.S.A.*) [Motor control] 16,806/12 and 22,664/12; HANDCOCK, DYKES and DUDDELL [Switchgear and signals operated by resonance] 6,772/13; W.E. Co. (*W.E. Co., U.S.A.*) [Flexible conductors] 10,164/13; FRANZ [Control of series-connected apparatus] 15,502/13.

**Dynamos, Motors, and Transformers:** BULLOCK [Convertors] 19,000/12; GIRVIN [High-pressure D.C. dynamos] 22,270/12.

**Electrometallurgy and Electrochemistry:** GIULINI [Aluminium nitride production] 25,874/12; JOHNSON (*Deutsche Gold and Silber-Scheide-Anstalt*) [Alkali metal production] 1,933/13; LOBECK [Milk sterilisation] 14,249/13 and 14,256/13.

**Heating and Cooking:** GEB. SIEMENS [Non-metallic heating elements] 7,932/13.

**Ignition:** RILEY [Spark plugs] 23,404/12.

**Incandescent Lamps:** WESTINGHOUSE METALLFADEN GLUHLAMPENFABRIK [Tungsten and molybdenum wire filaments] 3,162/13; A.E.G. [Lamp-manufacturing machines] 14,433/13.

**Instruments:** COPLANS [Liquid conductivity] 19,113/12.

**Switchgear, Fuses and Fittings:** POLLAK [Pressure regulators for variable-speed generators] 16,782/12; KLEIN [Snap switches] 19,073/12; STERN and BRITISH EVER-READY ELEC. Co. [Switches for hand lamps] 19,451/12; B.T.-H. Co. and WATSON [Automatic dynamo regulators] 26,597/12; SIEMENS DYNAMO WORKS and BOLTON, 27,874/12; HADDAN (*Ludenschneider Metallwerke A.-G.*) [Swan contacts] 29,372/12; CLEMENS and MONARCH REFILLABLE FUSE Co. [Refillable fuses] 3,573/13.

**Telephony and Telegraphy:** GIRARDEAU [Indirect excitation of oscillatory circuits] 11,703/12; AUTOMATIC TELEPHONE MFG. Co. (*Automatic Elec. Co., U.S.A.*) [Signalling] 19,255/12; AKT. L. M. ERICSSON & Co. [Trunk line switchboard clock control] 11,658/13; DUBILIER [Production of alternating or pulsating currents] 16,917/13.

**Traction:** TELLOW [Trolley collectors] 16,549/12; VON KRAMER [Traffic regulation and control] 19,467/12; TARRANT and SYKES [Signalling] 10,063/13.

**Miscellaneous:** DAVIES [Clock movements] 18,654/12; BRYAN and MOUNTFORT [Controlling valves] 19,203/12; STERN and BRITISH EVER-READY ELEC. Co. [Portable lamps] 19,318/12; SEVERY and SINCLAIR [Pulsation timing devices for electrically-driven musical instruments] 19,870/12; B.T.-H. Co. (*G.E. Co., U.S.A.*) [Vacuum glass containers with sealed-in conductors] 23,775/12; SNOOK and KELLY [X-rays] 24,046/12; WATKINS [Adjustable condensers] 2,238/13; A.E.G. [Clocks] 6,934/13; SIEMENS SCHUCKERT [Regeneration of transformer oil] 8,130/13.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Dynamos and Motors:** WHITESIDE [Motors] 18,178/13.

**Ignition:** RENAULT [Engine self-starter] 18,252/13.

**Incandescent Lamps:** PODSZUS [Manufacture from refractory material of parts of incandescent lamps] 18,323/13.

**Switchgear:** SIEMENS-SCHUCKERT, 17,532/13.

**Miscellaneous:** SNOOK [X-rays] 16,853/13; MÖLLER [Separation of suspended particles from gases] 18,357/13; BRUNS [Remote control of valves] 18,526/13.

### Grant of Patent Allowed

16,821/12. **Sewing Machine Lighting.** J. M. WALLWIN. The grant on this application, though opposed, has been allowed.

### Expired Patents

The following are the more important Patents that have become void through non-payment of renewal fees.

**Distributing Systems, &c.:** JOHNSON-LUNDELL ELEC. TRACTION Co. (*R. Lundell, U.S.A.*) [Control of compound wound motors for overbalanced lifts, &c.] 11,304/03; SIEMENS DYNAMO WORKS and H. B. POYNTER [Speed control of polyphase induction motors using auxiliary motor-generator] 11,873/07.

**Dynamos, Motors, and Transformers:** B.T.-H. Co. (*G.E. Co., U.S.A.*) [Traction motor field magnet spools] 11,444/04; J. B. BROOKS and F. H. ALSTON [Induction coils] 11,170/08.

**Electrochemistry:** G. J. ATKINS [Cells and electrodes] 11,470/04.

**Instruments and Meters:** M. KALLMANN [Calibration] 28,049/06.

**Traction:** W. P. THOMPSON (*W. H. Arnold, U.S.A.*) [Bearings for trolley wheels] 11,056/08.

**Miscellaneous:** S. O. COWPER-COLES [Electroplated lamp reflectors] 12,005/07; W. S. STELJES [Secondary clocks] 25,577/08.



# Space will Not Allow

READING  
—  
TABLE  
■—  
STUDY  
■—  
PIANO  
—  
DESK  
LAMP

This is only  
**ONE LAMP,**  
but can be  
adapted to the  
above uses  
and more.

PRICE  
**£1 4s.**

Including  
Flex. Plug, and  
Lamp Adaptor.

us to explain here the numerous advantages and uses of the D.G. Adjustable Reading Lamp. We have therefore compiled a small folder giving illustrations and diagrams of the Lamp, detailing the cleverly constructed Revolving Shade, and the benefits to the eyes derived from its use, the scientifically designed Reflector, etc.

Write or 'phone for a supply of this literature with your name and address overprinted free of charge.

**DRAKE  
AND  
GORHAM  
LIMITED**

**LONDON:** 1, Felix Street, S.E.

(4388, Hop.)

**MANCHESTER:** 47, Spring Gardens.

(3700, City.)

**GLASGOW:** 50, Wellington Street.

(2198, Argyle.)

**LIVERPOOL:** 37, School Lane.

(754, Royal.)

When corresponding with Advertisers, please mention "Electrical Engineering."



**How to Kill two birds  
with one stone !!!**

Increase your revenue and  
reduce your maintenance  
charges by using the

**"NEW BASTIAN" METER**

For instructions on Cleaning and Polishing  
Electrical Fittings and Electric Cookers, read

**CANNING'S HANDBOOK ON**

**POLISHING, ELECTRO-PLATING & LACQUERING.**

Fully Illustrated. Price 2s. 3d. post free. Abroad, 2s. 6d.

**W. CANNING & CO., BIRMINGHAM.**

LONDON: 18/20, ST. JOHN'S SQ., CLERKENWELL, E.C.

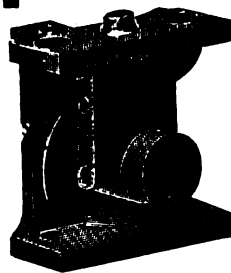
MENTION BOOK E&A.

**Why waste time and money  
on machining**

small intricate pieces when the most complicated  
parts can be cast in a finished state by

**"PRANA"**

**Die-finished Castings**



HOLES, SLOTS, etc., CAST to  
PERFECT SIZE! ABSOLUTE  
ACCURACY GUARANTEED  
FOR ALL REPETITION WORK

Send for illustrated booklet, mentioning  
this paper; or send sample for quotation  
to

**AERATORS, Ltd**

UPPER EDMONTON

LONDON, N.

**ELECTRICAL PORCELAIN**

OF.

**HIGHEST QUALITY**

APPLY TO

**JAMES MACINTYRE & CO., LTD.,**

BURSLEM.

The Micanite & Insulators Co., Ltd

WALTHAMSTOW,  
London, E.

FOR **FIBRE**  
SHEETS, RODS  
AND  
TUBES.

**BLAKE & INSULATING STAPLES**

Write for Samples and Prices.

**MOSSER & MITCHELL,**

Chiswell Works, 122-124, GOLDEN LANE, E.C.

**STEATITE  
INSULATORS**  
SUPPLIED  
FOR ALL KINDS OF  
ELECTRICAL WORK  
**WILLIAM SUGG & CO. LTD.**  
WESTMINSTER.

THE

**India-Rubber, Gutta-Percha & Telegraph Works Co., Ltd.**  
(The **SILVERTOWN** Company),

manufacture  
CABLES for Telegraphy, Telephony, Lighting and Power, BELL WIRES, TELEPHONE  
CORDS and FLEXIBLES, India-Rubber and Gutta-Percha Insulated WIRES, SHOT-FIRING  
WIRES, DYNAMOS, BALANCERS, BOOSTERS, MOTOR-GENERATORS, ROTARY  
CONVERTERS, PETROL-ELECTRIC SETS for Country House Lighting, Yacht and Ship  
Lighting, and Isolated Plants generally. MOTORS for all classes of service, SWITCHBOARDS,  
INSTRUMENTS for Telegraph and Testing Purposes, POWER SWITCHBOARDS for Tele-  
graph and Telephone Purposes, PRIMARY BATTERIES (Leclanché, Daniell, Bunsen, &c.),  
INSULATORS, INSULATING TAPES and JOINTING MATERIALS, RUBBER  
INSULATING GLOVES, &c., &c.

**SILVERTOWN**

MANUFACTURES HAVE ALWAYS BEEN NOTED FOR EFFICIENCY  
AND A HIGH STANDARD OF WORKMANSHIP AND FINISH.

Estimates and Price Lists on Application.

HEAD OFFICES: 106, Cannon Street, London, E.C.

WORKS: Silvertown, London, E.

BRANCHES:

HOME.—Belfast, Birmingham, Bradford, Bristol, Cardiff, Dublin, Glasgow, Liverpool, Manchester, Newcastle-on-Tyne,  
Portsmouth, Sheffield.

ABROAD.—Adelaide, Brisbane, Buenos Ayres, Bulawayo, Calcutta, Christchurch (N.Z.), Durban, Hobart, Johannes-  
burg, Launceston, Melbourne, Perth, Sydney.

When corresponding with Advertisers, please mention "Electrical Engineering."

## LOCAL NOTES

**Carlisle: Electricity Undertaking.**—The late City Electrical Engineer, Mr. S. T. Allen, has, at the request of the Electricity Committee, issued a statement upon the electricity undertaking for the year to March 31st, 1913. In this he points out that although the net profit is much lower than in the previous year, a large amount of capital expenditure has been charged to revenue, including £1,560 for a new switchboard. Nevertheless, the reduction in the net profit was only £1,234, in spite of other items of capital expenditure, in addition to the one mentioned above, being charged to revenue. The working expenses were the lowest on record, and only in one item has there been any increase, viz., that of fuel, which went up from 0.22d. to 0.23d. per unit. The revenue account showed an increase of £1,438, notwithstanding that the average price received per unit sold had gone down from 0.76d. to 0.72d. During the year three miles of new mains were laid.

**Hastings: Street Lighting.**—A uniform charge of £5 14s. each per annum has been agreed upon with the Electric Lighting Committee for those public lamps containing two incandescent burners.

**Hobburn: Fusing of Cables.**—The Board of Trade is to hold an inquiry into an explosion which took place a short time ago, through the fusing of an electric cable, which resulted in a fatal accident. Since that accident, other complaints have been made by residents along the routes of mains as to strong smells of bitumen in their houses, which, it is alleged, are due to the electric mains.

**King's Lynn: Electricity Accounts.**—There was a gross profit of £3,790 upon the electricity undertaking last year, and the net revenue account, including £2,038 from the previous year, was £5,828, after meeting capital charges and transferring £300 to relief of rates. The balance of £2,388 is carried forward.

**Leeds: Purchase of Roundhay Co.**—The Finance Committee propose to purchase the Roundhay & District Electric Lighting Co. at a cost of £12,390, plus £500 for liquidation purposes, the taking over of the Company's liabilities, and the making good of the Company's overdraft at the bank, making a total expenditure of between £16,000 and £17,000. When the matter came before the City Council last week, objection was taken to the proposition on the ground that the Electricity Committee had not been consulted, and in order to allow this to be done the recommendation was withdrawn for a month.

**Middleton: The Electric Power Co.**—The Corporation has agreed to the Lancashire Electric Power Co. supplying the Calico Printers' Association, Ltd., with power. It is satisfactory to note that the Corporation has taken up the attitude not often adopted under similar circumstances, that, as they themselves are unable to supply this consumer, who is in their own area, they think it their duty to allow the Power Co. to do so.

**Portsmouth: Electricity Accounts.**—After meeting capital charges, there was a net profit of £3,112 on the working of the electricity undertaking last year. Of this amount £2,500 has been transferred to relief of rates, and £500 to reserve. The number of units sold was 3,780,860.

**Redditch: Position of Electricity Undertaking.**—As reported in our columns, a special committee of the Corporation a short time ago made a special investigation into the position of the electricity undertaking, and made certain recommendations. The newly appointed Engineer has now informed the Committee that there is no stand-by machinery, and that a breakdown of the turbine at any time would mean a total failure of the supply. This report has once again disturbed those members of the Council who are opposed to the undertaking being retained, and notice has been given of a resolution calling upon the Clerk to convene a town meeting to consider the advisability of selling the undertaking, in view of the necessity for further capital expenditure as revealed by the Engineer's report, and also in view of the heavy losses which the undertaking has involved during its fourteen years' existence.

**Stirling: Proposed Purchase of Electricity Undertaking.**—With reference to the recent notes in these columns regarding the proposal of Messrs. Balfour Beatty & Co. to purchase the electrical undertaking, and to convert the horse tramways to electric traction, this firm has now been asked to submit details of their offer.

**West Hartlepool: Waste Heat Power Station.**—All the consumers on the mains of the Corporation have now been transferred to the new waste heat power station.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

## Generating Stations, Sub-Stations, Mains, &amp;c.

**Bacup.**—A loan of £1,800 for additional H.T. feeders is to be applied for.

**Batley.**—Two new substations are to be built.

**Braintree.**—The Council has appointed a consulting engineer to report upon an electric lighting scheme.

**Cardiff.**—A loan of £30,500 is to be taken up chiefly for new turbine plant at the Roath power station.

**Carlisle.**—An expenditure of £4,300 in connection with the H.T. supply has been sanctioned.

**Eastbourne.**—A loan of £3,000 for additional mains is to be applied for.

**Ilkley.**—Complete power-station equipment. Consulting Engineer, Mr. George Wilkinson. October 6th. (See advertisement on another page.)

**Leek.**—Various cable extensions are to be made.

**Lurgan.**—The Council has under consideration a report by a consulting engineer upon an electric lighting scheme.

**Plymouth.**—An inquiry has been held concerning a loan of £5,500 for extensions of the plant at the electricity works.

**Port Elizabeth.** Considerable extensions are to be carried out to the electrical undertaking. Their urgency is so great that, owing to the absence through illness of the Council's Electrical Engineer, a temporary engineer is to be engaged to take charge of the extension scheme, says the *British & South African Export Gazette*.

**Royton.**—Mr. S. W. Newington, Chief Electrical Engineer to the Oldham Corporation, has reported upon an electric supply scheme for this district.

**St. Anne's-on-Sea.**—The L.G.B. has sanctioned a loan of £3,000 for mains and services.

**Salford.**—A loan of £2,000 is to be taken up for the conversion of a portion of the three-phase bulk supply at 6,600 volt to 3,000 volt two-phase supply.

**Teignmouth.**—Mr. E. M. Lacey has been retained to report upon the supply of electricity in Teignmouth and Shaldon.

**Warrington.**—Plant extensions.

**Wigan.**—One 1,500-kw. turbo-alternator, jet condenser and pipework. Borough Electrical Engineer.

**Wolverhampton.**—Two electrically-driven centrifugal pumps are to be installed at the waterworks at an estimated cost of £650.

**Worcester.**—A recommendation by the Electricity Committee to instal a wet air filter plant for the 1,500-kw. turbo-alternator at the power station has been confirmed. This decision is the direct outcome of the discussion at the I.M.E.A. Conference this year.

## Wiring

The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.

**Battle.**—With reference to the note on page 496 of our last issue, notice has been given by one of the Guardians to rescind the resolution authorising the installation of electric lighting at the workhouse.

**Bridgwater.**—Enlargement of hospital (£5,000).

**Cheltenham.**—New municipal offices.

**Dublin.**—Cinematograph theatre in Henry Street. Architect, B. Crewe, 75 Shaftesbury Avenue, London.

**Eastbourne.**—Electric lighting of workhouse.

**Halifax.**—New cinematograph theatre.

FOR  
STEAM JOINTS  
USE



JOHN HUDSON & CO.'S SUCCESSORS, Mansell St., London, E.

**Leigh (Lancs.).**—Secondary School.  
**Malvern.**—New elementary school.  
**Manchester.**—Extensions to Education Offices in Deansgate (£5,000).  
**Sheffield.**—Extensions to Town Hall (£42,800).  
**Stockport.**—Trades hall. Architects, Swann & Stockton, St. Peter's Chambers.  
**Swansea.**—New nurses' home (£6,500).

### Miscellaneous

**Australia.**—Eighteen flame arc lamps and accessories are required by the Victorian Railway Commissioners.—The New South Wales Government Tramways require thirteen 600-volt D.C. motors with field rheostats.—A common battery multiple switchboard and eight automatic switchboards are required by the Deputy Postmaster-General, Melbourne. Further particulars, 73 Basinghall Street, London, E.C.—The City of Melbourne requires 9,147 yds. of lead-covered cable, and three 250-k.v.a. three-phase transformers. Messrs. McIlwraith, McEacharn & Co., Biliter Square Buildings, E.C.

Tenders are invited for the overhead electrical equipment and overhead transmission mains for the Melbourne suburban railways. (See advertisement on another page.)

**Greece.**—A 10-ton and a 6-ton electric crane is required for the docks at the Piræus. Chairman, Harbour Board. Sept. 30th.

**London: Mile End.**—A twelve months' supply of electrical fittings for Guardians. Clerk, Bancroft Road, Mile End.

**New Zealand.**—A.C. voltage regulators for 3,000-volt and 400-volt circuits by the Dunedin Town Council. Town Clerk, Nov. 12th. Further particulars, 73 Basinghall Street, E.C.

### TENDERS RECEIVED AND ACCEPTED

**Bacup.**—The tender of Messrs. W. T. Glover & Co. has been accepted for 4,000 yds. of 0.1 sq. in. cable.

**Dundee.**—A contract for converting machinery has been placed with Bruce Peebles & Co., at £1,500, the cable contract in connection therewith having been given to the British Insulated & Helsby Cables, Ltd.

**Manchester.**—The following tenders have been accepted:—Cable, W. T. Henley's Telegraph Works Co., Callender's Cable & Construction Co., and Johnson & Phillips; water-softening plant for the Stuart Street station, the Kennicott Water Softening Co.

**Peterborough.**—The tender of Messrs. Crompton & Co. has been accepted at £576 for a switchboard.

**South Africa.**—The *African World* states that the A.E.G. Electric Co. of South Africa has received a contract for the entire equipment of the new power house which is being erected by the Stellenbosch municipality.

**Torpoint.**—An offer by the local electric light company to supply 50-c.p. lamps for street-lighting purposes at £2 5s. per lamp per annum has been accepted for a period of five years.

### APPOINTMENTS AND PERSONAL NOTES

Mr. R. P. Brousson, General Manager and Engineer to the Great Northern & City Railway Co., has severed his connection with the undertaking on its acquisition by the Metropolitan Railway Co. We understand that Mr. Brousson will in future be associated with Messrs. S. Pearson & Son, the large firm of contractors, in connection with a number of electrical undertakings with which that firm is now concerned.

Mr. S. Boys, who for the past two-and-a-half years has held the position of Supplies Manager to the Sheffield branch of Messrs. Siemens Bros. Dynamo Works, Ltd., and has been associated with the firm for over ten years, is resigning this position to take up an appointment with the Edison & Swan United Electric Light Co., Ltd., where he will take charge of their London business.

The salary of Mr. H. F. Friederichs, Chief Electrical Engineer to the West Hartlepool Corporation, has been increased by £40 to £450 per annum.

After some discussion, the maximum salary of Mr. F.

Garside, Borough Electrical Engineer, Aldershot, has been increased from £300 to £350 per annum.

Mr. R. M. Carr, Borough Electrical Engineer at Leek, has resigned on receiving a more important appointment elsewhere. Applications are to be invited for the appointment of a successor to Mr. Carr at a salary of £225 rising to £275 per annum.

Mr. J. S. Smith, Charge Engineer at the Burton-on-Trent electricity works, has resigned. A successor is to be appointed.

### MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. G. Smith & Son, of 5 Philpot Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night, was £77 5s. to £77 15s. (Last week, £74 to £74 10s.)

**Rapid Delivery of Osram Lamps.**—The General Electric Co. tell us of a case of extremely quick delivery of some lamps which were called for on June 4th and reached their destination at Kalgoorlie (370 miles inland in Western Australia) by July 12th, thus covering 10,750 miles in thirty-eight days, an average of about twelve miles per hour for the whole distance.

### COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &c.

**British Electric Transformer.**—An interim dividend at the rate of 6 per cent. per annum less tax has been declared on the ordinary shares for the past year.

**Clyde Valley Electrical Power Co.**—At the half-yearly meeting last week a net profit of £25,907 was reported for the June half year. It has been decided to transfer £12,500 to depreciation, bringing this fund to £68,890. Contracts are in hand for an increase in the connections, bringing them to 6,438 h.p.

**The I.M.E.A.**—The Proceedings of the 1913 Convention of the Incorporated Municipal Electrical Association have now been published, and contain, as usual, the papers and discussions in full, as well as the Council's Report and list of members. In addition to the Proceedings of the Convention, the volume contains a Paper by Mr. A. M. Reid, Chief Accountant to the Dundee Corporation Electricity Department, upon "The Reliability of the 'Total Cost Per Unit Sold.'" In this Paper is discussed some possible reasons for the somewhat wide difference in the costs of various undertakings of a similar size and working under similar circumstances, as revealed by the analyses of accounts published from time to time in the technical press.

**Deaths from Electric Shock.**—Two deaths from electric shock have occurred during the week. In one case a telephone employee at Kirkcaldy was engaged upon some telephone wires in Strathore Road on a pole which also carries the Fife Electric Power Company's 8,000 volt cables. Whilst carrying out his work, his head came into contact with the power cable, and he received a fatal shock. In the other case, an electrical assistant in the works of Messrs. Stevenson & McKellar, of Pollokshaws, by some means received a fatal shock from an electric motor.

**Osram Lamps.**—The Osram Lamp Works, Ltd., last week applied before Mr. Justice Astbury, sitting as the vacation judge, for an injunction to restrain Messrs. Glenn & Co. until the trial or further order, from an alleged infringement of their patents. For the defence it was claimed that there was evidence to show that the filament in the lamps in question was not a squirted filament but a drawn filament. Mr. Justice Astbury decided that he could not grant an interim injunction, but the defendants undertook to keep an account of the lamps sold pending the action.

**COMPOUND DYNAMO** wanted, 110 volts direct, 50 amperes. AILSA CRAIG MOTOR WORKS, Chiswick.

**PLATINUM UTENSILS, SCRAP, LAMP TOPS.**—Best prices given by DERBY AND CO. LTD., 44 Clerkenwell Road, London, E.C. N.B.—Platinum Sold.

**WANTED.**—Old electric lamp tops. Scrap Platinum, Mercury, False Teeth, Metals, Rubber, Cable. ATLAS Co., Umfreville Road, Harringay, N.



# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 351 [VOL. IX., No. 38]  
*All rights reserved.*

THURSDAY, SEPTEMBER 18, 1913.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES and TECHNICAL COLLEGE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

*Other Advertisement Rates on Application.*

#### Latest Time for Receiving

Letters for Insertion, Tuesday first post.

Small Advertisements and Official Announcements, Wednesday first post.

Displayed Advertisements, Tuesday first post.

Corrections in Standing Advertisements, Monday first post.

All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 208-206, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Circling, Fleet, London." Telephone No.: 5509 Holborn.

Orders to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

### SUMMARY

SOME notes on the arrangements for the next session and other matters relating to the Universities and Technical Colleges are given. (Page 521.)

THE meeting of the British Association at Birmingham commenced with Sir Oliver Lodge's presidential address last Wednesday, and the work of the various sections started on the following morning. Prof. Kapp's address to the engineering section dealt with electric traction on main line railways. He expressed the opinion that there was little probability that the high-pressure D.C. system could beat the single-phase system, and none whatever that it would beat the three-phase system. There was also a discussion on fuel in the same section, and in the chemical section Prof. W. M. Thornton spoke on coal-dust explosions. (Page 523.)

AN interesting Paper in the Engineering Section on Friday was read by Prof. J. T. Morris, on the cost of a year's electric cooking in a small household, and mine explosions were referred to in an evening discourse. (Page 524.)

THE principal electrical Paper on Monday was by Dr. W. H. Eccles, before Section A, on the action of wireless telegraph receivers of the loose-contact type, but on Tuesday a Paper was read by Mr. W. R. Cooper advocating a method of making heating tests of electrical machinery by short runs. Prof. E. Wilson also gave the results of some exposure tests of copper,

aluminium, and duralumin, which came out in that order as regards durability. An interesting discussion on wireless telegraph wave propagation occupied a part of Tuesday morning's meeting. (Pages 524 and 525.)

ON Tuesday, Mr. J. S. Anderson described, before Section A, a method of starting mercury vapour lamps without tilting, and in Papers before that section on Wednesday, Mr. W. H. F. Murdoch gave particulars of a magnetic susceptibility meter, and Mr. J. S. Anderson described a new method of sealing electrical conductors through glass. (Page 525.)

REPORTS were submitted during the meeting of committees on electrical standards, nomenclature, and radiotelegraphic investigations. (Page 525.)

SOME good results as regards both weight and efficiency have been obtained from a process of making new, or regenerating old, storage battery plates. (Page 526.)

A SHORT illustrated article describes a new design of switch panel for electric cranes. (Page 526.)

A NEW electric water heater, some motor-car lighting switches, and an indirect lighting fitting are illustrated on page 528.

THE electrical driving of sheet rolling mills is dealt with in our Questions and Answers columns. (Page 529.)

NEW designs of potential transformers and continuous current motor starters and a new style of glassware are referred to in articles on page 529.

WE refer to the Aisgill disaster on the Midland Railway in connection with the electric lighting of trains, and give particulars of what the Midland Railway is doing with regard to track circuit signalling and electric locking devices.—The Bristol Corporation proposes to apply for powers to work the local electric tramways.—A partly underground and partly elevated electric railway is to be constructed in Berlin. (Page 530.)

UNDER "Telephony and Telegraphy," we refer to several Papers on wireless telegraph subjects read before the British Association, including one by Dr. W. H. Eccles on the theory of the behaviour of "loose contact" receivers, and a discussion on two Papers dealing with the nature and propagation of electric waves by Prof. G. W. O. Howe and Dr. Eccles, and one on the variation with meteorological conditions of the strength of wireless signals received at Liverpool from Paris, by Dr. E. W. Marchant. (Page 531.)

THE specifications published by the Patent Office last Thursday include one for a voltage regulator, by A. Pollak; a motor control system, by the B.T.H. Co., who also patent some improvements on their Tirrill regulator, and a rectifier with condensers to prevent sparking, by A. Bullock. The patents relating to metal filament lamps include a Westinghouse patent for drawn filaments and a machine for fusing in holding wires, by

the A.E.G. Among other subjects treated are isolating switches and variable condensers. (Page 532.)

THE whole of the Carlisle electricity profits are to be handed over to the relief of rates.—Public electric lighting is to be installed at Llanidloes, following a dispute with the gas company.—Progress is being made with electric lighting schemes at Portrush, Eastwood, and Truro.—Extensions of the lighting areas of Hull and York are contemplated. (Page 533.)

HIGH and low tension switchgear is required for the Melbourne Railways, and also by the Carlisle Corporation; cables at Harrogate and Heywood; a 125-h.p. motor at Hammersmith, and an air compressor at Salford.—A loan of £30,000 is to be taken up at Oldham, and various electrical plant is required in Australia. (Page 533.)

A 6 PER CENT. dividend is paid by the Victoria Falls and Transvaal Power Co. for last year, the carry forward being £96,787.—The revenue of the Yorkshire Electric Power Co. for the June half year increased by no less than 48 per cent., the net profit being £6,971. No dividend is paid on the ordinary shares, but £4,308 are carried forward. (Page 534.)

**Unique Turbo-Generator Sets.**—Some new turbo-generators of 30,000-kw. capacity were recently ordered by the Interborough Rapid Transit Co., of New York. These large turbines are divided into two elements, a high-pressure set running at 1,500 r.p.m., and a low-pressure set fed with steam from the first set running at 750 r.p.m. By this means the temperature range in either element is reduced, and a high efficiency obtained without exceptional mechanical difficulties. The loss due to two separate generators being used is said to be more than counterbalanced by the more efficient turbine speeds. According to the *Electric Railway Journal* (New York), two separate turbine elements driving separate generators at different synchronous speeds has never been done before. On a 29-in. vacuum, 75½ per cent. of the available energy of the steam has been guaranteed to be available at the generator terminals by the Westinghouse Machine Co., which is building these units.

## UNIVERSITY AND TECHNICAL COLLEGE ANNOUNCEMENTS

THE recently issued "Announcements" for the session 1913-14 at the Northampton Polytechnic Institute (Clerkenwell, E.C.) shows that both day and evening courses in electrical and mechanical engineering, including wireless telegraphy and electro-chemistry, may be taken. The Principal of the College and Head of the Electrical Department is Dr. R. Mullineux Walmsley. The day courses commence on Monday, September 29th, and the evening classes on Monday, September 22nd. Enrolments for the latter commenced on Monday last. The engineering day courses are being continued with certain minor developments. In the evening classes departures have been made by the introduction of short courses of lectures by specialists in their various subjects. Thus, in the electrical engineering department one of the series of advanced lectures has interpolated a special course of six lectures on "Business Engineering in its Legal Aspects," by Major W. A. J. O'Meara, whilst another course has interpolated a special course of six lectures on "Secondary Batteries," by Mr. W. R. Cooper. These special courses, whilst intended primarily for those who are taking the full course, can be attended by others who are specially interested in the subject. A new departure is also being made in the section of the telegraphy and telephony in the arrangement of special classes for workmen on the maintenance and constructional staff of the Post Office, and also for the boy messengers. Special classes in submarine cable work for the employees of the various cable companies who have their headquarters in London are to be held, under the direction of Mr. J. H. Stephens, of the Eastern Telegraph Co.

The full course of study in electrical engineering at King's College, London, provides, in addition to the academic training, opportunity for practical training in works. Three-year courses are also held. These courses are arranged to be suitable for candidates for the engineering degrees of the University of London, or for the diplomas and certificates of the College. Prof. D. S. Capper is Dean of the Faculty of Engineering, and Prof. Ernest Wilson is Head of the Electrical Engineering Department. Full information as to the courses can be obtained from the Secretary, King's College, Strand, W.C.



MEMBER OF THE GENERAL PUBLIC:—Here is something from the British Association for the Advancement of Science which I can understand at any rate.

## THE MEETING OF THE BRITISH ASSOCIATION AT BIRMINGHAM

THE Birmingham meeting of the British Association commenced on Wednesday of last week with the Presidential address of Sir Oliver Lodge, which was entitled "Continuity" and dealt with some tendencies of present-day scientific thought, particularly as regards the existence of a continuous ether, and contained various speculations regarding continuity in other branches of thought. The work of the various sections started on Thursday. That of Section G (Engineering) commenced with the sectional presidential address of Dr. Gisbert Kapp.

### Electric Traction on Main Line Railways.

Professor Kapp devoted his address mainly to a survey of the present position of electric traction on railways, the best argument in favour of which was the vast amount of capital now being spent in many countries on the conversion to electrical working of main lines. He dismissed briefly as obsolete the Ward-Leonard system of single-phase transmission and continuous-current driving, and also the three-wire continuous-current system of obtaining high trolley voltage with low motor voltage, and took up in more detail the three-phase, single-phase, and continuous-current methods as now applied. In the three-phase system, largely used in Italy, the objections of complication of the double overhead wire, the danger that the motors would not share the load equally, and the inability to run without rheostatic waste at intermediate speeds, or to run at a higher than synchronous speed to make up for lost time, have been found to be of little weight in practical work. Any slight inequality in the driving-wheels of two locomotives coupled together may be compensated for by an adjustment of the slip of the motors, and in some cases, an automatic slip adjusting liquid rheostat is used controlled by a series solenoid which incidentally gives a wonderfully constant acceleration. As many as four economical speeds are obtained by pole-changing, which has now superseded the cascade connection. The main advantage of the system is the steady regenerative braking possible on down grades, which not only allows of higher safe speeds down hill, but saves as much as 17 per cent. on the coal bill. Recent designs of 2,000-h.p. three-phase locomotives weighed 30 kg. per h.p. With regard to single-phase motors, Dr. Kapp stated that the present tendency was in favour of the series rather than the repulsion motor, and mentioned the latest 2,500 h.p. locomotives of this class, designed by Behn-Eschenberg, weighing 43 kg. per h.p. These figures compare with 50 to 70 kg. per h.p. for the high-pressure C.C. system. The Deri motor, which had appeared promising, owing to its simplicity of control by brush shifting only, worked out rather heavy with the low frequencies alone possible in traction, and the Latour-Winter-Eichberg repulsion motor was only satisfactory at frequencies as high as 25 cycles. Its great advantage was its good power-factor and commutation at speeds slightly above synchronism. The line pressure on single-phase lines may be anything up to 15,000 volts, a figure likely to become standard in future, but with "high pressure" C.C. working, 1,200 volts is the maximum in America, 2,000 on the Continent, and 3,500 in England, in all cases with two motors in series. This last pressure is that used in the recent short section of the Lancashire & Yorkshire Railway equipped by Dick, Kerr & Co. Here motor coaches are used, each with four 300-h.p. motors, and the complete coaches weigh only 52 kg. per h.p. Such excellent commutation is obtained that one set of brushes lasts 50,000 miles. "From the figures quoted above," continues Dr. Kapp, "it will be seen that where motor coaches are employed, the C.C. system has an advantage in point of weight over the single-phase A.C. system. But main-line traction, including goods trains, is not going to be done by motor coaches, and if we come to large electromotives of some 2,000 to 3,000 horse-power, then this advantage is likely to vanish. No high-pressure C.C. electromotive has as yet been built for so large a power, and it is therefore not possible to make a direct comparison; but, if we may judge from the largest engines yet built for moderate-pressure C.C., there is little probability that the C.C. system for high-pressure can beat the single-phase system, and none whatever that it can beat the three-phase system." The interference with telephone lines of single-phase traction now appears to be due not to the commutator, but to the employment of open slots in the motors, and the trouble nearly ceased when rotors with semi-closed spiralled slots were used. Precautions, however, have to be taken to prevent the telephone lines acquiring a high potential. The frequency of 15 cycles chosen as standard by the Swiss Government Commission was chosen in preference to a higher figure mainly with a view to keeping down the number of poles of the motors, maintaining a good power-factor, less skin effect in the rails, and less liability to disturbance of neighbouring circuits. The address then set forth some details of the three-phase lines at work

in Italy, and the latest 2,500-h.p. single-phase locomotives now running on the Loetschberg line, and, in conclusion, mentioned the forthcoming conversion to electric traction of the Gothard line. The first section that will be converted is that between Erstfeld and Bellinzona, a length of 110 km., of which 29 are in tunnel, with heavy gradients. The Erstfeld-Airolo section will be running in four years, and the southern one a year later. Ultimately the electrical working is to be extended to Lucerne, 60 km. to the north, and to Chiasso, 55 km. to the south. Power will be taken from two water-power stations, one at Amsteg, where at first 32,000 h.p., and ultimately 60,000 h.p., will be available, and the other at Piotta for 40,000 h.p., and later 50,000 h.p. Power will be transmitted along duplicated feeders at 30,000 volts, and the line pressure will at first be 7,500 and later 15,000 volts. There are to be sub-stations at Biasca, Goeschenen, Lavorgo, and Bellinzona. Only locomotives will be used. These are to haul express trains weighing 420 tons at 50 km. per hour up grades of 2.6 per cent., which will require about 3,000 h.p. Goods trains weighing 670 tons are to be hauled by two locomotives at 23 km. per hour.

### Fuel.

An important feature of Thursday's meeting of the section was a discussion on fuel, initiated by Prof. F. W. Burstall (Birmingham).

Prof. Burstall emphasised the high thermo-dynamic efficiency of the gas engine, although he did not see much future for the gas turbine, and outlined gas and by-product production at the coal fields. There was no real rivalry, he said, between gas and electricity; both took their origin from coal, and each was capable of doing things that the other could not. Mr. W. M. Mordey and Prof. T. H. Beare looked forward to possible adaptations of the Humphry gas pump in conjunction with water turbines for driving dynamos.

A few references to electrical matters were made in some of the other Sections.

**Coal Dust Explosions.**—Mining engineers will be interested in a Paper read the same day before Section B (Chemistry) by Prof. W. M. Thornton (Newcastle) on the influence of the presence of gas on the inflammability of coal dust in air. This contained an account of a series of experiments on the sensitiveness to ignition of clouds of dust in various mixtures of gas and air, observing the minimum current required to be broken to cause an explosion. We hope to deal with this research more fully at a later date.

**Power Production.**—Reference was made in the presidential address of Prof. H. N. Dixon to Section E (Geography) to the power resources of the country, and the field of electric transmission, both in connection with water power which could thereby be used by means of the electric furnace for metallurgical processes, and in connection with power supply from the coal fields from generating stations at the pit's mouth, or possibly, as Sir William Ramsay had suggested, even without actually mining the coal.

The most important of the series of papers read before Section G on Friday morning, was that by Prof. J. T. Morris, entitled:—

### Cost of a Year's Electric Cooking in a Small Household.

Prof. J. T. Morris has taken some valuable records of the cost of electric cooking (and also lighting and heating) in a flat in Marylebone consisting of six rooms plus a kitchen and bathroom. Electric heating was not employed for the hot-water supply, but, instead of a kitchen fire for this, a small Carron coke boiler was employed, which also served to heat the kitchen in the winter and for burning rubbish. The figures represent consumption for five persons with occasional visitors. The item for heating does not comprise quite the entire cost, as a coal fire was used in one of the rooms for part of the period in question. No gas is used in the flat at all. The expenditure from July 27, 1912, to July 26, 1913, was as follows:—

	£	s.	d.
Annual "Telephone" charge	...	6	10 8
Hire of cooker at 15s. per quarter	...	3	0 0
Cooking: 2,934 units at 3d.	...	6	2 3
Heating: 2,068 " " "	...	4	6 2
Lighting: 200 " " "	...	0	8 4
		20	7 5
Coke and wood	...	4	11 0
		24	18 5

Owing largely to the reduction of the heavy work in the flat due to the suppression of the kitchen range, a saving of between £25 and £30 was made in the cost of domestic service.

A Jackson cooker was employed, having three hot plates, two for boiling, and one of lower heat for simmering purposes, one grill and a fair-sized oven, the approximate measurements being: height 38 in., width 30 in., depth 24 in. The Board of Trade units when each of the hot plates, &c., were in use individually for one hour is given in the following table:—

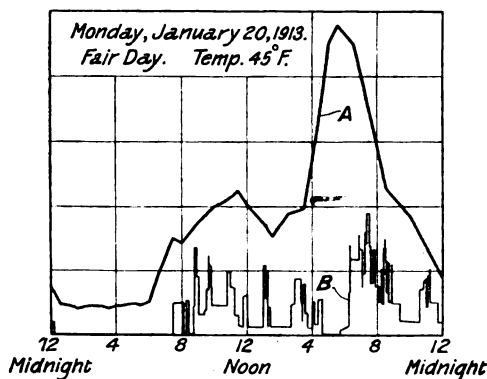
	No. 1.			No. 2.			No. 3.		
	Low.	Med.	High.	Low.	Med.	High.	Low.	Med.	High.
Units used in 1 hour	0.36	0.67	1.34	0.36	0.70	1.39	0.24	0.48	0.94

	Oven.			
	Grill.	One-third.	Two-thirds.	1/3+2/3rds.
Units used in 1 hour	1.34	1.06	2.11	3.17

Detailed observation of the consumption was carried out for the latter ten months of the period. For cooking, the number of units consumed weekly varied from 48 to 90 (excepting the Christmas pudding week, when it rose to 100). The weekly average during these ten months was 68.2, but it is seen from the first table that the average during the whole year was only 56.4. For lighting, an average of less than 5 units a week was consumed, and the maximum was 6.5.

A typical load curve, taken on Jan. 20th, 1913, is given below, compared with the station load curve; it is seen that



CURVES COMPARING GENERATING-STATION LOAD (CURVE A) WITH SHAPE OF COOKING, HEATING, AND LIGHTING LOAD DUE TO ONE CONSUMER (CURVE B).

the peaks do not exactly coincide, and that the addition of similar domestic cooking installations in large numbers would improve the station load curve considerably. The two curves are, of course, of different vertical scale.

In the concluding part of his Paper, Prof. Morris considered the direction in which further improvements in cooking apparatus were being made. Experience gained with his electric cooker had suggested the following:—(1) At present a rather serious obstacle in the way of reheating dishes—a common everyday need in most households—is the relatively long time taken in bringing the oven to the working temperature, and consequently the disproportionately large expenditure of energy to effect a comparatively trifling result. (2) The time taken to boil a pint of water, especially the first one in the morning when the cooker is quite cold, might be shortened with considerable advantage. (3) Cooking utensils, however perfectly flat-bottomed they may be when first supplied, appear, with ordinary wear and tear, too soon to lose this quality, so necessary for economy both in time and energy used. That these matters were receiving attention at the hands of some designers of electric cookers, he said, would be gathered from the following information which he had received since the first draft of his Paper had been made. The latest form of electric cooker, of which about a dozen are in use at the present time, have the ovens arranged so that the direct radiation from the heater is not shielded in any way, with the result that the time taken for raising the oven to the working temperature has been reduced to about one-half of what it was in the older patterns. Further, in a week or two a red-hot plate would be put upon the market which would halve the time necessary for raising cold water up to the boiling point, avoid the necessity for special utensils, and would be robust, for cold water could be poured upon it with impunity.

Professor MORRIS, after reading his Paper, added that in Birmingham heating was charged at 1d. per unit, and lighting

at 3d., whilst in addition the apparatus was not hired out, but sold on the hire purchase system. The altered conditions would make the year's cost in a similar case in Birmingham come to £33 15s. 4d., compared with the £24 18s. 5d. given in the Paper for Marylebone.

The CHAIRMAN (Professor Gisbert Kapp) mentioned the less shrinkage of meat with electric cooking, which was one of its great advantages.

Dr. J. A. FLEMING said he had carried on domestic cooking for three years, but one of its drawbacks was the irregular life of the heaters. There was also the difficulty that as the stoves were at present constructed, the heaters were not detachable, with the result that if anything went wrong, the whole oven had to be sent back to the makers for repair. As to the cost of electric cooking, he had to pay 1½d. per unit, and that put it out of court altogether for water heating. At ½d. per unit, electric cooking compared favourably with coal or gas, and none who had ever cooked electrically would want to give it up. Even at 1d. per unit it was comparable.

Professor MORRIS agreed with Dr. Fleming that the stoves should be so made that if anything went wrong it could be put right in the house at once. In Marylebone, however, the stoves were maintained by the Electricity Department, and the £3 a year included maintenance as well as hire. If anything went wrong, one had only to telephone the department, and it would be put right in two hours. He believed the hire charge of £3 was to be reduced considerably very shortly. On his particular stove also there was a spare hot plate.

**Mine Explosions.**—Means of preventing explosions in mines formed the subject of a discourse delivered on Friday evening by Sir H. H. Cunynghame. He enlarged particularly on the dust danger, and emphasised the necessity for enclosing lamps, coal-cutters, and all electrical machinery, so that they could not set fire to the dust.

The Papers read before Section G on Monday were none of them of direct electrical engineering interest. In Section A, however, Dr. W. H. Eccles read a Paper on the Contacts Used as Detectors in Radiotelegraphy. In this Paper, which is referred to more fully under "Telegraphy and Telephony," the author investigates to what extent the effects produced are due to thermo-electric action.

On Tuesday a Paper was read by Mr. W. R. Cooper on:—

#### Short Heat Tests of Electrical Machines.

Tests of dynamo-electric machinery are generally carried out extending over six hours in order to determine the maximum temperature rise. Suggestions have been made that such tests might be considerably shortened by assuming that the curve of temperature rise is a logarithmic curve. The author gives a brief account of the methods that have been proposed, and points out that the "thermal time constant," on which the behaviour of a body in heating and cooling largely depends, should be found most easily, and under less complex conditions, from the cooling curve. In order to test the applicability of the various methods, tests were made upon a 5-kw. motor-driven dynamo. The curves of temperature rise were found to be fairly logarithmic. The usual method of running a machine on test is to run on constant output with constant voltage, which necessitates increasing the input to the field coils as their resistance rises. A truly logarithmic curve can only be expected if the input of heat is at a constant rate, so that a better result would be expected if a machine were tested with constant input to the field coils, the output of the machine being constant, but at varying voltage. Actually this method of testing was not found to give an improved result. Graphical methods appear to give better results than formulæ, as the latter are very sensitive to small errors in the data. In any case only certain portions of the temperature-rise curve should be used, and any formulæ depending on the initial rate of temperature-rise should be avoided, as this is difficult of exact determination. The curve of cooling has certain advantages; only a small portion of it seems suitable for graphically determining the thermal time constant, but this quantity can be derived much more readily by the time taken for a certain percentage drop of temperature-rise. In the results given there is better agreement between the values found for the thermal time constant than for the maximum temperature-rise. It is suggested that a fair approximation to the maximum temperature-rise can often be obtained by testing for a time equal to, say, one and a quarter times the thermal time constant, deducing the value of this constant from the cooling curve, and thence the maximum temperature-rise from the heating curve.

Two or three speakers spoke upon the paper in the course of this discussion, Mr. W. M. Mordey remarking that apparently Mr. Cooper did not put forward with any very great confidence



the shortening of the test runs. Personally, he thought that too much attention was paid to the question of temperature tests. Many other questions were of far greater importance, such, for instance, as freedom from vibration, bearings, balance, &c., especially as in machines made by most good makers the temperature rise could be relied upon to be rarely in excess of the ordinary specified limits. Most methods of testing temperature were unsatisfactory. The resistance method was quite useless, and the thermometer method almost equally so. What one wanted was the temperature of the hottest part of the dynamo, and this could not be obtained by either of the above methods. Manufacturers or consulting engineers should adopt the plan of putting into every important machine in the place where tests had shown the greatest heat—as a matter of ordinary manufacture—a small platinum resistance or couple in order to enable one to determine the temperature of the hottest part of the machine. He had specified this himself, and the cost of doing so was nothing compared with the information obtained, because it enabled one to make tests as to the life of the insulating material. Prof. W. E. Marchant asked the author how he measured the temperature rise, because he had nearly always found in getting heating curves that there was a bend at the beginning of the curve. Mr. Cooper said that he used a resistance to get rid of this effect.

**Exposure Tests of Copper, Aluminium, and Duralumin.**—A Paper also read on Tuesday morning before Section G by Prof. E. Wilson described a continuation of tests upon the influence of exposure in London on the electrical conductivity of light aluminium alloys, reports of which have been made from time to time to the British Association. Each specimen is in the form of wire 0.126 in. diameter and 70 ft. long; and the percentage increases of electrical resistance after two years' exposure of high conductivity copper, commercial aluminium, and duralumin, were found to be 2.0, 4.4, and 8.2 respectively. Duralumin is a copper-manganese-magnesium alloy of high tensile strength, and exposure has apparently made it more brittle.

### Wireless Telegraphy.

After these Papers, the following three Papers on wireless telegraph subjects were read and discussed together:—The nature of the electromagnetic waves employed in radio-telegraphy, and the mode of propagation, by Prof. G. W. O. Howe; atmospheric refraction and absorption as affecting transmission in wireless telegraphy, by Dr. W. H. Eccles; and the effect of atmospheric conditions on the strength of signals received at Liverpool from Paris by Prof. W. E. Marchant, together with an account of the diurnal variations in the energy received. Further reference to these Papers is contained under "Telephony and Telegraphy" on another page.

### Mercury Vapour Lamps.

One of the Papers before Section A on Tuesday, by Mr. J. S. Anderson, described a new method of starting mercury vapour apparatus.

The tilting arrangement for starting is very often inconvenient. Messrs. John S. Anderson and G. B. Burnside have overcome this difficulty by the employment of a heating arrangement near one of the electrodes, preferably the negative. The lamp tube is provided with a small vessel near this electrode, the vessel having a re-entrant portion or recess in which a heating element, e.g., a small coil of platinum wire, is placed. The part of the tube immediately above this small vessel and its recess is constricted so that the coil may be removed at will, without interfering with the vacuum of the lamp. The heating coil of wire is connected in series or in shunt, in the latter case being provided with an automatic cut-out. An external resistance is placed in series with the lamp. Before starting, the small vessel is full of mercury, which forms a continuous connection inside the tube between the positive and negative electrodes. When the electrical current is switched on, the heating coil becomes incandescent, and the heat given off by the wire goes to raising the temperature of the vessel and its contained mercury, there being no appreciable loss by radiation into the surrounding air. Very little heat is required, because the first bubble of mercury vapour formed rises to the constricted portion of the lamp and is there caught, thus breaking the continuity of the mercury inside the lamp and starting the arc. Owing to the resistance of the mercury vapour, which is formed once the arc is started, the current is cut down to the value required for running the lamp. The platinum wire of the heating element can be made of such a thickness, and the external resistance can be so adjusted, that the wire does not emit heat when the lamp is working, but becomes incandescent when the lamp is started, the action being quite automatic.

Among the papers of electrical interest read before Section A on Wednesday were the following:—

**A Magnetic Susceptibility Meter.**—A Paper by Mr. W. H. F. Murdoch described a unipolar method of testing, with the addition of a circular coil in series with the magnetising solenoid. This coil acts upon the magnetometer needle which is lying in a neutral field of force, so that the tangent of the resulting deflection due to the magnetic material plus the coil is strictly proportional to the magnetic susceptibility. A mirror may be used to read the deflections. Such an instrument with tangent scale and pointer can be graduated to read directly the value of the susceptibility coefficient in C.G.S. units. To fix the value of  $H$ , the current is measured and the values multiplied by a constant. The theory of the instrument was given, and an example of its use for testing iron, together with a diagram of connections and curve of results.

**Sealing Electrical Conductors through Glass.**—Mr. John S. Anderson described the progress of the experiments made in conjunction with Mr. G. B. Burnside, who had devised a simple method whereby not only platinum wires, but also other conductors, such as copper wires, may be sealed through ordinary glass. The metal and glass are fused together in the usual way, and then, after the seal has cooled to about a red heat, it is immersed in a bath of oil or fat. Each immersion lasts about two or three seconds, and the seal is immersed a little further in the cooling medium at each successive immersion until it is completely cooled. For currents up to 15 amperes solid conductors may be employed, but for larger currents it is found advisable to make use of tubular conductors. Copper wires 1.5 mm. in diameter were successfully sealed through German glass, and platinum wires of 1 mm. diameter were sealed through Jena and other glasses. A copper tube, capable of carrying a current of 100 amperes, was sealed through German glass. In the case of mercury vapour lamps, platinum must be used, but a tubular form of conductor can be employed for large electrical currents, and the tubular shell filled in with copper, subsequent to the sealing process.

The following were among the reports of special committees submitted during the meeting:—

**Committee on Electrical Standards.**—The Committee has concluded its labours, and does not ask for reappointment. The admirable work done from 1862 to 1870, and from 1881 to 1912, has been published in book form (see review in *ELECTRICAL ENGINEERING*, March 13th, 1913). This year's report is very short, and relates chiefly to the new Lorenz apparatus at the National Physical Laboratory, which is now complete. By its means measurements of resistance will be able to be made "with an uncertainty of not more than a few parts in 100,000."

**Electrical Nomenclature.**—A report was also issued by the committee on the nomenclature and definitions of magnetic and electrical quantities, of which Dr. S. P. Thompson is Chairman. After a general consideration of the questions involved, the committee recommend that no multiples smaller than by 1,000 be used, and proceed to give a list of proposed symbols which differ slightly from that put forward by the International Electrotechnical Commission; the latter, although having much to recommend it, fails in some cases in details. For example, the correlation of magnetic and electrical quantities is imperfect. The committee follow the convention that specific quantities, numerical constants, and angles be expressed by Greek letters, and propose that total quantities be expressed by Roman capitals, while length, space, or volume differentials be expressed in block or heavy capitals, differentials being given the same letter as the total quantities. The problems connected with magnetic units are discussed, and the term "gauss" is favoured for the C.G.S. unit of magnetic force, and the "line" for magnetic flux. Important divergences from the I.E.C. list is the use of the block letter  $I$  for current density instead of  $\Delta$ , and  $\kappa$  instead of  $\epsilon$  for specific inductive capacity. The various quantities are discussed in detail at some length, and finally a series of proposed definitions for each is given.

**Radiotelegraphic Investigations.**—A report was also issued by the committee which is investigating the influence of meteorological conditions, &c., on wireless signals and the origin of stray waves, which is referred to under "Telephony and Telegraphy" on another page.

**Arc Lamps versus High-pressure Gas.**—The City of Strasburg has recently carried out experiments in street lighting with two kinds of flame arc lamps, inverted high-pressure gas lamps and two kinds of inverted low-pressure gas lamps. Some results obtained are given in the *Elektrotechnische Zeitschrift* of September 11th. The costs were reckoned on the basis of 1s. 8d. per 1,000 cubic feet for gas, and for electricity 1.44d. per unit until 10 p.m., and 0.48d. per unit from 10 p.m. until dawn, giving an average price of 0.83d. per unit. The total costs, including all materials and attendance per Lux, for 100 square metres per hour, were as follows:—Arc lamps, A, 0.02d.; arc lamps, B, 0.017d.; high-pressure gas, 0.036d.; low-pressure gas, A, 0.04d.; low-pressure gas, B, 0.051d. In other words, the arc lamps came out, on the average, half the cost of the gas lamps. As a result of these tests, the city authorities decided to instal arc lamps.

## BATTERIES FOR TRACTION AND VEHICLE LIGHTING

THE "Naylor" process, originally applied to regenerating old storage-battery plates (ELECTRICAL ENGINEERING, Vol. VII., p. 155, March 23rd, 1911), is now, after thorough testing, applied to the production of entirely new plates by the Naylor (Patent) Battery Co. (1 Lammermoor Road, Balham, S.W.). We understand that upwards of 120 complete batteries have now been made and have given very satisfactory results. The process which is used is patented by Mr. E. H. Naylor, and consists in cleaning the negative plates of old batteries and then in immersing them in a bath of sulphothinoyl chloride or disulphur dichloride ( $S_2Cl_2$ ). This substance is energetically absorbed by the active material with the generation of heat, and as a result the active material

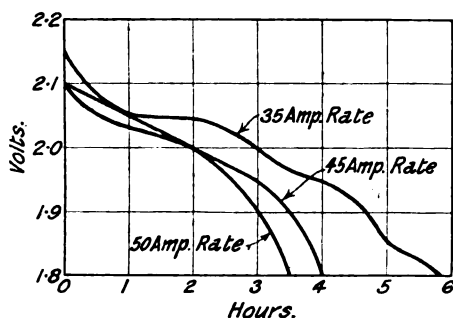


FIG. 1.—DISCHARGE CURVES FOR 21-PLATE "NAYLOR" TRACTION CELL WEIGHING 29LB. COMPLETE.

actually becomes a porous metallic lead thoroughly welded to the conductor. After being subjected to heat to remove the free sulphur and chlorine, the active material is reduced electrolytically in dilute sulphuric acid, and the plates are washed and "formed." The life of any of these batteries has been found to be as much as 4,500 to 5,000 miles when used on electric vehicles.

In the case of a landaulette weighing 38 cwt. and carrying four passengers and the driver, a distance of fifty-six miles can be run with forty-five cells each containing twenty-one plates and weighing 29 lb. The capacity of the battery is between 200 and 210 ampere-hours. The discharge can be

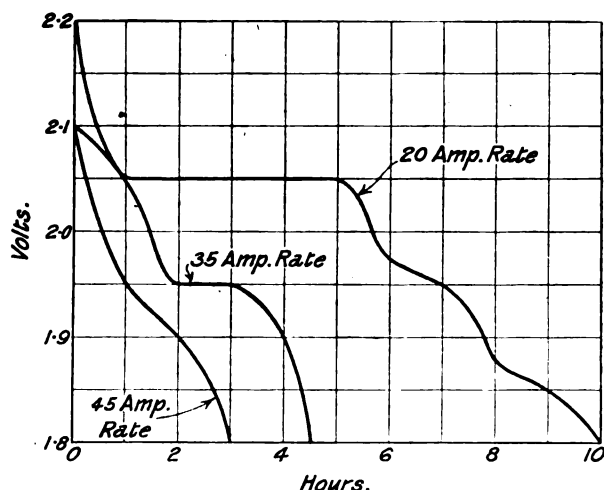


FIG. 2.—DISCHARGE CURVES FOR "NAYLOR" RAILWAY LIGHTING CELL WEIGHING 40LB. COMPLETE.

increased to 50 amperes without hurt to the battery, and can be maintained for three hours. Allowing that the plates would cost about £34 when new, and were returned twice and regenerated for £20 each time, so that three lives of 5,000 miles are obtained, the cost per battery mile is between 1d. and 1½d. (excluding the cost of charging).

The test curves of these cells are given in Fig. 1. Each cell has twenty-one plates, and the cell, complete with acid in ebonite box, weighs 29 lb. With a discharge of 35 amperes the voltage does not fall below 1.8 volts for five hours forty-five minutes, so that the capacity is 201 ampere-hours (or 18.6 watt-hours per lb. of cell). When the discharge is increased to 45 amperes the time is only reduced to four hours, and the capacity to 180 ampere-hours, while at the 50-ampere

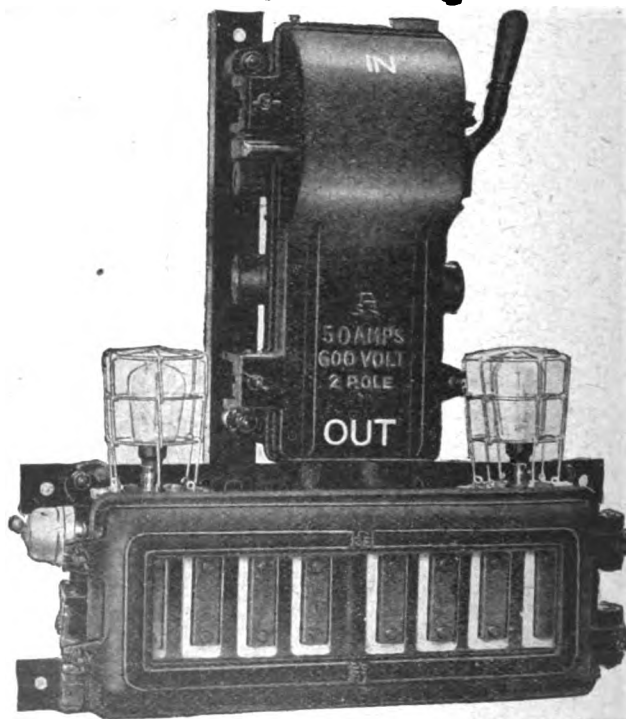
rate the time falls to three hours twenty-five minutes and the capacity to 170 ampere-hours.

The cells have also been found to be very efficient for vehicle lighting, and Mr. Naylor claims that the following figures show that there is no need to employ lighting dynamos for trains. In Fig. 2 are given the results of tests on a cell used for train lighting. In ebonite box, complete with acid, the weight is only 33 lb., and in a wooden lead-lined box only 40 lb. With a discharge of 20 amperes it takes six hours for the voltage to fall to 2 volts, or ten hours to fall to 1.8 volts. By increasing the discharge rate to 35 and 45 amperes the times taken for the voltage to fall to 1.8 are four-and-a-half and three hours respectively.

The low cost and weight, combined with the results obtained, would indicate that the plates made by this process will be useful in other cases than railway and car lighting and road traction; for instance, on board ship, in submarines, &c., as well as for land purposes, especially where space is valuable. So far the process has not been applied to cells much larger than those mentioned, though there is apparently no reason why this should not be done.

## IRONCLAD CRANE PANELS

A NEW form of switch-panel has recently been designed by the General Electric Co. (67 Queen Victoria St., E.C.) to meet the very exacting demands of crane work. It consists of a standard Salford switch and a distribution board mounted on a strong iron framework, together with pilot lamps and an inspection lamp plug. The switch is completely separate from the distribution board, and the main fuses are contained in the switch-case. These fuses are enclosed in separate fireproof compartments, and the case is lined with insulating material. The inspection lamp plug is connected to the top contacts of the switch, so that the crane driver can use the light irrespective of whether the main switch is open or closed. In order to afford the operator an indication of whether the power is on his controller, two pilot lamps which are provided are alight the whole time



IRONCLAD CRANE PANEL.

the switch is closed. The switch blades are interlocked with the cover of the switch, so that it is not possible to close the switch with the cover open, or to open the cover with the switch closed. Both the inspection lamps and pilot lamps are protected by fuses fixed on either side of the switch-case. Care has been taken to insure that the clearances between the fuses are adequate, and no attempt has been made to sacrifice safety to compactness. The fuses are of the Home Office pattern, and it is impossible for the hand to touch a live part accidentally whilst inserting or removing a fuse. The cables from the bottom of the main fuses can be conveyed from the switch-case to the distribution board in conduit. These panels are made for continuous and alternating-current work in sizes from 50 to 200 amperes at 500 volts.

## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,356.

Work out, in terms of the rated wattage and voltage of a tungsten lamp when run at normal efficiency, the range of resistance necessary for a dimming switch in series with the lamp to reduce the candle-power to from 5 to 60 per cent. of the normal. Over what range of candle-power will the various dimming switches on the market regulate a 55-watt 200-volt lamp?—"H. T."

(Replies must be received not later than first post, Sept. 25th.)

### ANSWERS TO No. 1,354.

WHAT are the advantages gained by the adoption of electrical over steam driving for sheet rolling mills, and are there also any disadvantages? If possible, state the saving derived per ton of sheets rolled by electrical driving compared with steam driving.—"MORGAN MORGAN."

The first award (10s.) is given to "J. A." for the following reply:—

The application of the electric drive to sheet mills would appear to be preferable to the steam drive, because, in this type of mill, the variation of power is very great and very rapid. It is generally recognised that the operation of rolling mills constitutes the severest service to which the electric motor has ever been applied. The exceptional requirements, such as rapid and frequent acceleration, frequently recurring heavy loads, continuity of operation, and reckless handling, place this service in a class by itself. At the same time, modern development has been so rapid that a reliable motor can be obtained, and it is probable that in the near future the electric drive for rolling mills will be universally used. In the earlier installations of electric drive a high-speed three-phase motor was employed with a resistance inserted in the rotor circuit, so that the speed could be arranged to drop as the load came on and so allow the flywheel to give up its stored energy. The modern method is to use a slow-speed motor, together with a flywheel on the main motor shaft and drive direct without intermediate gearing, but with suitable coupling. A considerable saving has been effected by this change, as the loss of power by the rope drive and by the slip resistance is eliminated. The efficiency of the slow-speed motor can be gathered from the fact that generally this is constant within 1 or 2 per cent. at any load from  $\frac{1}{2}$  to 50 per cent. overload, and at a speed between the considerably wide limits which are usually set. By means of a special compound winding in the motor field the speed can also be arranged to drop, and the stored energy in the flywheel is utilised without any loss in power. It would also be well to mention that, as the overload capacity of a motor is three to four times that of a steam engine, greater uniformity in the speed of the rolls is possible, and consequently greater uniformity of thickness is obtained in the sheets.

The only real disadvantage which can be put forward against the electric drive is that the initial cost is high, but, on the other hand, its lower depreciation, better operation, and lower cost of maintenance should justify its installation. Several electrically driven sheet mills are working in this country, but unfortunately no reliable costs per ton have as yet been published. It would appear, however, by "reports," that considerable saving and greater output has been effected. The local conditions will prove a great factor in the working costs, as it is evident that much will depend on the rate at which power can

be obtained. The cost of power should not exceed 0.4d. per unit, and this figure should not be difficult to obtain. If a supply of exhaust steam is available, it is possible to reduce this cost to a much lower value by installing exhaust-steam turbine generator sets. At the same time, whatever local conditions may be, the electric drive would certainly appear to be more economical, because, whatever the steam consumption necessary per brake horse power delivered to the mill shaft may be, this steam could be utilised in our present-day highly efficient turbo-generators or gas engines to produce nearly 100 per cent. more power in electric units. American and Continental competitors have been much more progressive than those in this country in applying the electric drive to rolling mills. The usual scheme of power generation is by gas-engine driven generators, and in many cases waste gases from heating furnaces are utilised, so that the price per unit becomes almost ridiculously low. The Skinningrove Iron Co.'s recent electrical equipment is designed somewhat after this principle, and if actual costs per ton were available these would probably show enormous reductions over those with the old method of steam driving. With the electric drive the actual costs per ton would be obtained with great accuracy, whereas costs for steam-driven mills can only be approximate, as many factors have to be considered which can only be approximately measured. The electric meters will record the actual power required for all thicknesses and conditions of working, and it will be quite apparent that when a tabulated list of correct readings has been obtained, it will be possible for a driver, without any special skill, to turn out work of uniform quality. With the steam drive a skilled driver is absolutely necessary—even then breakdowns are frequent. In this respect the development of contactor gears, relays, &c., has made the electric control almost automatic.

For figures and examples of the saving derived per ton of sheets rolled by Continental manufacturers, "Morgan Morgan" should refer to the Papers by C. A. Ablett read before the Institution of Electrical Engineers, December 11th, 1911, and also before the Cleveland Institution of Engineers.

The second award (5s.) is given to "W. H.," who writes as follows:—

The question covers far too wide a range for any specific reasons or relative costs to be given, and the statements made below must only be taken as applying to ordinary general practice. There is no doubt as to general superiority of electrical drive over steam driving where sheet rolling mills are concerned. This is particularly the case if a supply of direct current is available, although for sheet rolling mills non-reversible motors are generally required, thus doing away with one advantage of the direct-current motor, namely, its easy reversibility. Where sheet rolling mills are concerned, slow speeds are almost universally required; thus, in order to obtain one of the great advantages of electrical drive, i.e., a high-speed motor, it is usual to use either spur or helical-gear drive or worm-gear drive. The last-mentioned allows a greater gear reduction, and consequently a large saving in space and weight, and, as a consequence, a saving in first cost of the electrical equipment as compared with the large, slow-speed steam engine. The over-all efficiency of the plant is considerably greater than for a steam-driven set, in which rope drive would probably be used. One of the reasons for this is the necessity for the use of very large ropes in order to take care of the sudden overloads. These large ropes produce very high losses, which, it may be mentioned, are being incurred the whole time the plant is running light, as well as when on load. Another point where electrical driving scores over slow-speed steam drive is the saving in the flywheel. This is, of course, a necessary fitment in order to store up the energy during periods of light load. It will be seen that when electrical drive is used the flywheel may be fitted on the motor shaft, which runs at a high speed, permitting, therefore, the use of much smaller and lighter flywheels. This gives a saving not only in cost, but in wear and tear. It may, of course, be argued that in a rolling mill where a large amount of waste heat is necessary, this could be utilised for heating the boilers for producing the steam necessary for the mill engines. But a satisfactory way of avoiding this waste is to instal gas-heated furnaces, and either take the electrical supply from the supply company, or in large mills put down a special generating plant for supplying current to the mill motors. Generally speaking, it would be necessary to purchase current at about 0.5 of a penny per unit from a supply company, in order to compete with a specially installed generating plant. It is quite impossible to lay down any figures for the comparative saving when using electrical drive as compared with steam drive, but there is undoubtedly a considerable one. It may be stated, however, that the cost per ton of finished product in a steel-sheet rolling mill would average 4s. 6d., taking power at  $\frac{1}{2}$ d. per unit. This may vary in specific cases to as low as 3s. per ton and as high as 5s. 6d. per ton.

### A RAPID WATER HEATER

WE illustrate here a new water heater which has been brought out by Simplex



"PLEXSIM" RAPID WATER HEATER.

Conduits, Ltd. (116 Charing Cross Road), to meet the requirements of the medical profession, dentists, chemists and others who require small quantities of hot water immediately. The article is substantially made in polished copper, and will give a supply of hot water immediately the switch is turned on; the temperature may be regulated by means of two sunk switches. The smallest size is of four pints capacity, and is equipped with two heating elements taking 300 and 600 watts respectively, controlled by separate switches, so that three different degrees of heat can be obtained. Larger sizes of capacities of two and five gallons can also be supplied. The latter is fitted with a ball valve to give a constant supply of hot water when required. It is designed for heat regulation. If the minimum switch is kept constantly "on," the contained water is gradually

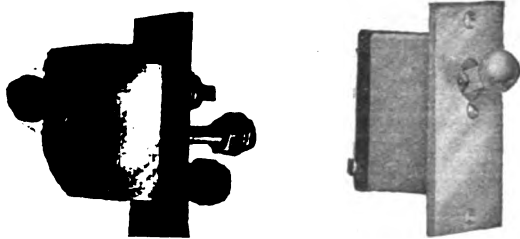
heated up, so that very hot water can be drawn off immediately upon turning on the maximum switch.

The Company also inform us that they are introducing larger sizes of cast-iron electric ovens. These are fitted with the same special arrangement of elements as the smaller size, which has been very successful up to the present, in which the manner of fixing the elements ensures great rapidity in heating up, and absolutely uniform temperature at the top and the bottom of the oven.

### MOTOR CAR LIGHTING SWITCHES

A NEW series of automobile lighting switches has now been placed on the market by the British Thomson-Houston Co. (Mazda House, 77 Upper Thames Street, E.C.). These switches are of neat design and lasting construction, and are made in two types, for surface and flush fixing respectively, and in two finishes, polished brass and nickel. Other finishes can be supplied to order.

The switch is of the single-pole type, but two, three or four switches can be mounted side by side on one plate, so that any desired switching combination can be arranged. The



SURFACE AND FLUSH PATTERNS OF MOTOR-CAR LIGHTING SWITCHES.

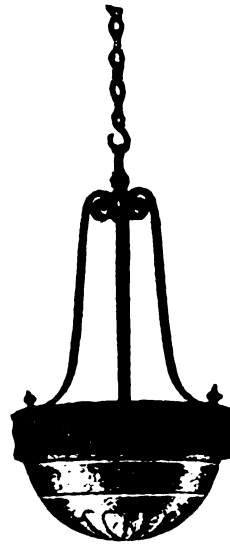
surface-type switches have the ordinary tumbler movement, while the flush switches can be had either with tumbler or push-button movement. There is also a flush-locking switch which is operated by means of a key. The switch plates can be engraved in any desired way. Electrical contractors, motor-car builders and repairers are advised to write to the British Thomson-Houston Co., Ltd., Mazda House, 77 Upper Thames Street, E.C., for further information regarding these switches.

**Electrical Exhibition in Barcelona.**—It has been decided to hold an international electrical exhibition in Barcelona the end of next year or early in 1915.

**New Platinum Alloy.**—It is reported from America that a new platinum osmium alloy (0.5 to 10 per cent. osmium) has been produced with electrical and physical qualities equal to the platinum-iridium alloys, with a high percentage of iridium.

### SEMI-INDIRECT FITTINGS

WE have received from Simplex Conduits, Ltd., a catalogue of special designs of semi-indirect lighting fittings. The catalogue shows a comprehensive range of designs at all prices. Four different kinds of glass-ware are used in these. "Luxuro" is a pure white glass of satin finish, and the "Intaglio" glass is the same, but with designs embossed on the surface. Another particularly rich glass of ivory texture and colour is given the name "Onyx," and the "Alabaster" glass has great richness, with the same decorative markings as real alabaster, but more luminous and cleaner in use. Real alabaster bowls can also be quoted for where required. In most cases the fittings are also made suitable for use with the new inverted dish-type of holophane reflector for semi-indirect lighting.



"INTAGLIO" GLASS SEMI-INDIRECT FITTING.

**A New Australian Engineering Journal.**—We have received a copy of the first issue of a new monthly journal, entitled *The Commonwealth Engineer (Electric and Mechanical)*, which emanates from the same publishing offices as the *Mining and Engineering Review*. Among the contents of electrical interest is an illustrated article on the Auckland electric supply system, and some notes are also given on the Dunedin electricity undertaking. A Paper on the use of bare aluminium cables is also reprinted, with a report of the discussion. Other branches of engineering are equally well represented.

**Shipping, Engineering, and Machinery Exhibition.**—Arrangements are advancing for the Shipping, Engineering, and Machinery Exhibition which is to be held at Olympia, September 25th to October 17th, 1914. From a preliminary list of exhibitors we note that the following are among the firms who have already signified their intention to participate:—Babcock & Wilcox; the British Vacuum Cleaner Co.; the Electric Appliances Co., vacuum cleaners, fans, &c.; Feld Brothers & Co., electric lamps for marine purposes; Jacob, White & Co.; the James Keith & Blackman Co.; Marconi's Wireless Telegraph Co.; Pinchin, Johnson & Co.; the Sunderland Forge & Engineering Co.; W. C. Tackley & Co.; and Kelvin, Bottomley & Baird.

**The International Electrotechnical Commission.**—We have before us some further particulars of the meeting held in Berlin recently, which was referred to on page 512 of last week's *ELECTRICAL ENGINEERING*. It appears that the meeting was attended by some 70 delegates from 24 nations, five of which represented Spanish-speaking countries. Amongst several official Government delegates were those of Canada, India, and Great Britain. Mr. C. O. Mailloux, president of the American Institute of Electrical Engineers, presided over the unofficial meetings at which the work of the special committees was considered in detail, and the special committees were presided over by Dr. S. P. Thompson (Nomenclature), Dr. K. Strecker (Symbols), Mr. Huber-Stockar (Rating), and Dr. Zoelly (Prime Movers). We have already mentioned the subjects upon which agreement was arrived, and it may be interesting to add that the name of "Siemens" instead of the "mho" is to be put before the San Francisco Congress of the applications of electricity, to be held in 1915. The rating of electrical machinery gave rise to a prolonged discussion. It will be remembered that a special committee to study the subject was appointed at Turin in 1911, and that the committee has met in Paris and in Zürich. At Zürich certain limiting temperatures for modern insulating materials were put forward, and, broadly speaking, these have been adhered to. Much discussion centred round the question of the ambient or cooling air temperature. The distinction between the ideal rating which is useful for the purposes of comparison, and the available output which is dependent on the geographical position, came out most clearly in the debate. The majority of delegates were in favour of 40° C. as the limit of the cooling air temperature: three delegates, however, preferred 35° C. As it was not possible to arrive at a decision on this important point, involving, as it does, the fundamental question as to what temperature rise should be allowed in first-class modern electrical machinery, the Commission, rather than force a vote on a subject not yet ripe for decision, very wisely referred this particular point back to the National Committees for further consideration. It is hoped that a definite decision, satisfactory to all, may be arrived at in San Francisco in 1915.



## POTENTIAL TRANSFORMERS

WE illustrate here a new pattern of potential transformer which has just been put on the market by Messrs. A. Reyrolle & Co. (Hebburn-on-Tyne). These transformers are enclosed in iron cases suitable for oil filling. They will give an output of several times their rated capacity without over-heating. A special method of winding the coils is adopted to give immunity from breakdown. The insulating and other materials are carefully selected, and all coils are impregnated under vacuum. Every transformer is pressure-tested to three times its working pressure to earth, between phases, and windings, and, further, the coils are tested for insulation between turns by connecting their terminals to a circuit giving

OIL-IMMERSED POTENTIAL TRANSFORMER REMOVED FROM CASE.

three times the working pressure. The outputs are designed for a regulation of 1 per cent. from full load to no-load, the exact ratio occurring at half-load. The designs have been specially prepared to meet heavy service conditions on large power systems; a failure under these conditions would lead to serious consequences, and so the most scrupulous care is taken in the design and manufacture of all details.

## CONTINUOUS-CURRENT MOTOR STARTERS

ALTHOUGH the design of continuous-current motor starters now proceeds along well-defined lines, improvements are continually being effected, which, though of a minor nature, add materially to the satisfactory manner in which they work. When standard motor starters were first introduced, it was not anticipated that they would be exposed to such hard conditions as they are at the present moment. Special gear has therefore become necessary, and the General Electric Co. (67 Queen Victoria Street, E.C.) have perfected a type of starter capable of meeting the most stringent tests. Facilities are provided for the renewal and adjustment of parts subject to the most wear.

The whole series of five patterns, some of which are illustrated here, ranges from  $\frac{1}{4}$  h.p. to 100 h.p. for pressures up to 500 volts. A noteworthy feature in the small sizes is

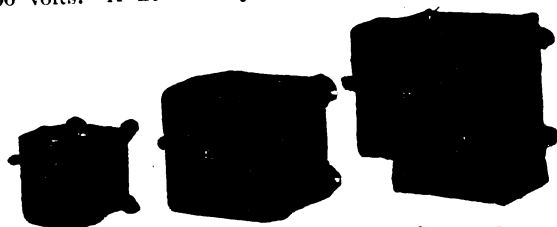


FIG. 1.—SMALLER SIZES OF G.E.C. STARTERS.

the self-aligning contact block, which has been introduced in order that it can adapt itself to irregularities in the contacts which inevitably occur in practice through arcing. All the contacts are ground true in place on the face plate. Several outside improvements have also been included in the larger sizes. All the contacts are renewable from the front, so that should one require replacement, it is only necessary to lift two screws and it comes away bodily. In a running position, both the stops against which this short-circuiting brush rests are adjustable, so that if after considerable wear the brush exerts an uneven pressure on the two contacts, they may be readily adjusted. No-volt coils are usually set to release at 75 per cent. of the normal voltage, but users are sometimes mistaken in the exact voltage delivered, with the result that the no-volt coil may sometimes have an insufficient holding-on power. To meet this the no-volt coil is made detachable, and special instructions are sent out attached to each no-volt coil, so that, should it not hold on sufficiently well, the user is instructed how to take it out

for return. For making the main contact in the larger sizes of starters there are two brushes, one a carbon brush, and the other a brass or copper brush; the carbon brush taking any arc that may be formed, and so preserving the contacts. Other features are a self-aligning contact block,

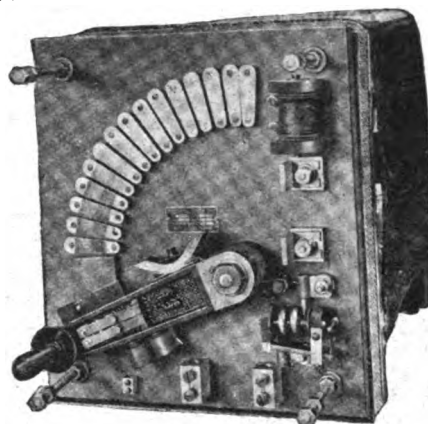


FIG. 2.—LARGER STARTER WITH COVER REMOVED.

solid terminals for the incoming cable, and an overload trip adjustable over a wide range. These starters are built in the open, semi-closed, and totally enclosed cover patterns, the latter having a window through which the contacts may be inspected. A waterproof pattern can also be supplied.

## SUPERLUX GLASSWARE

A NEW series of glass diffusing reflectors has been introduced by the General Electric Co. (67 Queen Victoria Street, E.C.), which they claim to be a great advance on anything of the kind yet produced. The material used is a pure white glass of exceptional reflecting and diffusing qualities, and an absorption factor which we are told is no more than 5 per cent. over the effective angle of illumination. The inner or reflecting surface is of a dull, unpolished nature, which is produced in the manufacturing processes, and thus the surface is in perfect correlation to the glass, and is not affected in any way by cleaning or rubbing. The outer surface has a subdued polish, which, combined with its pure whiteness and texture, produces a most pleasing effect. The form of the reflectors has received as much attention as the material, and they are made in numerous sizes of the distributing and concentrating types, as well as in the form of globes and bowls of various designs. The company also list in the same catalogue a series of channelled steel and aluminium reflectors useful for industrial purposes, as well as corrugated glass mirror reflectors for special purposes.

**Electric Milking of Cows.**—In the course of an address to the Sanitary Inspectors' Congress last week at Llandudno, Sir J. Crichton-Browne spoke strongly in favour of electrical milking machines, which avoided the danger of infection, and could not act as typhoid carriers.

**Effect of Vibration on Magnetic Qualities of Iron.**—An article by E. Gumlich and W. Steinhaus, of the Physikalisch-Technische-Reichsanstalt, in the *Elektrotechnische Zeitschrift* of September 4th, describes a series of experiments made on bundles of recently annealed iron stampings to determine the effect of vibration. The bundles were tumbled about in a rotating zinc cylinder (between one and two falls per second) for one hundred hours continuously, and the magnetic qualities tested before and after this treatment. It was found that the permeability was reduced quite 10 per cent. and the hysteresis loss increased by varying percentages, depending on the constituency of the iron, the effect being similar to that of "ageing" by moderate continued heating. Such an effect would be produced, for example, by rail transport over long distances, or in the iron of traction motors subject to much vibration.

**Sheffield Fuel, Light, and Power Exhibition.**—This exhibition is to be held from October 24th to November 15th, and will include an interesting electrical section, a special feature of which will be demonstrations of cooking and heating. The following are among the intending exhibitors:—British Vacuum Cleaner Co. (boiler flue-cleaning plant); W. E. Burnand & Co. (power and electrical appliances); I. Coats & Co. (fittings, radiators, &c.); G. St. John Day, Ltd. (lamp holders, fittings, and radiators); E. Green & Son, Wakefield (economisers); Heenan & Froude; Lea Recorder Co.; Marsh Bros. (fittings); Steenhal & Boydell, Bradford (instruments); and T. W. Ward, Ltd. (motor and machine tools). It may be mentioned that the B.E.A.M.A. has granted permission to its members to exhibit.

## CATALOGUES, PAMPHLETS, &amp;c., RECEIVED

**ELECTRIC FIRES.**—A neat catalogue, in which particulars of a number of fine designs of glowing electric radiators introduced for the present season, has recently been issued by Belling & Co. (Derby Road, Edmonton, N.). The designs are suitable for halls, reception rooms, libraries, offices, bedrooms, &c., and each design is obtainable in several different finishes. The smallest size takes  $1\frac{1}{2}$  kw., and the largest size listed takes as much as ten. The improved fire-bars already described in our columns are used. Each bar can be wound for pressures up to 500 volts, so that failure of any bar does not affect the rest. We note also that a very liberal guarantee is given. In a test now in progress, the fire-bars are being run continuously face downwards, so that a very high temperature is reached, but no deterioration has so far been detected. The test has been in progress for over 2,800 hours.

**CARBON FILAMENT LAMPS.**—A new list of carbon filament lamps has been issued by the Stearn Electric Lamp Co., Ltd. (47 Victoria Street, Westminster, S.W.). Besides lamps of standard type for high and low pressures, there are listed lamps for laryngoscopic and ophthalmic purposes, as well as special lamps for various domestic and office purposes. A leaflet gives net trade prices for standard type lamps.

**PRIVATE TELEPHONE INSTALLATIONS.**—A list dealing with telephones and telephone switchboards for private installations has been issued in a convenient pocket size by Siemens Bros. & Co., Ltd. (Woolwich, S.E.). Included are magneto- and C.B. telephones, inter-communication telephones of the radial arm, and automatic replacement types, as well as water- and gas-tight telephones, cables, insulators, and accessories.

**MAZDA LAMPS.**—The British Thomson-Houston Co., Ltd. (Mazda House, 77 Upper Thames Street, E.C.), invites contractors to apply at once for folders, window cards, &c., for the Mazda advertising campaign, which will commence on Monday next. Included in the scheme is a bold window card embracing the "Mazda Arrow" pointing to an injunction to electric-light users to employ Mazda lamps.

*Readers desiring copies of catalogues or pamphlets should apply to the firms in question, referring to the notice in "Electrical Engineering."*

**LIMIT SWITCHES.**—A sheet from George Ellison (Victoria Works, Warstone Lane, Birmingham) describes a substantial totally enclosed emergency switch of the self-resetting type for cranes, hoists, lifts, or for signalling purposes. The switch can be arranged to either open or close a circuit when it is operated.

**PORTABLE ELECTRIC TOOLS.**—The Adnil Electric Co., Ltd. (Adnil Building, Artillery Lane, E.C.), has issued a new list dealing with portable electric tools. The list is very comprehensive, and includes drills, grinders, drill posts, commutator grinding outfits, electro-magnetic chucks, &c., for direct, one, two, or three-phase circuits. The tools are well described and fully illustrated.

**ELECTRIC LIFTS.**—We have received a copy of a new edition of an attractive booklet entitled "Notes on Electric Lifts," which is being issued by Smith, Major & Stevens, Ltd. (Abbey Works, Northampton). This is fully illustrated, both as regards mechanism and control gear, and views of buildings, ships, &c., where the firm's lifts are installed. The descriptive notes on the different control systems and other arrangements are interesting reading.

**ARC LAMPS.**—Arc lamps, ornamental standards, raising and lowering gear, and other accessories, are well treated in a catalogue received from Johnson & Phillips, Ltd. (Charlton, S.E.). A considerable part of the publication is devoted to a consideration of the well-known "Metroflam" magazine flame arc lamp, and in connection with this a number of imposing photographs of lighting installations where these lamps are used are included. Another lamp dealt with is the "Orb" shuntless, single-enclosed arc.

**INSULATING MATERIAL.**—A leaflet from the Electrical Engineering and Equipment Co., Ltd. (Bank Buildings, 109-111 New Oxford-street, W.C.), brings to notice ambroin, margolit, isostabil, and other insulating materials.

**SCHOLEY'S MAGAZINE.**—The September issue of this little publication of Scholey and Co. (151 Queen Victoria Street, E.C.) contains a portrait of Mr. A. H. Stanley, managing director of the tube railways, and some interesting notes on flame arc lighting and automatic electric lifts.

**The Batti Wallahs.**—A visit is to be paid to the White Star liner *Olympic* on Saturday next. The party leaves Waterloo by the 10.15 a.m. train.

## ELECTRIC TRACTION NOTES

From the conflicting evidence given on Monday and Tuesday in the Board of Trade inquiry into the Aisgill disaster on the Midland Railway, it is still impossible to know whether gas was the cause of the serious fire which followed the collision, and whether, if all the coaches had been electrically lighted, there would have been less loss of life. It appears, however, from the statement made by Sir Guy Granet, the General Manager, that the use of gas lighting will not be discontinued unless this action is forced upon the directors by public opinion. The travelling public, however, will not be misled into thinking, from Sir Guy Granet's explanations, that the electric lighting of trains is still in the experimental stage, for they have been able to see examples of it for years on a large number of other steam-driven railways, and, in fact, on the Midland line itself. Another part of Sir Guy Granet's statement is interesting. No less than £100,000, he said, is being spent on improvements in the signalling system by introducing track circuits and electric locking devices in various places. Already there are 374 cases in which the line has been track-circuited between the home and starting signals, and the necessary locks and indicators provided, and 379 cases in which the interlocking block has been put in; the latter includes the provision of an electric lock on the starting signal to prevent the signalman from lowering it until the preceding train has cleared the home signal in advance. This, however, does nothing to meet the case of the driver taking no heed of the danger signals, and in this connection we may refer to a communication we have received from a correspondent, who refers us to the article which we published on the "Railophone" system of signalling in our issue of July 11th, 1913. In this system, it will be remembered, communication is maintained between the locomotive and the signal cabin by means of a coil carried on the locomotive and a wire laid parallel to the track. In the article an automatic train-stopping device was described, by means of which the brake was put on from the signal cabin in the event of the train overrunning the danger signal, and the working of this was demonstrated at some trials on the Stratford-on-Avon & Midland Junction Railway. Our correspondent also mentions a similar system which has been tried and extended on a section of the Berlin-Stettin line. In that case the trains run in a continuous inductive field, which is made to collapse suddenly when the train or locomotive approaches a distant signal. This causes a signal to be recorded in the cab of the locomotive. The signal is repeated almost immediately afterwards, so that the driver or the guard on the train has two signals warning him that he is approaching the distant signal, and if the distant signal is at danger the driver receives a third and prolonged warning, which may be visual or audible as desired, and this signal continues so long as the train travels beyond the distant signal if it is at danger. This does not embody the arrangement used in the "railophone" system, by which the train can actually be stopped if the danger signal is passed, but both methods are worthy of the attention of railway engineers at the present time when the confidence of the public has been so seriously disturbed.

A peculiar system of electric traction has been decided on for the electrification of the Norfolk & Western Railway in the mountainous Pocahontas district of America. A single-phase contact line will be used at 11,000 volts, 25 cycles, and the locomotives will carry a rotating phase splitting device fed at 750 volts for feeding four polyphase induction driving motors. At starting, the stators will be wound for 8 poles, and rotor resistance inserted, the motors being in cascade. A speed of 7 m.p.h. will then be obtained, and, by paralleling the motors, 14 m.p.h. will be possible, while, by changing the stator connections to give a 4-pole field, 28 m.p.h. will be an efficient running speed. Each motor will develop about 330 h.p. at 14 m.p.h., and as the trains will weigh about 3,250 tons when loaded with coal, and continuous grades up to 2 per cent. are encountered, four locomotives, two pulling and two pushing, will be used. These will be arranged for multiple unit operation in pairs, but there is to be no electrical connection between the two ends of the train. The motors will be geared in pairs through a jack shaft, crank, and side rods to the driving wheels, which are 62 in. diameter. The gear ratio is to be 18 to 85. No details of the phase splitting device are so far available, but the system was chosen on account of its lesser cost, when the slow speeds of rotation of the motors and limited room were

THE BEST IS THE  
CHEAPEST!

SPECIFY

# IGRANIC

## SWITCHGEAR

IGRANIC ELECTRIC CO. LTD.  
LONDON

Works:  
BEDFORD

considered, while in addition regenerative braking can be effected. This is regarded as more important from the point of view of safety than from the possible saving in energy consumption. Twenty-six locomotives are to be built, and the first is expected to undergo its trials next spring. Some idea of the arduous nature of the road can be gathered from the fact that the trains are now worked by three Mallet locomotives, one pulling and two pushing. There is a badly ventilated tunnel 8,100 ft. long on the line.

According to the *Financier*, the Berlin municipal authorities have sanctioned the construction of a railway which will be partly elevated and partly underground, between the north-west and the south-west of the city. The total length of the line will be six miles, and the estimated cost is £4,500,000.

The Birmingham Tramways Committee has now completed the Hagley Road tramway, and a service has been commenced. This route is noteworthy for the many Parliamentary fights which the Birmingham Corporation had to carry on before powers were ultimately obtained. "First-class" cars are to be run on this route.

The gross profit on the Bradford Tramway system for the past year was £97,320, to which must be added £1,297 from the parcels department. The railless service, however, resulted in a deficit of £67. After payment of all capital charges, £32,921 remained to be transferred to reserve and renewals fund, after £9,000 had been contributed to the rates. It is interesting to note from the report that the tramway traffic expenses work out at 3'035d. per car mile, and for the railless service at 3'492d. An improved type of car is to be adopted on the latter.

The Bristol Corporation has decided to apply to Parliament from powers to acquire and work the tramway system, subject to the result of a poll of the city. This applies to the undertaking of the Bristol Tramways & Carriage Co. within the old city boundary, which the Corporation have the option of purchasing in 1915, except the Hanham Light Railway, which is not purchasable before 1928.

The scheme of the National Electric Construction Co. for extension of the Dewsbury tramways to Dewsbury Moor and Shaw Cross received the sanction of the Dewsbury Town Council last week, in spite of considerable opposition. An amendment favouring a railless scheme was defeated.

The Annual Report of the Sheffield Tramway system records a considerable increase in the traffic receipts, but a slight increase also in the expenses per car mile due to rises in price of coal and wages. The working expenses now stand at 6'176d. per car mile. The net balance after meeting capital charges was £77,296, of which, after large contributions to renewals and other funds, £30,234 remains for relief of rates.

The balance sheet of the United Electric Car Co. for the year to June 30th shows a net profit of £12,058, and a 5 per cent. dividend is declared on the ordinary shares.

A scheme is being considered for the conversion to electric traction of the Swansea & Mumbles Railway.

### TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

The report of the proceedings at a Preliminary International Conference held in London last June, "On the Further Protection of Submarine Telegraph Cables," has just been issued. It contains as appendices a description of the system of inspection of steam trawlers which is in force in this country for the purpose of lessening the number of cases of damage to cables, and recommendations as to the design of trawls. The resolutions passed at the Conference practically amount to a recommendation to the various Governments to institute systems of inspection more or less on the same lines. The report is in French—the language adopted at the Conference; copies may be obtained through any bookseller or direct from Messrs.

Wyman & Sons, Fetter Lane, E.C., for the modest sum of fourpence.

As stated on another page, several Papers relating to wireless telegraphy were read at the meeting of the British Association at Birmingham. Dr. W. H. Eccles, in a Paper before Section A, investigates how far the behaviour of the "loose contacts" used in wireless receivers is accounted for by purely thermal actions, including Joule, Peltier, and Thomson effects, as well as alterations of resistance and configuration. The cases of like and unlike substances are gone into, and equations are deduced which are sufficiently verified by experiment to lend support to this theory. Prof. G. W. O. Howe contributed a Paper to Section G on the nature and mode of propagation of electric waves. He considered first the waves existing in the space between the conductors of a single-phase transmission line, and then imagined these replaced by two parallel infinite discs. He then replaced one by the earth and the other by an inverted conducting cone of infinite extent to obtain similar waves to those employed in wireless telegraphy, and showed that contrary to the usually accepted view, the horizontal magnetic field and the vertical electric field due to the sending antenna are not 90° out of phase, but are approximately in phase, except in the immediate neighbourhood of the antenna. Dr. Eccles also read a Paper before this section on the propagation of electric waves over the globe. It has been agreed that diffraction alone cannot account for the transmission of signals a quarter way round the globe, and it has been suggested that the transmission of signals to great distances is successful either because the earth is not a perfect conductor or because the air is not a perfect dielectric. At night signals may travel to remarkable distances whatever their wave-length, and this suggests reflection rather than refraction; in the day signals of great wave-length travel best, which suggests refraction. The hypothesis introduced by the author, which attempts to account for this, is based on the assumption that the sun's rays ionise the atmosphere in such a way that the concentration of ions increase gradually as we ascend in the atmosphere. In this event, a ray started horizontally, say, will pursue a curved path with its concavity towards the earth; and thus, if the ionisation is great enough, an electric ray may follow and overtake the curvature of the earth. The quantitative side to the question is developed mathematically. The third Paper on this subject before Section G was by Dr. E. W. Marchant, who gave results of observations of the effect of atmospheric conditions on the strength of signals received at Liverpool from Paris. It appears that there is a maximum variation from 0.6 to 1.3 in the strength of the signals received on different days in the same month, the average strength of signal being assumed to be 1.1, and that the current received on a fine, clear night is about 1.7 times as strong as that received in the daytime. Observation has shown that rain in Paris always corresponds with a diminution in strength of received signals. In one case, with a wind of 6 metres per sec. velocity, blowing in a N.W. direction, the signal-strength fell to half its normal value. The most favourable condition for signalling appears to be a cloudy sky at both sending and receiving stations, the signals being weaker when the sky is clear or covered with light clouds. Rain at the receiving station appears to have a comparatively small influence on the strength of the received signals. The result of a set of special signals shows that the increase in strength of night signals occurs just after sunset, there being a sudden increase in strength of about 70 per cent. Signals are slightly stronger just after sunset than during normal night conditions.

In a brief discussion, which was taken part in by Dr. J. A. Fleming, F.R.S., Prof. Nicholson, Mr. Rivers Moore, and Prof. E. Wilson, certain differences of opinion were expressed regarding the theories put forward by Dr. Eccles and Prof. Howe. It was, however, generally agreed that the evidence upon which we have at present to work is too slight to justify any one worker being dogmatic. The one point agreed upon was the need for co-operation among wireless telegraph workers in recording atmospheric and other effects noticed by them during the course of their work. This course of action was strongly urged during the important discussion on wireless telegraphy which

## "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

### Specifications Published September 11th, 1913

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

Names in *italics> indicate communicators of inventions from abroad.*

**16,782/12. Voltage Regulators.** A. POLLAK. A voltage regulator in which the dynamo voltage is regulated mainly by the stationary core of a coil which is connected in shunt to the main circuit while the movable core serves to operate the contacts of the switch in such a manner that the voltage is regulated to a value exceeding the normal until the movable core has reached a position of minimum distance from the stationary core. Special means are adopted to damp the oscillations of the armature. 1 figure.

**16,806/12. Motor Control.** B.T.-H. Co. (*G.E. Co., U.S.A.*). The system is for motors driving heavy machine tools, printing-presses, or other machinery, in which heavy parts have to be quickly stopped and reversed. The control is by a master switch and contactors, and means are provided for producing electrically a gradual dynamic braking effect in the motor when the moment of reversal is approached. 3 figures.

**19,000/12. Rectifiers.** A. R. BULLOCK. These rectifiers, which may be used for conversion from A.C. to D.C., or *vice versa*, are of the revolving commutator type with condensers connected between each commutator brush and each slip-ring, so that whenever a break occurs, a condenser is always across it. The condensers are connected in series to form a closed circuit. The A.C. circuit is connected at two points to this condenser circuit, and the D.C. circuit is connected at two points on opposite sides of the condenser circuit. 9 figures.

**19,113/12. Testing Conductivity of Liquids.** M. COPLAND. Apparatus for testing the conductivity of liquids in which movable electrodes are arranged to be controlled as to their position by the temperature of the liquid to be tested. 4 figures.

**19,467/12. Railway Signalling and Control.** H. VON KRAMER. This specification relates to a system of railway signalling or control having a live wire and a frame on the vehicle carrying a coil characterised by the fact that current is always flowing in the live wire maintaining an inductive connection with the frame. Signals are established by temporary absence of such inductive connection. 5 figures.

**23,775/12. Sealing in Lamp Leads.** B.T.-H. Co. (*G.E.C., U.S.A.*). The leading-in wires are provided with a coating of metal, the oxide of which is soluble in the surrounding glass at a relatively low temperature, the compound wire having substantially the same coefficient of expansion as the glass. 2 figures.

**26,597/12. Voltage Regulator.** B.T.-H. Co. and A. H. WATSON. Improvements in the Tirrill regulator are given with the object of increasing its range of regulation. An additional separately excited winding is provided on the main solenoid of the regulator. 1 figure.

**27,874/12. Isolating Switches.** SIEMENS BROTHERS DYNAMO WORKS and R. A. R. BOLTON. In order to prevent liability of these switches to come out on overload by the electromagnetic forces due to the current itself, the switches are so constructed with right-angle bends in the conductors to them that the direction of these forces is such as to hold the switch closed and not to open it. 3 figures.

**2,238/13. Variable Condensers.** A. E. WATKINS. These condensers are made with movable semicircular metallic plates, each moulded in or encased by a disc of non-conducting material. 2 figures.

**3,162/13. Metal Filaments.** WESTINGHOUSE METALLFÄDEN GLÖHLAMPENFABRIK. This specification protects a method of making tungsten or molybdenum alloyed filaments by the mechanical treatment of alloys containing suitable proportions of one or more auxiliary ductile metals, such as nickel, copper, or iron, removing these auxiliary metals after the ingot has been mechanically worked to render it sufficiently tough, and further working the remaining pure metal by hammering, rolling, or drawing.

**14,433/13. Incandescent Lamp Manufacture.** A.E.G. In this specification is described a machine for fusing holder wires into the supporting frame having wire-gripping devices arranged radially round a stationary support, and a fusing in chamber or mould against or into which the fused stem of the filament-

supporting frame is pressed so that the wires become imbedded in the stem. 3 figures.

**15,502/13. Series System.** R. FRANZ. A system of running lamps or apparatus in series is described. A substitutional resistance is inserted in series with the whole circuit. During normal action this is put out of action by a shunt of comparatively low resistance, which, upon failure of any one lamp, which can be readily detected by testing, the shunt can be placed across the testing terminals of the lamp to restore the main circuit. These contacts can be collected together to a multiple switch or plug board. 3 figures.

### Specifications Published To-day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free.

Summaries of some of the more important of these patents will appear in our next issue.

**Arc Lamps:** MARKS (*Deutsche Beck-Bogenlampen Ges.*) 12,592/12.

**Distributing Systems:** B.T.-H. Co. and WEDMORE, 6,807/13.

**Dynamos, Motors, and Transformers:** THOMPSON (*Splitdorf Electrical Co.*) [Magnet generator] 26,323/12; SIEMENS BROTHERS' DYNAMO WORKS (*Siemens Schuckertwerke*) [Commutators] 6,648/13.

**Heating and Cooking:** KERCHER [Cookers] 19,754 and 19,771/12; MANN [Cooking utensils] 4,479/13.

**Instruments and Meters:** HOLDEN and CHAMBERLAIN & HOOKHAM [Meters] 19,118/12.

**Switchgear, Fuses and Fittings:** B.T.-H. Co. (*A.E.G.*) [Oil switches] 148/13; CLEMENS and MONARCH REFILLABLE FUSE Co. [Refillable fuses] 3,574/13; SCHUCHARDT [Plug contacts] 7,243/13.

**Telephony and Telegraphy:** GRAHAME-WHITE and FOTHERGILL [Production of electric power for wireless telegraphy on aeroplanes] 16,992/12; AUTOMATIC TELEPHONE MANUFACTURING Co. (*Automatic Electric Co.*) [Telephone systems] 19,251, 19,252, and 19,254/12; CONNER and KAHL [Telephone apparatus] 24,089/12; LOEWENSTEIN [Telephone mouthpiece guards] 3,387/13; SCHOT [Telegraphic transmission] 13,089/13.

**Traction:** DAWSON and BUCKHAM [Signalling] 19,585/12; CROSS [Electric road vehicles] 19,825/12; STRAITON [Trolley points] 24,372/12.

**Miscellaneous:** FRIEDMAN and FRIEDMAN [Electrically wound clocks] 19,429/12; TAYLOR and PINNEY [Fixing fittings, &c., to concrete] 19,921/12; HARTMANN & BRAUN [Portable lamps] 21,917/12; CAREY and R. WAYGOOD & Co. [Vacuum cleaners] 26,660/12; GRIGSBY and CAMPBELL, 27,396/12; MÜLLER [Insulators] 27,738/12; BICKLEY [Advertising devices] 29,881/12; GRAHAM [Electromagnetic diaphragm horns] 313/13; SCHANZENBACH and KNAFF [Globes and reflectors] 992/13; REID [Electric clocks] 1,243/13; BALDWIN [Miners' safety lamps] 3,115/13.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Electrometallurgy and Electrochemistry:** SCHOTT & GEN [Electrodes for electrolysis] 17,759/13.

**Incandescent Lamps:** SCHALLER, 1,804/13.

**Switchgear:** BROWN, BOVERI ET CIE [High-tension switches] 17,583/13.

**Traction:** BROOKS [Railway and tramway trucks] 17,087/13.

### Expired Patents

The following are the more important Patents that have become void through non-payment of renewal fees.

**Arc Lamps:** VERITY'S, LTD. [Arc-lamp suspension] 10,816/05.

**Dynamos, Motors and Transformers:** H. H. LAKE (*G.E. Co., U.S.A.*) [Turbo-alternator field magnets] 11,831/02; E. ARNOLD and J. L. LA COUR [Single-phase motors] 10,830/05; B.T.-H. Co. (*G.E. Co., U.S.A.*) [Control of induction motors] 12,497/06; J. E. L. BARNES (*M. Breslau*) [Alternators and rotary converters] 11,558/08; A.E.G. [Single-phase motors] 11,633/08.

**Switchgear, Fuses and Fittings:** O. BAKER [Switches] 27,168/08.

**Telephony and Telegraphy:** J. HAAR [Printing telegraphs] 12,585/07.

**Traction:** W. FAIRWEATHER (*Electrical Devices Co., U.S.A.*) [Controller regulator] 12,477/06.

**Miscellaneous:** BROWN, BOVERI ET CIE [Combined turbine and electric drive for ships] 10,482/05.



took place at the Dundee meeting last year. Since then the Committee appointed as the result of that meeting has got to work, and hopes to publish a scheme of this character in the course of the next few months. In the meantime, an effort was made by the Post Office to obtain such information from its operators in various parts of the country, but although a large amount of information was obtained, the exigencies of the commercial work of the stations interfered so greatly with the recording of such effects that it is not felt that the results would be of much value if published. The chief aim of the Committee seems to be to enlist the aid of amateurs, and it is probable that in the course of another year much valuable information will have been accumulated. Dr. W. H. Eccles is acting as secretary to the Radiotelegraphic Committee.

During the meeting a report was submitted by the Committee on Radiotelegraphic Investigations. This Committee has come to the conclusion that the most urgent and profitable work they could promote was the investigation of the influence of sunrise and sunset, of daylight and darkness, and of meteorological conditions, on the propagation of electric waves over long distances, and the origin and the laws of "strays"—i.e., natural electric waves. In order to promote the necessary widespread observations, the Committee propose to draw up a simple scheme of instructions which will be circulated to operators, including directions for simultaneous observations of the strength of the time-signals, and the average strength and frequency of strays. The observations would subsequently be classified and reduced by this Committee, who have resolved to apply for a grant of £200 to enable the work to be started in a thorough manner.

According to the *Financial Times*, Marconi's Wireless Telegraph Co. is negotiating for the acquisition of the patent rights relating to the Goldschmidt system.

The strike of Italian Marconi operators at Genoa has been settled, and the men have returned to work.

Radiotelegraphic communication between Cataldo (Bari) and Antivari was suspended. On the 4th inst. the Panama Co.'s cables between Puerto Rico and St. Thomas and St. Croix became interrupted, and were repaired on the 9th. For the time being messages were transmitted via the lines of the French Cable Co.—Owing to a partial breakdown of the land lines between Puerto Plata and San Domingo, traffic for the latter place, Curaçao, Venezuela, is subject to delay.

## LOCAL NOTES

**Ballyconnell (Ireland): Electricity Supply.**—An inquiry was held on Wednesday last into the application of the Bawnboy R.D.C. for powers to carry through a scheme for the lighting by electricity of the town of Ballyconnell.

**Bexhill: Cooking Tariff.**—The charge for current for heating and cooking is now 2d. per unit up to 800 units and 1½d. afterwards.

**Burton: Electricity Accounts.**—A net surplus of £1,189 has resulted from the year's working of the electricity undertaking, of which £1,000 has been contributed to the rates and the remainder carried to renewals fund. The figure is slightly less than that for the previous year, on account of the higher price of coal.

**Carlisle: Electricity Profits.**—It has been decided that the whole of the profits of £1,509 be devoted to relief of rates. The Electricity Committee's proposal to add £500 to the reserve fund was defeated.

**Eastwood (Notts): Street Lighting.**—Some inconvenience is being caused by the main thoroughfare being in darkness, due, it is said, to delay in signing an agreement with the Notts & Derby Electric Power Co. The date now fixed for commencement of supply is September 21st.

**Hull: Extension of Supply Area.**—It is proposed to apply for an electric lighting provisional order for the district of Sutton.

**Launceston: Electricity Accounts.**—The first annual report of the Launceston & District Electric Supply Co. records revenue of £536 and expenditure of £534.

**Llanidloes: Street Lighting.**—Following a dispute with the gas company, on account of which the streets remained unlighted for fifteen days, electric street lighting is to be adopted at the same price.

**Perth: Electricity Accounts.**—The net profit on the year's working of the electricity undertaking is £237, of which £230 will be placed to reserve. An increase is to be made in the price of current supplied to the tramways.

**Portrush: Electric Lighting.**—A site has been purchased by the Council for an electric lighting station.

**Sturry (Kent): Supply Scheme.**—A scheme is being considered for electric supply to Sturry, Fordwich, Westbere and Broad Oak, in the neighbourhood of Canterbury, from water-driven generating plant at the Black Mill, Sturry. Overhead transmission at 240 volts is proposed.

**Truro: Supply Scheme.**—The whole electric supply scheme now under consideration is to be submitted to the ratepayers, partly in view of the fact that a more expensive site for the generating station is now proposed.

**Wishaw: Electric Light Undertaking.**—A small profit has been made for the first time on the electric light undertaking. The gross profit represented 8½ per cent. on the capital expended, and a net profit of £53 remained after meeting capital charges.

**Yeovil: Electricity Supply.**—Mr. E. W. Petter has intimated his intention to apply to the Board of Trade for a Provisional Order for the supply of this district.

**York: Extension of Supply Area.**—Application is to be made to the Board of Trade for an Order authorising the supply of electricity in a large number of rural district areas outside the city.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

### Generating Stations, Sub-Stations, Mains, &c.

**Australia.**—20,000-volt switchgear, low-tension switchgear and accessories for power station and substations to be constructed for the Melbourne railways. Consulting Engineers, Merz & McLellan, 32 Victoria St., S.W. (See an advertisement on another page.)

**Carlisle.**—Application is to be made to the Local Government Board for sanction to a loan of £4,300 for high-tension apparatus.

**Harrogate.**—It has been resolved to apply to the Local Government Board for permission to borrow a further £2,000 for cable extensions and £500 for transformers for lighting purposes.

**Heywood.**—A loan of £11,750 is to be applied for in connection with cables, buildings, and plant required for the bulk-supply scheme from the Bury Corporation.

**London: Hammersmith.**—Tenders are invited for a 125-h.p. A.C. motor by September 24th. (See an advertisement.)

**Oldham.**—A Local Government Board inquiry was held last week regarding an application for a loan of £30,000 for plant extensions which would enable the Corporation to supply power to three cotton mills and a workshop.

**Riga.**—A large expenditure is contemplated upon extensions at the electricity works.

**Salford.**—The Electricity Department invite tenders by September 29th for a compound air compressor. Particulars from Borough Electrical Engineer, Frederick Road, Pendleton.

### Wiring

The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.

**Dartford.**—Public Library.

**Doncaster.**—Technical school.

**Ealing.**—A scheme for enlarging the Town Hall has been sanctioned by the Local Government Board.

**Huddersfield.**—Isolation hospital at Crosland Moor.

**Jarrow.**—New police station.

**Lossiemouth.**—New Masonic Hall.

**Oldham.**—New school.

**Preston.**—Nurses' home at Fulwood Workhouse.

## THE RECORD ELECTRICAL Co., Ltd.

LONDON OFFICE:  
CAXTON HOUSE,  
WESTMINSTER, S.W.

Telephone:  
3067 Victoria.  
Telegrams & Cablegrams:  
"Infuslon,"  
London.

MEASURING  
INSTRUMENTS.

RECORD'S PATENT.

Write for Prices & Particulars.

WORKS:  
BROADHEATH,  
MANCHESTER.

Telephone:  
164 Altrincham.

Telegrams & Cablegrams:  
"Infuslon,"  
Altrincham.

**Worcester.**—New County offices.  
**Yarmouth.**—Picture palace in Regent Road.

### Miscellaneous

**Adelaide (Australia).**—The Postmaster-General invites tenders by November 12th for a trunk line switchboard, &c. Local representation necessary. Particulars from Commercial Intelligence Branch, Board of Trade.

**Australia.**—Tenders are invited by the Victorian Railway Commissioners for a haulage engine and 200-h.p. motor and equipment for the State coal mine. Particulars from Commercial Intelligence Branch of the Board of Trade.

**Melbourne (Australia).**—Tenders are invited by October 14th for 1,000 cable distributing boxes by the Postmaster-General. Local representation necessary. Particulars from Commercial Intelligence Branch, Board of Trade.

### APPOINTMENTS AND PERSONAL NOTES

Mr. W. J. Rendell Baker, Electrical Engineer to the Malvern U.D.C., has been appointed to a similar position at Mansfield.

Mr. Victor Broadbent, of Messrs. T. W. Broadbent, Ltd., Electrical Engineers, Huddersfield, has been presented with an electric clock by the employees, on the occasion of his wedding.

Mr. R. W. Willis, Assistant Electrical and Mechanical Engineer in the Swindon Electricity Department, has resigned. A successor is to be advertised for at a salary of £150, rising to £180 per annum.

A vacancy occurs for an apprentice in a manufacturing works in France. (See an advertisement on another page.)

An electrical engineer capable of designing electric lighting dynamos for motor-cars is required. (See an advertisement on another page.)

In consequence of the resignation of Mr. B. Sanky, who is taking up an appointment at Port Elizabeth, South Africa, there is a vacancy for a borough electrical engineer at Whitehaven.

Jointer required by British Insulated & Helsby Cables, Ltd., for paper-insulated cables. (See an advertisement on another page.)

An assistant electrical engineer is required for the Indian State Railways (Oudh & Rohilkund Railway). Director-General of Stores, India Office, S.W. October 4th.

### MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. George Smith & Son, of 5 Philpot Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night, was £77 10s. to £78. (Last week, £77 5s. to £77 15s.)

**Osram Lamps in a Fire.**—Further evidence of the strength of Osram drawn-wire lamps is supplied by the fact that in a recent fire in South Shields the Osrams in the outside lamps were not damaged, although the three shops involved were gutted, and the heat caused the opal globes to burst, while molten lead and a burning sun-blind fell on the fittings.

**Boiler-tube Treatment.**—Mr. Sherard Cowper-Coles has granted a licence to the British Mannesmann Tube Co. for ferro-zincing or ironising boiler tubes to prevent pitting or corrosion. They are erecting a plant for the purpose at their works at Landore. The process consists of coating the tubes with a thin layer of pure iron which may or may not be afterwards coated with zinc. The coating of pure iron is found to be very inert to chemical action.

**Tramway Supplies.**—The Electrical Engineering & Equipment Co., Ltd. (Bank Buildings, 109-114 New Oxford Street, W.C.), have secured the sole selling rights in this country for electric tramway and railway equipments formerly sold by the Via Co., including overhead line material, poles, rail bonds, and automatic signalling systems.

**Metal Filament Lamps.**—The Searn Electric Lamp Co., Ltd. (47 Victoria Street, Westminster, S.W.), announces that the list prices of "Leuconium" lamps, which are claimed to be at least as strong as any tungsten lamps now on the market, are subject to an increased discount to the trade.

**Canadian Agency.**—H.M. Trade Commissioner for Canada reports that an agent in Westmount desires to secure the representation of manufacturers in the United Kingdom of electrical appliances, supplies, and specialities.

### COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &c.

**Victoria Falls & Transvaal Power Co.**—The report for 1912 records an increase of revenue over that of the preceding year of £123,286, resulting in a profit of £446,380, in addition to the £45,744 brought forward. This increase is in spite of considerable capital being unproductive, due to constructional work being in progress, and of reductions in the price charged for power. The dividend is at the rate of 6 per cent., with £96,787 carried forward. There are continued increases in the demand for power, and the Vereeniging Power Station now runs with great reliability, the earlier transmission line troubles having been got over. Contracts for further plant aggregating 90,000 h.p. have been entered into.

**Yorkshire Electric Power Co.**—At the half-yearly meeting yesterday it was mentioned that the revenue for the half year, which in 1912 was £20,357, had this half year amounted to £30,132, an increase at the rate of 48 per cent. In spite of high prices of coal, the accounts show a profit of £6,971 for the half year. This, after payment of £3,307, the dividend on the preference shares, will leave £4,308 to carry forward. The waste-heat station at Barugh is now practically completed. The first installation there is a 2,000-kw. turbine, but increasing demands for supply have compelled the directors to place a further order for a 3,000-kw. turbine.

### NEW COMPANIES

**CLONES ELECTRIC LIGHT & POWER.**—Capital of £2,000, divided into 2,000 shares of £1 each.

**ATMOSPHERIC NITRATES (KILBURN SCOTT PATENTS).**—Capital, £12,600. First directors, E. K. Scott, R. McDougall, F. Howles, and S. McDougall. Registered by T. T. Hull and Son, 22 Chancery Lane.

**I.L. SYNDICATE.**—Electrical Engineers, 34-36 Gresham Street, E.C. Capital, £2,600.

**ELECTRIC MOTOR & STOVE HIRING CO.**—Capital, £5,000. First directors, J. C. B., E. J., H. S., and E. C. Ingleby, Leeds.

**LIVERPOOL ELECTRIC WELDING CO.,** 17 Water Street, Liverpool. Capital, £1,000. Private company. First directors, W. A. M. Wacksmuth, E. Jones, and H. Woods.

"The Central."—The September issue of this journal contains, in addition to the usual college and old students' notes, an article on a recent cable-laying expedition by Mr. B. S. Lion. Some interesting notes on the Leclanche battery are contributed by Mr. Maurice Solomon, and the Exchange Telegraph Company's news distribution system is described by Mr. Clifford Higgins.



### NEW CATALOGUE

Of "CALOR" Electric Fires & Cooking Appliances

NOW READY

TOWNSHEND'S ART METAL Co. Ltd. Works & Showroom—Ernest St., Birmingham. London Showroom—62, Holborn Viaduct, E.C.

# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 352 [VOL. IX., No. 39]

*All rights reserved.*

THURSDAY, SEPTEMBER 25, 1913.

[PRICE ONE PENNY.]

*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES AND TECHNICAL COLLEGE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

*Other Advertisement Rates on Application.*

### Latest Time for Receiving

Letters for Insertion, Tuesday first post.

Small Advertisements and Official Announcements, Wednesday first post.

Displayed Advertisements, Tuesday first post.

Corrections in Standing Advertisements, Monday first post.

All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 208-206, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Cireling, Fleet, London." Telephone No.: 5509 Holborn

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

SOME notes on the arrangements for the next session and other matters relating to the Universities and Technical Colleges are given. (Page 536.)

IMPORTANT reductions have been made in the prices of metal filament lamps. (Page 536.)

OUR "ELECTRICAL ENGINEERING Literary Section" contains a list of new publications, reviews of a number of technical books, and gives a selected list of recommended works on all branches of electrical engineering. (Page 537.)

A HOME OFFICE Report has been issued on the fatal explosion which took place in connection with a Diesel engine last summer at Bray. (Page 543.)

THE committee appointed by the I.M.E.A. to encourage the use of electric vehicles has issued a statement regarding the directions in which its work will lie. (Page 543.)

AN interesting example of economies effected by electric power applications is presented in the scheme recently carried out at the works of the Salt Union, where large quantities of steam required for the evaporators are utilised also for power production, so that not only can the whole pumping plant and other machinery be driven electrically, but power can be supplied to outside consumers as well. (Page 544.)

THE ventilation of a chamber containing transformers is dealt with in our Questions and Answers columns. (Page 545.)

A SIMPLE and efficient rotary air-pump system for condensing plant in which a minimum of space is required is described. (Page 545.)

A NEW insulated terminal is described on page 546.

THE scheme of the proposed Channel tunnel outlined at the Franco-British Travel Union this week, included a description of how electric locomotives would replace at Dover the steam locomotives which at present haul the trains from London. (Page 547.)

A NEW four-core telegraph cable is being laid between Mundesley (Norfolk) and Emden in Germany, a distance of 240 nauts.—No confirmation is obtainable of the rumours that the Marconi Company contemplates increasing its capital.—Results are given of a comparison of the different types of Leclanche cells in which it is shown that the simple porous pot type gives the highest efficiency. (Page 547.)

THE Patent Office published specifications last Thursday dealing with D.C. motor meters, in which one brush and a mercury contact is used, by S. H. Holden and Chamberlain & Hookham, and two dealing with cooking utensils by A. J. Kercher and J. Mann respectively. A design of reflector or globe after the fashion of a venetian blind in which the light source is hidden has been protected by G. Schanzenbach and C. Knapp. (Page 548.)

THE electric lighting of all the streets in Rawtenstall is to be considered.—Manchester electrical workers are agitating for higher wages.—A scheme for working a refuse destructor with the Rothsay electricity works has been prepared.—Definite terms have been placed before the Stirling Corporation for the purchase of their electricity undertaking.—The Lancashire Power Co. has inaugurated supply at Tyldesley. (Page 549.)

ROTARY converters are required at Salford; L. T. feeder cable at Walthamstow; Diesel engine generating set at Worthing; a 250-kw. generating set by the Preston Guardians; a 6,600-volt overhead transmission line at Keighley.—An expenditure of £16,000 is contemplated at Grimsby, £7,500 at Carlisle, £4,000 at Littleborough, and £6,700 at Wigan.—A 15-ton electric crane is required by the Victorian Railway Commissioners, and cables, single-phase transformers, and incandescent lamps by the Melbourne Electric Supply Committee.—Switchgear is required at Wellington (N.Z.). (Page 549.)

THE capital reorganisation scheme of the British Westinghouse Co., which has now been placed before its shareholders, consists of a reduction in the capital of £725,000.—Satisfactory progress is reported by the reconstructed Crompton Company. (Page 550.)

## UNIVERSITY AND TECHNICAL COLLEGE ANNOUNCEMENTS

THE Calendar of Armstrong College, University of Durham (Newcastle-on-Tyne), shows that, in addition to the day courses, which commence next Monday, leading to a degree or diploma in one or other branch of engineering, evening classes in various subjects connected with the electrical engineering profession are held. Besides electricity and magnetism and general electrical engineering, there is a special weekly class dealing with wireless telegraphy. There are also classes on Saturdays embracing physics, mechanics, &c., and a complete course for miners at a reduced fee. The whole theoretical course for a Colliery Manager's Certificate is covered. A course on similar lines for colliery engineers, enginewrights, apprentices, &c., is also conducted. The former course extends over three winter sessions, and involves attendance from 3 to 6 p.m. for twenty-four Saturday afternoons each session. In the second case the attendances required are as above, except that they are of two hours' duration only. Dr. W. M. Thornton is Head of the electrical department.

The South Wales and Monmouthshire School of Mines (Treforest), which has been established to provide instruction of an advanced and practical character for training all grades of colliery officials. It is associated with a large number of collieries in the immediate neighbourhood. The courses of instruction comprise: (1) A three-years' full-time mining course; (2) A part-time day course for four years of one day of eight hours per week for mine managers, mechanics, electricians, and chemists, &c.; (3) Special courses in mining engineering, including the electrical equipment of collieries, and (4) a special course for surface foremen. The first term commences on October 8th. The Secretary is Mr. H. M. Ingledew (4 Mount Stuart Square, Cardiff).

A popular lecture will be given by Mr. F. H. Taylor on "Light—Ancient and Modern," in the science lecture theatre of the Willesden Polytechnic, on Wednesday, October 1st, at 6 p.m. Tickets may be had on application at the office of the Polytechnic, Priory Park Road, Kilburn, N.W.

**Miniature Rifle Clubs' Contest.**—The Siemens Dalston Works Miniature Rifle Club recently met the Western Electric Co.'s Rifle Club on their open-air range at Plumstead. The result was a win for the Siemens team. The average score was 89.5, while the total was 537 out of a possible 600.

**Protection against Corrosion.**—Lead, Ltd. (1 and 2 Old Pye Street, Westminster, S.W.), have acquired from Mr. Sherard Cowper-Coles the sole right for the coating of iron and steel by an electrolytic process. Lead by this process can be deposited economically up to a thickness of  $\frac{1}{16}$  in. This process is also suitable for treating earthenware, wood and ornamental ironwork. The cost is said to be less than hot galvanising when equal weights of metal are considered. A plant has been erected in London.

**Motor Hiring.**—A Company named the Electric Motor & Stove Hiring Co. (Elland Road, Leeds) has been formed to deal with the business of letting out motors in Leeds. The motors hired out will be of Leeds manufacture. It will be remembered that a motor hiring scheme was before the City Council last year, but was not proceeded with.

**Fire Brigade Tournament.**—At the Annual Tournament of the London Private Fire Brigade Association, the Osram Lamp Works brigade won the second prize for the four-men drill, the third prize for the three-men drill, and the Geelong challenge cup, and were placed third among twenty-three competitors for the championship of the Association.

**Metal Filament Lamps.**—Pope's Electric Lamp Co., Ltd. (Hythe Road, Willesden, N.W.), inform us that in the course of a test of their "Elasta" wire lamps by a Corporation, a group of 240-volt 50-c.p. lamps, taken at random from stock, were run for 2,512 hours. When taken out of circuit they were all intact, and giving an average of 41.79 c.p., with an average consumption of 1.5 watts per British c.p. The Company inform us that they have contracts from the Admiralty, H.M. Office of Works, and many large Corporations.

## REDUCTIONS IN THE PRICES OF METAL FILAMENT LAMPS

WE have received intimations from several of the leading manufacturers of metal filament lamps that from Monday last they have made substantial reductions in the prices of metal filament lamps. The reductions, which are due to further economies in manufacturing processes combined with increased outputs, follow similar lines in the case of all the members of the Tungsten Lamp Association.

The lamps for 100 to 135 volts, in sizes from 10 to 60 watts, are reduced from 2s. 6d. to 2s. 2d., and of the 200 to 260-volt lamps the 30 to 60-watt sizes are reduced from 3s. to 2s. 8d., while the popular 20 and 15-watt sizes are reduced from 3s. 3d. to 2s. 11d., and from 3s. 6d. to 3s. 3d. respectively, and the 80-watt size from 4s. 6d. to 4s. 2d. Of the larger sizes, for all voltages from 100 to 260, the 100-watt lamps are reduced from 4s. 9d. to 4s. 3d., the 200-watt lamps from 9s. to 8s. 6d., and those taking 300 and 400 watts from 17s. to 16s. Certain other sizes in the 20 to 89-volt ranges have also been revised. Most of the makers have made arrangements to credit trade buyers with these reductions on unsold lamps still in stock, and the opportunity is being taken by the more energetic firms to prosecute a vigorous advertising campaign.

The General Electric Co. (67 Queen Victoria Street, E.C.) embody the new prices on the above basis, of their Osram drawn-wire lamps in a new and well-arranged list containing details of the ordinary high and low voltage lamps (now made in the case of 200 to 260 volts in the 15, 20, 30, 40, 60 and 80 watt sizes, and for 100 to 130 also for 10 watts), 20 to 80 volt lamps for country-house lighting, &c., large lamps right up to 1,000 watts (900 c.p.), and candle lamps for all voltages up to 260. They are also issuing attractive notices to be displayed in the windows of agents and contractors, calling attention to the reduction in prices.

The British Thomson-Houston Co. (Mazda House, 77 Upper Thames Street, E.C.) announce similar reductions in the prices of their Mazda drawn-wire lamps, and the revised prices are included in the current issue of their attractive little periodical, *Lighting News*. A very effective series of shop-window announcements of the reduction has been prepared, including a large notice in the form of an arrow, and some ingeniously worded posters.

Siemens Brothers' Dynamo Works, Ltd. (incandescent lamp and fittings department, Tyssen Street, Dalston, N.E.), have informed us of reductions in the prices of their "Wotan" drawn-wire lamps. Reductions are also being made by them in the prices of Tantalum lamps. Of these, the 8 and 10 c.p. sizes from 90 to 120 volts, and the 16, 25, 32, and 50 c.p. sizes for 50 to 130 volts are reduced from 2s. to 1s. 9d., and the 16, 25, 32, and 50 c.p. sizes from 180 to 260 volts are reduced from 2s. 6d. to 2s. 3d. Retailers desiring credit on unsold stocks must send in their returns by Sept. 28th. New price lists of both Wotan and Tantalum lamps are being issued in several attractive forms, and the company are prepared to overprint these for trade customers on receipt of inquiries.

The Electrical Company have also sent us copies of lists and leaflets announcing similar reductions in the prices of "Ægma" drawn-wire lamps, and have prepared advertising material in this connection.

The Edison & Swan United Electric Light Co., Ltd. (Ponders End, Middlesex), have informed us of similar reductions in the prices of their Royal Ediswan metal lamps. The new prices are set out in a complete list just issued, which includes, not only the ordinary standard lamps, but several designs of candle flame and tubular bulbs for special purposes.

The "Leuconium" lamps made by the Stearn Electric Lamp Co., Ltd. (47 Victoria Street, S.W.), are also subject to reductions in price on the same scale.

We are advised also by Pope's Electric Lamp Co., Ltd. (Hythe Road, Willesden), of corresponding reductions in the prices of their "Elasta" wire lamps.

Messrs. Drake & Gorham (1 Felix Street, S.E.), who hold large stocks of metal filament lamps, advise us of similar reductions in the prices of the following lamps marketed by them, viz., Osram, Mazda, Wotan, Ægma, Auriga, Foster, Philips, "Z," Stearn, and Ediswan.

Another manufacturing firm which has found itself able to reduce its prices on the same lines as the firms already mentioned is the Brimsdown Lamp Works, Ltd., who make the "Wirum" lamp.

**The Dublin Transit Trouble.**—In view of the refusal of the railways to handle goods consigned from London, the British Thomson-Houston Co. remind us that they have large stocks of Mazda Lamps, electrical supplies, &c., at their Dublin dépôt, at 25 Suffolk Street.



## "ELECTRICAL ENGINEERING" LITERARY SECTION

### NEW PUBLICATIONS

*We shall be pleased to post any of the undermentioned works to any address in the United Kingdom, Colonies, or Abroad at the prices given. Orders should be addressed to the Kilowatt Publishing Co., Ltd., 203-6 Temple Chambers, Temple Avenue, London, E.C., accompanied by a remittance.*

"Electrical Tables and Memoranda," by S. P. Thompson, F.R.S. 186 pp. 2½ in. by 1½ in.; 15 figures. (London: E. & F. N. Spon, Ltd.) Second edition. 1s. net; by post 1s. 1d.

"Electric Wiring," by W. C. Clinton. 197 pp. 6½ in. by 4½ in.; 105 figures and 4 tables. (London: John Murray.) Third edition. 2s.; by post 2s. 8d.

"Wireless Telegraphy," by C. L. Fortescue. 148 pp. 6½ in. by 5 in.; 20 figures. (Cambridge: The University Press.) 1s. net; by post, 1s. 2d. (Cambridge Manual.)

"Principles of Setting-Out: Securing and Tooling Operations," by A. Parr. 290 pp. 9 in. by 5½ in. 286 figures. (London: Longmans, Green and Co.) 7s. 6d. net; abroad, 8s. 2d.

"Freileitungsbau: Ortsnetzbau," by F. Kapper. 370 pp. 9½ in. by 6½ in.; 351 figures and 2 tables. (Munich: R. Oldenbourg.) 13s. net; by post, 13s. 6d.; abroad, 14s.

"Electrical Meters," by C. M. Jansky. 370 pp. 9½ in. by 6½ in.; 273 figures. (New York: McGraw-Hill Book Co.; London: Hill Publishing Co., Ltd.) 10s. 6d. net.

"Modern Electrical Theory," by N. R. Campbell. 400 pp. 8½ in. by 5½ in.; 9 figures. (Cambridge: The University Press.) 2nd edition. 9s. net; abroad, 9s. 7d.

"Practical Alternating Currents and Alternating Current Testing," by C. F. Smith. 898 pp. 8½ in. by 5½ in.; 268 figures. (Manchester: The Scientific Publishing Co.) 5th edition. 6s. net; abroad, 6s. 7d.

"Graphs in a Cable-ship Drum-room," by E. Raymond-Barker. 46 pp. 9½ in. by 6½ in.; 10 figures, 4 tables. (London: H. Alabaster, Gatehouse & Co.) 2s. 6d. net; by post, 2s. 8d.

"Switches and Switchgear," by R. Edler. Translated by Ph. Laubach. 401 pp. 9 in. by 6 in.; 365 figures. (London: Constable & Co., Ltd.) 15s. net; abroad, 16s.

"High and Low Tension Switchgear Design," by A. G. Collis. 218 pp. 8½ in. by 5½ in.; 94 figures. (London: Constable & Co., Ltd.) 10s. 6d. net; abroad, 11s. 2d.

"Simple Electric Cookery," by May Little. 7½ in. by 4½ in.; 11 plates. (London: Jarrold & Sons.) 1s. 6d. net; by post, 1s. 9d.

"Wireless Telegraphy and How to Make the Apparatus." 152 pp. 7½ in. by 4½ in.; 93 figures. (London: Cassell & Co., Ltd.) 1s. net; by post, 1s. 3d.

"Fairbrother on Patents," by H. Fairbrother. 48 pp. 8½ in. by 5½ in. (Birmingham: Bromhead & Co.) 1s. net; by post, 1s. 2d.

"Taschenbuch für Monteure elektrischer Beleuchtungsanlagen," by G. Lux and C. Michalke. Edited by S. F. V. Gaisberg. 284 pp. 6½ in. by 4½ in.; 210 figures. (Munich: R. Oldenbourg.) 46th edition. 2s. 6d. net; by post, 3s.

"Proceedings of the Optical Convention, 1912." Vol. II. 359 pp. 10 in. by 7½ in.; 167 figures. (London: Hodder & Stoughton.) 10s. net; abroad, 11s.

"Telephone Erection and Maintenance." By H. G. White. 129 pp. 7½ in. by 5½ in. 47 figures. (London: S. Rentell & Co., Ltd.) 1s. 6d. net; by post, 1s. 9d.

"Engineering as a Profession." By A. P. M. Fleming and R. W. Bailey. 288 pp. 7½ in. by 5 in. (London: John Long, Ltd.) 2s. 6d. net; by post, 2s. 9d.

A Pocket Glossary of English-German, German-English Technical Terms. By J. G. Horner and O. Holtzmann. 298 pp. 4 in. by 2½ in. (London: Crosby, Lockwood & Son.) 3s. net; abroad, 3s. 2d.

"A Text-book of Physics," by R. S. Willows. 471 pp. 8 in. by 5½ in. 280 figures. (London: Edward Arnold.) 7s. 6d. net; abroad, 8s. 2d.

"Principles of Thermodynamics," by G. A. Goodenough. 327 pp. 9½ in. by 6½ in.; 123 figures; 3 tables. (London:

Constable & Co., Ltd.) Second edition. 14s. net; abroad, 14s. 8d.

"Researches in Magneto-Optics," by P. Zeeman. 219 pp. 8½ in. by 6 in.; 74 figures. (London: Macmillan & Co., Ltd.) 6s. net; abroad, 6s. 6d.

"Dynamo Lighting for Motor Cars," by M. A. Codd. 96 pp. 8½ in. by 5½ in.; 126 figures. (London: E. & F. N. Spon, Ltd.) 2s. 6d. net; by post, 2s. 10d.

"Pocket-Book of Useful Formulae and Memoranda for Civil, Mechanical and Electrical Engineers," by Sir G. L. Molesworth and H. B. Molesworth. 986 pp. 5 in. by 8½ in. (London: E. & F. N. Spon, Ltd.) Twenty-seventh edition. 5s. net; abroad, 5s. 4d.

"The Ideal Code Condenser," by A. Kolkenbeck. 16 pp. 13½ in. by 8½ in. (London: Central Translations Institute.) 2nd edition. 21s. net.

### REVIEWS OF BOOKS

**High- and Low-Tension Switchgear Designs.** By A. G. Collis. 218 pp. 8½ in. by 5½ in.; 94 figures. (London: Constable and Co., Ltd.) 10s. 6d. net; abroad, 11s. 2d.

At the present time there is hardly any branch of electrical work more in need of an up-to-date treatise than that of switchboard design, especially one from the hands of a practical worker in the field. As the size of generating stations increases, the weak spots in the switchgear are being discovered, and it may almost be said that the design of heavy A.C. switchgear is in the melting pot. In some recent cases, in fact, this statement might have been applied literally not to the design of the switchgear, but to the switchgear itself.

The first portion of the book under review is devoted to alternating-current switchgear, and treats rather fully with A.C. principles generally, and particularly the breaking of A.C. power circuits under oil, as studied by the oscillograph. The question of the use of inductances is briefly dealt with, but receives but scant praise from the author, notwithstanding the fact that such devices are now generally considered to be essential for the safe control of large A.C. stations. Certainly some of the views expressed by the author will not receive general acceptance. The mechanical forces set up on short circuit are also touched upon, but the subject might have been enlarged with advantage. A chapter is devoted to A.C. relays of various types, and another to A.C. meters and instruments, but details of actual instruments are not given.

The second portion of the book is headed direct-current switchgear, but all the same it contains a considerable amount of matter on A.C. work. The breaking of direct currents by means of circuit breakers and fuses is treated at some length by means of oscillograms, whilst standard connections of various representative switch panels are also given at some length.

While we have criticised some features of the volume before us, it is only fair to say that a great part of the book is excellent, and both central station engineers and switchboard designers will find it of utility; but the matter might perhaps have been put together in a better manner, and the last few chapters might be rewritten with advantage.

**Electric Wiring.** A Primer for the Use of Wiremen and Students. By W. C. Clinton. 197 pp. 6½ in. by 4½ in. 105 figures and 4 tables. (London: John Murray.) 3rd edition. 2s.; by post, 2s. 3d.

The instruction given on those principles of electrical engineering which should be within the knowledge of men engaged in wiring work are quite sound, and the low price of this "primer" is also a recommendation. Here and there, however, the author falls into the error of employing language too cumbrously accurate, at any rate for the wiremen class, to whom the book is dedicated. For instance, Ohm's law is stated as follows:—

If in any circuit there is a steady, direct electromotive force producing a corresponding steady, direct current, then a change in the value of this electromotive force produces a change in the value of the current in the same ratio, provided that the temperature of the circuit does not alter.

The intelligent reader, however, will find matters made quite clear in the numerous "worked examples" given at the conclusion of each chapter. We trust that it will not be necessary to allow the same lapse of time—seven years—between the third and fourth editions of this book as between the second and third; and we hope that in the next edition the author will include a few more tables, and will educate the reader into the methodical application of these. For instance, in such simple calculations as the determination of the size of a conductor for a given voltage drop, few engineers would work right back from the specific resistance of copper, multiply it by the length of the circuit in inches, and then divide by the resistance given from the current and the required voltage drop. It is therefore hardly reasonable to expect the wireman to do this, and to carry out calculations involving the substitution of 0.00000067 for  $\rho$ ; and it is unkind to invite him to employ formulæ involving the use of a letter so far down in the Greek alphabet as to be beyond the limited knowledge of that language usually retained after a Board School training. We believe that  $\delta$  (pronounced so as to rhyme with "pelt her") is the usual limit.

**Telephone Erection and Maintenance.** By H. G. White. 129 pp. 7½ in. by 5½ in. 47 figures. (London: S. Rentell & Co., Ltd.) 1s. 6d. net; by post, 1s. 9d.

The greater number of wiring contractors and wiremen have hitherto derived their knowledge of house telephone installations from a very limited amount of personal experience and a perusal of the excellent "trade" literature published by the various manufacturers. Although they are able to instal simple telephone systems, they are not always ready to meet "traffic conditions," differing from the more or less conventional requirements, and are frequently completely at a loss when called in to repair or to extend systems unlike the particular one with which they have had experience. Mr. White's book should therefore meet with a cordial reception, and the publishers would have been justified in printing it in a less modest type and in charging a less modest price for it. The matter is thoroughly practical, and the author evidently writes from experience. He has gauged exactly what the average contractor ought to know

about house telephones, and has given him just what is necessary to extend his present limited field. The literary style of the book, and occasionally the grammar, leave something to be desired, but these faults can be condoned on account of the excellence in other respects.

**Freileitungsbau: Ortsnetzbau.** By F. Kapper. 370 pp. 9½ in. by 6½ in. 351 figures and 2 tables. (Munich: R. Oldenbourg.) 13s. net; by post, 13s. 6d.; abroad, 14s.

A book such as this in the English language and in English measurements would be of considerable value to the engineer engaged in the design and construction of overhead transmission or distribution networks. It is the work of an experienced engineer, and is excellently produced. Many important matters of purely an electrical nature, such as protection from lightning and surges, corona loss, the calculation of inductance and capacity of power lines, the effect of variation in altitude, and the design of outdoor switch and transformer poles, are entirely omitted, but the constructional features are treated of in a most thorough manner. The calculations are based on the rules of the Verband Deutscher Elektrotechniker, but the author rightly criticises these in some respects, in particular as regards the high maximum stress of 9 kg. per sq. mm. allowed for aluminium. It should be mentioned, however, that in the new rules of the V.D.E., to come into force on January 1st, 1914, this figure is reduced to 7 kg. per sq. mm. The author states with reason that the correct field for aluminium conductors is low-tension, large-section work with small spans, as the greater sag compared with that of a copper conductor has here the least effect on the height and cost of the pole. The chapters on pole, mast and tower construction are excellently illustrated, foundations and anchorings are fully dealt with, as well as the impregnation, life and cost of wooden poles, the various patterns of insulators, &c. Of particular value is the chapter on the protection of telegraph, telephone and other low-tension wires, road-crossings, &c., from falling high-tension conductors. In concert with most engineers, the author condemns the wire-network cradle as unsightly, unreliable, and even dangerous, and only to be used where low-tension wires pass over high-tension wires. For all other cases, earthing bars to earth the fallen wire, supplemented, if necessary, by additional supports for the conductor and a reduced tensile stress, are recommended. Two methods, adopted with considerable success on the Continent, are illustrated. In one case the conductor is duplicated, the two wires being connected together by a wire zig-zag or ladder formation along the whole length of the span. The other method is already in use in this country, and consists in having one or two additional insulators from which short lengths of cable run out to points a foot or two along the main cable in either direction. Interesting photographs of various methods of elevating erected towers are given, as well as useful hints on line surveying and cable stringing. An investigation of the most economical span under different conditions, and a complete list of cost data, will be found useful for estimating line costs. The final chapters are devoted to the design and construction of low-tension overhead distribution networks so frequent in the villages, small towns and city suburbs on the Continent. Wall brackets, roof poles, street poles and span wires are described and illustrated by numerous effective photographs. The absence of an index is a serious defect to an otherwise excellent book.

**American Telegraph Practice.** By D. McNicol. 507 pp. 9½ in. by 6½ in. 421 figures. (New York: McGraw-Hill Book Co.; London: Hill Publishing Co.) 17s. net.

The treatise is primarily intended for American students, and the systems described differ somewhat in detail from those used in the United Kingdom. Matters of principle are, however, very much the same in both countries, and these are dealt with in a very clear and concise manner. In addition to telegraph practice, the author has included several chapters on the general theory of magnetism and electricity, likely to be of use to a telegraph student. Without unduly labouring the mathematical side of telegraph transmission, the author brings out the essential facts necessary for its efficient achievement so far as signalling and auxiliary apparatus are concerned. The treatise is profusely illustrated with very clearly drawn and easily read theoretical diagrams, but it would have added to the usefulness of the book if a few more wiring diagrams had been included. Specially interesting chapters are those dealing

**THE INDIAN TRADE**  
of  
**BRITISH MANUFACTURERS**  
*can be largely increased if the advertising columns of*  
**"Indian Industries & Power"**

(Incorporating "INDIAN MOTOR NEWS")

*are made judicious use of.*

*This Journal, published at Bombay, is acknowledged to be the leading Engineering and Industrial journal in Western India. It is officially subscribed to by the Government of India, the Indian Provincial Governments and Native States throughout India.*

**MAKERS OF MOTOR CARS AND ACCESSORIES**

*will in particular find it an admirable medium. It was the first journal to deal with Motoring and Automobilism in the East.*

**Wheeler's Buildings,  
73, Hornby Road, Fort, Bombay**

*Telegrams: "Indopower" Bombay.  
Write for a specimen copy.*

## CROSBY LOCKWOOD & SON'S

### NEW and STANDARD BOOKS

**A POCKET GLOSSARY OF TECHNICAL TERMS. ENGLISH-GERMAN, GERMAN-ENGLISH.** For Engineers and Manufacturers. Compiled by J. G. HORNER, A.M.I. Mech.E. Translated into German by OTTO HOLTZMANN, Member of the Office of the "Illustrated Technical Dictionaries in Six Languages." 295 pages. Price 3s. net. [Just Published.]

**WIRELESS TELEGRAPHY: Its Theory and Practice.** A Handbook for the Use of Electrical Engineers, Students and Operators. By JAMES ERSKINE-MURRAY, D.Sc. Fourth edition, revised and considerably enlarged. 450 pages, 196 Illustrations. 10s. 6d. net.

**THE MECHANICAL ENGINEER'S POCKET BOOK OF FORMULÆ, RULES, AND DATA.** A Handy Book of Reference for Daily Use in Engineering Practice. By the late D. K. CLARK, M.Inst.C.E. 1913 Edition, revised throughout and enlarged by N. H. P. POWLES, A.M.Inst.C.E. 700 pages. Limp Cloth. Small 8vo. 4s. 6d. net. [Just Published.]

**THREE-PHASE TRANSMISSION.** A Practical Treatise on the Economic Conditions governing the Transmission of Electrical Energy by Underground and Overhead Electrical Wires. By WM. BREW, M.I.E.E. 185 pages, 82 Illustrations. Demy 8vo, cloth. 7s. 6d. net.

**ELECTRICAL ENGINEERING.** A First Year's Course for Students. By TYSON SEWELL, A.M.I.E.E. Fifth Edition, revised, with Additions. Large Crown 8vo, cloth. 460 pages, with 278 Illustrations. 5s. net.

**FACTORY ACCOUNTS: Their Principles and Practice.** By EMILE GARCKE and J. M. FELLIS. Sixth Edition, revised and enlarged. Demy 8vo, cloth. 314 pages. 6s. net.

**ELECTRIC TRACTION AND TRANSMISSION ENGINEERING.** By SAMUEL SHELTON and ERICH HAUSMANN. 317 pages. 127 Illustrations. Large crown 8vo, cloth. 12s. net.

**ELECTRIC WIRING, DIAGRAMS & SWITCHBOARDS.** By NEWTON HARRISON. Crown 8vo, cloth. 5s. net.

**ELECTRICAL & MAGNETIC CALCULATIONS.** By A. A. ATKINSON. Crown 8vo. 9s. net.

**ELEMENTARY ELECTRICAL ENGINEERING.** In Theory and Practice. A Class Book for Junior and Senior Students and Working Electricians. By J. H. ALEXANDER. 220 pages. 181 Illustrations. Crown 8vo, cloth. 3s. 6d.

**WIRELESS TELEPHONES: and How they Work.** By J. ERSKINE-MURRAY. Second Edition. 1s. 6d. net.

**DYNAMO, MOTOR, AND SWITCHBOARD CIRCUITS FOR ELECTRICAL ENGINEERS.** A Practical Book dealing with the subject of Direct Alternating, and Polyphase Currents. By WILLIAM R. BOWKER. Second Edition, revised. Medium 8vo, cloth. 109 Diagrams. 7s. 6d. net.

**ELEMENTARY ELECTRICAL CALCULATIONS.** A Manual of Simple Engineering Mathematics. By T. O'CONNOR SLOANE. 314 pages. 43 Illustrations. Crown 8vo, cloth. 9s. net.

**STANDARD ELECTRICAL DICTIONARY.** By T. O'CONNOR SLOANE. 7s. 6d. net.

**ALTERNATING AND DIRECT CURRENT DYNAMOS.** A Text-Book on their Construction for Students, Engineer Constructors and Electricians-in-Charge. By TYSON SEWELL, A.M.I.E.E. 328 pages. 230 Illustrations. Large Crown 8vo, cloth. 7s. 6d. net.

**ELECTRIC MOTORS: Their Action, Control, and Application.** By F. B. CROCKER and M. ARENDT. 10s. 6d. net.

**ELECTRIC POWER CONDUCTORS.** By W. A. DEL MAR. 9s. net.

**WIRELESS TELEPHONY: In Theory and Practice.** By ERNST RUHMER. Translated from the German by J. ERSKINE-MURRAY. Demy 8vo, cloth. 10s. 6d. net.

Complete Catalogue post free on application.

London: Crosby Lockwood & Son  
7, Stationers' Hall Court, E.C., & 5, Broadway, Westminster, S.W.

## Constable's New Books

### PRACTICAL MANUALS FOR PRACTICAL MEN

FULLY ILLUSTRATED AND INDEXED

NEW VOLUME

### SWITCHGEAR AND THE CONTROL OF ELECTRIC LIGHT AND POWER CIRCUITS

By A. G. COLLIS, A.M.I.E.E.

With many Diagrams. 1s. net. [Ready next Tuesday.]

### TESTING AND LOCALIZING FAULTS.

By J. WRIGHT. 1s. net.

### ARC LAMPS AND ACCESSORY

APPARATUS. By J. H. JOHNSON, A.M.I.E.E. 1s. 6d. net.

### MOTORS, SECONDARY BATTERIES, MEASURING INSTRUMENTS AND SWITCH- GEAR.

By S. K. BROADFOOT, A.M.I.E.E. 1s. net.

### MILL AND FACTORY WIRING.

By R. G. DEVEY. 2s. net.

### ELECTRIC MINING INSTALLATIONS.

By P. W. FREDEMACHER, A.M.I.E.E. 2s. net.

### SHIP WIRING AND FITTING.

By T. M. JOHNSON. 1s. net.

### BELLS, INDICATORS, TELEPHONES, ALARMS, ETC.

By J. B. REDFERN and J. SAVIN. 1s. 6d. net.

### FOUNDATIONS AND FIXING MACHINERY.

By FRANCIS H. DAVIES. 2s. net.

OTHER VOLUMES IN PREPARATION.

### THE PROPAGATION OF ELECTRIC CURRENTS IN TELEPHONE & TELEGRAPH CONDUCTORS.

By J. A. FLEMING, M.A., D.Sc., F.R.S.,  
Pender Professor of Electrical Engineering in the University  
of London.

### HIGH AND LOW TENSION SWITCH- GEAR DESIGN.

By A. G. COLLIS, A.M.I.E.E. With  
94 Illustrations, &c. Demy 8vo. 10s. 6d. net.

### SWITCHES AND SWITCHGEAR.

By R. EDLER. Translated, Edited, and Adapted to English  
and American Practice by PH. LAUBACH, A.M.I.E.E.  
Illustrated. Demy 8vo. 15s. net.

### ELECTRICAL ENGINEER'S POCKET

BOOK "FOSTER." A Handbook of Useful Data for  
Electricians and Electrical Engineers. By HORATIO A.  
FOSTER, M.A.I.E.E., M.A.S.M.E. With collaboration of  
Eminent Specialists. 5th Edition, completely revised and  
enlarged. Pocket size. Leather bound. With Thumb  
Index. Over 1600 pages. Illustrated. 21s. net.

### ELECTRIC MECHANISM. PART I.—Single-

Phase Commutator Motors. By F. CREEDY, A.C.G.I.,  
A.M.I.E.E., Assoc. Am. I.E.E. Demy 8vo. 7s. 6d. net.

### THE NEW STEAM TABLES.

Calculated from Professor Calendar's Researches by Professor C. A. M.  
SMITH, M.Sc., and A. G. WARREN, S.Sc. 4s. net.

### APPLICATION OF ELECTRIC POWER

TO MINES AND HEAVY INDUSTRIES. By  
W. H. PATCHELL, M.Inst.C.E., M.I.M.E., M. Am. I.E.E.  
Demy 8vo. 10s. 6d. net.

NEW EDITION, REVISED AND ENLARGED

### THE DIESEL ENGINE

FOR LAND AND MARINE WORK

Profusely Illustrated. Demy 8vo. 8s. 6d. net.

By A. P. CHALKLEY, B.Sc., A.M.Inst.C.E., A.I.E.E.

With an Introduction by Dr. DIESEL.

Please write for new Technical List.

LONDON

## MACMILLAN'S NEW & RECENT WORKS.

### Researches in Magneto-Optics.

With special reference to the Magnetic Resolution of Spectrum Lines. By **P. ZEEMAN**, Sc.D., Ph.D., D.Sc., Nobel Laureate, Professor of Experimental Physics in the University of Amsterdam. Illustrated. 8vo. 6s. net.

[*Science Monographs.*]

### Studies in Radioactivity.

By **W. H. BRAGG**, M.A., F.R.S., Cavendish Professor of Physics in the University of Leeds. 8vo. 5s. net. [*Science Monographs.*]  
*KNOWLEDGE.*—"Prof. Bragg's book admirably fulfils the intention of the series, and he has very wisely not omitted to describe briefly the researches of other experimentalists, as well as his own most valuable ones, which come within the subject of the work."

### Elementary Practical Mathematics, with numerous Exercises for the use of Students and especially of Mechanical and Electrical Engineering Students.

By **JOHN PERRY**, M.E., D.Sc., LL.D., F.R.S., Professor of Mechanics and Mathematics at the Royal College of Science, London. 8vo. 6s.  
*EDUCATION.*—"It is written in a manner which is decidedly stimulating. . . . The later chapters of the book contain many interesting applications to mathematical physics, especially telegraphy and telephony. We strongly recommend this book to the discriminating consideration of teachers."

MACMILLAN AND CO., LTD., LONDON.

with the means for minimising the interference from high-tension lines and the installation of simultaneous telegraphy and telephony. Very little information is given respecting overhead and underground line construction, but perhaps this may be remedied in a subsequent edition. The book would form a useful addition to any telegraph and telephone student's library.

**Practical Alternating Currents and Alternating Current Testing.** By **C. F. Smith**. 398 pp. 8½ in. by 5½ in.; 258 figures. (Manchester: The Scientific Publishing Co.) 5th edition. 6s. net; abroad, 6s. 7d.

The fact that this work has now reached its fifth edition is a proof that it is well known and appreciated. There is no outstanding feature in the new edition, as the revision has related mainly to minor points. The book is more than a laboratory manual of experiments, as the explanations, which are of admirable clearness, form in themselves a text-book, giving the student a practical insight into the principles of alternating-current working. Only elementary knowledge is assumed. The worked-out numerical examples enhance the utility of the book. A considerable amount of the space is given to the treatment of transformers, alternators, synchronous motors, rotary-converters, and induction motors, but not the least interesting chapters are those devoted to the single-phase commutator motor, and to the composition of voltage waves.

### Mathematical Physics. Volume I. Electricity and Magnetism.

By **C. W. C. Barlow**. 312 pp. 7 in. by 5 in.; 129 figures. (London: University Tutorial Press, Ltd.) 4s. 6d.; abroad, 4s. 10d.

Notwithstanding its rather high-sounding title, this little work has a modesty which cloaks some undoubted points of merit. It does not pretend to be an advanced mathematical treatise, nor, indeed, can it be accused of being a school cram-book. It is intended to be supplementary to other works of a more qualitative nature by supplying first those quantitative ideas which justify the well-known saying that "Science is measurement." Not only are electrostatics and the flow of electricity, magnetism and its interaction on currents, and thermo-electricity, treated, but there is a final chapter on the modern corpuscular theory which should form an excellent introduction to the point of view from which the facts revealed by modern researches should be viewed. The treatment throughout is clear, and the numerous examples should be of assistance to the student.

**Simple Electric Cookery.** By **May Little**. 7½ in. by 4½ in. 11 plates. (London: Jarrold & Sons.) 1s. 6d. net; by post, 1s. 9d.

This is, we believe, the first book to be published on electric cooking from the cooking point of view, and should be useful to consumers. The authoress has conducted demonstrations in electric cooking at Norwich and elsewhere, and is responsible for various other publications dealing with cookery. Only the first twenty-seven pages are really devoted to the electrical side of the subject. The advantages of electric cooking are briefly set out, a number of forms of cooker are illustrated but very little is said as to their construction. We do not think that everybody will agree with the opening

statement that "the best-known makes of electric cookers are like gas cookers in appearance." The hints on cooking appear to be excellent, but we should like to have seen a little more information enabling the prospective consumer to judge of the merits of apparatus by different makers, to choose a range of apparatus suited to his requirements, and to understand a little more of the electrical side of the subject. Probably, however, the consumers to whom the book is addressed are expected to hire all the apparatus from the supply authority, and to abide by its decision in these matters. More than three-quarters of the book consists of appetising recipes upon which is not our province to express an opinion.

**Dynamo Laboratory Outlines for Students in Electrical Engineering.** By **J. F. Wilson**. 129 pp. 7½ in. by 5½ in.; 84 figures. (New York: McGraw-Hill Book Co.; London: Hill Publishing Co.) 4s. 2d. net.

There are many manuals of electrical engineering laboratory practice, but few as concise as this one, considering the amount of ground which it covers. The author does not aim at elaborate completeness, hence his title "outlines," and in his treatment endeavours to strike the happy medium between making the student an independent discoverer of facts and "spoon-feeding." The utility of the book is enhanced by the numerous references to standard works, and the diagrams are just such as are required. Direct and alternating-current machinery is dealt with, and the sequence of the experiments is well arranged.

**Wireless Telegraphy.** By **C. L. Fortescue**. 148 pp. 6½ in. by 5 in.; 20 figures. (Cambridge: The University Press.) 1s. net.; by post, 1s. 2d. (Cambridge Manual.)

This is one of the latest of the "Cambridge Manuals" series of booklets, over seventy of which have already been published, dealing with the general principles of the great questions engaging the attention of present-day investigators. The volume under review treats the complex subject of wireless telegraphy in as clear a manner as could reasonably be expected within the compass of 140 small pages, seeing that the assumption is made that the reader has no electrical knowledge at all. Of course, at times there is a certain amount of vagueness in the descriptions of plant, its uses, and the way in which it fulfils its functions. Wireless telegraphy on shore, and on craft navigating both the water and the air, is dealt with, and the question of wireless telephony is also touched on. An obvious mistake occurs on page 54, where, six lines from the bottom, the word *useful* has been printed instead of *useless*.

**Principles of Thermodynamics.** By **G. A. Goodenough**. 327 pp. 9½ in. by 6½ in. 123 figures; 3 tables. (London: Constable & Co., Ltd.) Second edition. 14s. net; abroad, 14s. 8d.

The author of this work is a professor in the University of Illinois, and the volume of which the second edition is now before us is one of those painstaking treatises addressed to students of engineering which are being produced in considerable numbers in the United States. The fundamental laws are first developed, and the general thermodynamic



equations are derived. The laws of gases and gaseous mixtures are then discussed, and their technical application considered. In the same way a discussion of the properties of saturated and superheated vapours is followed by the technical applications involving them. The arrangement and logical sequence are good, and the physical conception of entropy, always difficult to present, is attacked in a happy way. Recent quantitative researches on superheated steam are included, and more space than usual is devoted to the flow of fluids and throttling processes. The exercises at the end of each chapter will be found useful by students, and there are tables of references enabling any section of the subject to be followed up further.

**Dynamo Lighting for Motor Cars.** By M. A. Codd. 96 pp. 8½ in. by 5½ in. 126 figures. (London: E. & F. N. Spon, Ltd.) 2s. 6d. net; by post, 2s. 10d.

A large proportion of this little volume is devoted to somewhat detailed descriptions of the many electric lighting sets which are now on the market, and as a comparison of the different methods employed for connecting and disconnecting the dynamo to the cells according to the speed of the drive, and for regulating the voltage of the machine, it is interesting. The introductory part is, perhaps, not quite as good as the descriptive part. There is a little confusion as regards the output and the voltage of a dynamo, and the explanations of the way in which the machines with inherent regulation keep their voltage constant is a little vague. The practical man in charge of motor-cars in search of information on the choice and use of lighting sets will not, however, quarrel with the author on these points, and will find useful hints as regards upkeep and maintenance.

**Wireless Telegraphy and How to Make the Apparatus.** 152 pp. 7½ in. by 4½ in.; 93 figures. (London: Cassell & Co., Ltd.) 1s. net; by post, 1s. 8d.

Although only recently published, this little handbook, which is one of the well-known "Work" series, has already been twice reprinted. Clearly printed and well illustrated, the book, true to its title, gives ample information to enable the amateur to erect a wireless station, and to construct the necessary apparatus. Instructions for making a Wimshurst machine, and for using various kinds of coils, as well as other incidental matters, are also included.

**Pocket-Book of Useful Formulae and Memoranda for Civil, Mechanical and Electrical Engineers.** By Sir G. L. Molesworth and H. B. Molesworth. 936 pp. 5 in. by 3½ in. (London: E. & F. N. Spon, Ltd.) 27th edition. 5s. net; abroad, 5s. 4d.

Our dear old friend "Molesworth," which is still unbeaten as an engineering pocket-book, has now, with its twenty-seventh edition, reached its jubilee, for it is fifty years since the first edition, by Sir Guilford Molesworth, was published; and the preface to this new edition draws some interesting comparisons between the state of engineering then and now. The book has grown from an original modest total of 220 pages to its present 944, and the thorough revision to which it has been subjected before the appearance of every edition renders it as up-to-date now as it was originally. As has been the case now for some time, electrical matters are dealt with separately in a supplement by Mr. Walter H. Molesworth, and the best praise we can accord to this is that it is worthy of the rest of the work, even if necessarily somewhat compressed.

**Electrical Tables and Memoranda.** By S. P. Thompson, F.R.S. 136 pp. 2½ in. by 1½ in. 15 figures. (London: E. & F. N. Spon, Ltd.) Second edition. 1s. net; by post, 1s. 1d.

We are very pleased to see a new edition of the diminutive red pocket-book formerly known as Thompson and Thomas, but now published under the name of the former author only. Even though it is now some years since the first edition was completed, there is a good deal remaining that could never become obsolete, but the revision has nevertheless been thorough, and it is as true that the new matter is fully up to date as it is that none of the old matter is out of date. The metal filament lamp takes its due place, useful information as to illumination is now included, and there are admirable little articles on electric heating and cooking and the cost of electric supply. An abstract is included of the Institution wiring rules, and many practical hints on various branches of electrical engineering appear throughout the work. The copper-wire tables are in convenient form, and tables of trigonometrical functions and logarithms are given at the end. The whole is wonderfully complete for its

## A VALUABLE WORK ON ELECTRICAL INSTALLATIONS.

By Rankin Kennedy, C.E.

If any reader who is interested in this subject will send the coupon below, he can obtain a complimentary copy of an illustrated booklet describing what is probably the most valuable work on the subject ever published.

The necessity for electrical engineers being well acquainted with all designs for installations that have given good results will be readily acknowledged by those whom the matter concerns.

While there are numerous text-books dealing with one branch or another of electrical engineering, they are all prepared for the student, and their contents deal rather with theory than with practice.

The aim of "ELECTRICAL INSTALLATIONS" is to assist the practical man who is concerned with electrical installations in any form, and this because it is recognised that there exists a very large class engaged in constructive and installation work, and a still larger class whose duty it is to take care of the machinery employed in working by electricity. Most of these men have picked up a working knowledge of their employment. What they need is to study the elements of the science of the subject. These elements are fully treated of in the first volume; and on the sound foundation thus laid, the author, who is a civil and electrical engineer by profession, and recognised as being in the front rank of electricians and engineers, proceeds to deal with every possible form of electrical installation, their principles and practical application.

This work describes and illustrates the best practice in all branches of the electric light and power installation business; the last volume treats of all the lighter branches of electrical manufactures—telephones, wireless telegraphy, and kindred subjects.

This second and revised edition of the work justly claims to have brought all subjects up to date with descriptions and information regarding recent machinery and apparatus. The matter has also been re-arranged so that all information relating to one subject follows consecutively.

The illustrations number 1,000, and there are eight fine plates in each volume. In addition, each plate contains a coloured cardboard sectional model of an electrical machine in four sections superposed.

### TWO OPINIONS:

**Mr. PONTECORVO, Engineer, The British Westinghouse Electric Co., Ltd., Manchester:**—"The work is very clear in its explanations, and gives, by means of well illustrated experiments, a complete idea of the electrical phenomenon. The chapter with hints as to how to build experimental apparatus seems particularly useful. Printing and illustrations are clear and accurate."

**Mr. A. H. SHAW, M.I.E.E., A.M.I.Mech.E., Manager Ilford Electricity Supply and Tramways, Ilford:**—"I consider this work is all you claim for it. The matter is clear and up-to-date, and the diagrams and plates are particularly good. The article on supply meters should prove very useful. This is a work that everyone engaged in the practical applications of electricity should have access to."

## A FREE BOOKLET.

To the CAXTON PUBLISHING CO., LTD.,

97, Surrey Street, London, W.C.

Please send me, free of charge, and without any obligation on my part, Illustrated Booklet on ELECTRICAL INSTALLATIONS, and particulars of your plan whereby the volumes are delivered for a first payment of 1s. 6d., the balance being paid in small monthly instalments.

NAME.....

Send this Form or a Post Card.

ADDRESS.....

size, which is such that it need not oust all the legitimate occupants of a cigarette case.

**Modern Electrical Theory.** By N. R. Campbell. 400 pp., 8½ in. by 5½ in. Nine figures. (Cambridge: The University Press.) Second edition, 9s. net; abroad, 9s. 7d.

Though nominally a second edition, this volume is to all intents and purposes, a new book. It really belongs more to the domain of physics than of electrical engineering, and has been written for those who have an adequate acquaintance with the older physics, and wish to study its modern developments, especially in regard to the Principle of Relativity, which the author shows must supersede the Principle of Moving Axes. There has been but little change in our conception of the electronic theory since the date of the first edition some six years ago, but more knowledge concerning some of the difficulties raised, and the most likely ways of solving them, has developed. For instance, though considerable advance has been made in our knowledge of metallic conductivity and in the problem of radiation generally, we are still confronted with many difficulties. The book is divided into three parts, the first deals with the electronic theory, and covers the properties of electricity, dielectrics, conductors, gaseous conduction, magnetic susceptibility, and magneto-optics. The second deals with every known kind of radiation, while the third discusses the properties of matter, the structure of the atom, and the properties of moving systems. Much in this last section is new, and although necessitating a change in our ideas, the arguments are convincing, as soon as one appreciates their meaning. There are references with explanatory notes, at the end of each chapter to fuller discussions on the same lines as those given in the chapter concerned.

**A Text-book of Physics.** By R. S. Willows. 471 pp. 8 in. by 5½ in. 280 figures. (London: Edward Arnold.) 7s. 6d. net; abroad, 8s. 2d.

A considerable popularity of this work can be foreseen, in spite of the keen competition by the many other books on this subject now on the market. The first chapter is given over to a consideration of the general properties of matter; then follow chapters on heat, light, sound, magnetism, and electricity. The standard is that of the intermediate examinations of the various Universities and of the Civil Service Commission. The method and order of presentment, combined with the neat explanatory drawings of apparatus, is to be commended, as there can be no doubt that it is in line with the most rational way of teaching by lectures and laboratory experiments. A large proportion of the experiments in each section are given at the beginning of that section, so that experiment is the more easily kept ahead of theory. With regard to the sections on magnetism and electricity, the former is dealt with first, then some of the more elementary parts of the branch known as electrostatics, followed by what is often known as current electricity, while the section is closed by more advanced considerations of some electrostatic phenomena. The consideration of magnetism and electricity takes up about one-third of the book, and is straightforward and exact—not confused with out-of-date historical matter or side issues.

**Principles of Setting-Out: Securing and Tooling Operations.** By A. Parr. 290 pp. 9 in. by 5½ in. 236 figures. (London: Longmans, Green and Co.) 7s. 6d. net; abroad 8s. 2d.

The title of the work implies merely marking off of work and the setting up for machine operation, whereas, in spite of its comparatively small size, the book ranges throughout the whole field of workshop practice. The most modern examples of gauges, jigs, clamps, and fixtures are well illustrated, and even the principles of gearing are touched upon; the result is a most useful treatise for young engineers, but perhaps a little too condensed for workshop use, and a little too detailed for the general engineer. Incidentally, we may mention that we do not agree with the author's opinion that malleable cast iron may in many cases be equally satisfactory to forgings of iron or steel, nor do we consider two illustrations of fixtures for planing machines quite suitable for general use, but, as a whole, the work is excellent.

**Engineering as a Profession.** By A. P. M. Fleming and R. W. Bailey. 288 pp. 7½ in. by 5 in. (London: John Long, Ltd.) 2s. 6d. net; by post, 2s. 9d.

The fact that we are ourselves continually receiving inquiries as to the best course to be pursued for the education of those who wish to enter the engineering profession would indicate that some such book as that before us should be welcome. The object of the authors is to give a general idea of the nature of the training required, to give particulars facilitating a choice of technical school or college suitable for the particular case, with information also as to works, &c., where pupils are taken, as well as to indicate some of the ways in which the profession may be entered when the earlier part of the training is complete. The list of appointments and qualifications gives a good general idea of the class of openings that exist, but in matters of detail

there are, of course, frequent changes. A short chapter also notices the principal features of engineering training as carried out in some other countries. There is useful information as to facilities for obtaining training at minimum expense.

**Researches in Magneto-Optics.** By P. Zeeman. 219 pp. 8½ in. by 6 in. 74 figures. (London: Macmillan & Co., Ltd.) 6s. net; abroad, 6s. 6d.

The author has in this publication supplemented the lecture entitled "Recent Progress in Magneto-Optics," which he delivered before the Royal Institution in 1906. After some notes on modern spectroscopes and their resolving powers, i.e., their capacity to separate vibrations which differ little in wave-length as effected by gratings, prisms, &c., the magnetic resolution of emission lines and allied problems are dealt with. An interesting chapter is that dealing with solar magneto-optics, and in the last chapter some account is given of the behaviour in the magnetic field of the atom built up of electrons and positive electricity, as conceived by Sir J. J. Thomson. In general the material in the different chapters has been arranged historically, so that a connected narrative of the progress in this science, and embodying the important experimental and theoretical contributions of the author, is available to all.

**Taschenbuch für Monteur Elektrischer Beleuchtungsanlagen.** By G. Lux and C. Michalke. Edited by S. F. von Gaisberg. 284 pp. 6½ in. by 4½ in. 210 figures. (Munich: R. Oldenbourg.) Forty-sixth edition. 2s. 6d. net; by post, 3s.

The fact that this is a forty-sixth edition shows that the book is a great favourite of the German erecting electrical engineer and foreman. English readers who understand German and take an interest in German practice, will find it useful.

**Fairbrother on Patents.** By H. Fairbrother. 48 pp., 8½ in. by 5½ in. (Birmingham: Bromhead & Co.) 1s. net; by post 1s. 2d.

To those who only desire to know the fundamental patent laws of the various countries where patent protection is granted, this handbook enables such information to be obtained in a minimum of time. The countries thus dealt with are arranged in alphabetical sequence, and the notes show the kinds of patents granted, the life of a patent, terms of payment, including renewal fees, if any, conditions as to working, marking, &c. Some indication is given of the value of a patent so obtained, but the cost of obtaining it, and the amount of the payments necessary, are unfortunately not included, possibly because considerably more space would be required to make these matters clear than is available. It should prove a handy work of reference on those matters with which it deals.

**A Pocket Glossary of English-German and German-English Technical Terms.** By J. G. Horner and O. Holtzmann. 298 pp. 4 in. by 2½ in. (London: Crosby Lockwood and Son.) 3s. net; abroad, 3s. 2d.

Those who have much to do with German technical literature should find this little work very convenient. On account of its small size, it can be always handy, but, considering its smallness it appears very complete. A somewhat extensive range of engineering is covered, and there is a fair proportion of electrical terms. Electrical engineering is not, however, quite so well represented as mechanical workshop practice. The English-German and German-English sections are separate.

**Proceedings of the Optical Convention, 1912.** Vol. II. 359 pp. 10 in. by 7½ in. 167 figures. (London: Hodder and Stoughton.) 10s. net; abroad, 11s.

In this volume are recorded the proceedings of the second Optical Convention, which met in London in June, 1912, under the Presidency of Prof. Silvanus P. Thompson. Among the 36 papers which are printed, together with the discussions on them, perhaps the most interesting, from the point of view of the electrical engineer, are one on measurements and notes on the visibility of point sources of light, by C. C. Paterson and B. P. Dudding, and another on recent advances in the measurement of light and illumination, by J. S. Dow and V. H. Mackinney. The volume is well got up, and covers a considerable variety of subjects.

**The Ideal Code Condenser.** By A. Kolkenbeck. 16 pp. 13½ in. by 8½ in. (London: Central Translations Institute.) Second edition. 21s. net.

This is the second edition of a work first published in 1906, the main object of which is to enable two code words taken from any recognised numbered code to be condensed into one artificial word to effect a saving in the cost of transmission by using the figures and forming out of them a pronounceable ten-letter word by means of tables of syllables. The only material alteration in the tables is an improved arrangement of the check indicator table, making a two-figure difference between all similar combinations. Users of the first edition can obtain free of charge a sheet giving the revised arrangement. The explanations and instructions, which are in English, French, and German, are also a little fuller than before.

## "ELECTRICAL ENGINEERING" LIST OF SELECTED TECHNICAL BOOKS

We shall be pleased to send any of the following books to addresses in the United Kingdom at the *net* published prices named, unless otherwise stated. The increased price for sending abroad is also quoted after each book. All the books listed have been recommended by our editorial staff and reviewers.

Orders should be addressed to the Kilowatt Publishing Co., Ltd., 203-206 Temple Chambers, Temple Avenue, E.C., and should be accompanied by a remittance.

### Electricity Supply and Distribution.

(See also *Steam, Gas, and Water Plants*.)

- Power House Design. J. F. C. Snell. 21s. net; abr., 22s. (Reviewed Jan. 18th, 1912.)  
Heavy Electrical Engineering. H. M. Hobart. 16s. net; abr., 17s. 3d. (Reviewed July 15th, 1909.)  
Three-Phase Transmission. W. Brew. 7s. 6d. net; abr., 8s. 1d.  
Electric Cables, Their Construction and Cost. Coyle and Howe. 15s. net; abr., 15s. 8d.  
Electric Power Conductors. W. A. Del Mar. 9s. net; abr., 9s. 8d.  
Theory of Electric Cables and Networks. Alex. Russell. 8s. net; abr., 8s. 8d. (Reviewed Oct. 7th, 1909.)  
Electric Mains and Distributing Systems. Dick and Fernie. 10s. 6d. net; abr., 11s. 4d. (Reviewed Feb. 29th, 1912.)  
Long Distance Electric Power Transmission. R. W. Hutchinson. 12s. 6d. net; abr., 13s. 4d.  
Practical Calculation of Transmission Lines. L. W. Rosenthal. 8s. 6d. net. (Reviewed Oct. 14th, 1909.)  
High and Low Tension Switchgear Design. A. G. Collis. 10s. 6d. net; abr., 11s. 2d. (Reviewed Sept. 25th, 1913.)  
Electricity Meters. C. Gerhardt. 9s. net; abr., 9s. 8d.  
Electricity in Factories and Workshops. A. P. Haslam. 7s. 6d. net; abr., 8s. (Reviewed Aug. 5th, 1909.)

### Steam and Gas and Oil Engines, Water Plants, and General Engineering

- Steam Turbine Engineering. Stevens and Hobart. 21s. net; abr., 22s. 4d.  
The Steam Turbine. R. M. Neilson. 4th edition. 15s. net; abr., 15s. 10d.  
Theory of the Steam Engine. A. Jude. 2nd edition. 18s. net; abr., 19s. 4d.  
Heat Engines; Steam, Gas, and Oil (Elementary Manual of). A. Jamieson. 13th edition. 3s. 6d.; abr., 3s. 9d.  
Steam Boilers. W. Inchley. 8s. 6d.; abr., 9s. (Reviewed Sept. 26th, 1912.)  
Boiler Draught. H. K. Pratt. 4s. net; abr., 4s. 3d. (Reviewed Jan. 18th, 1912.)  
Boiler Explosions. E. J. Rimmer. 4s. 6d. net; abr., 4s. 11d. (Reviewed Sept. 26th, 1912.)  
The Indicator Handbook. C. N. Pickworth. *Part I.*, The Indicator; Its Construction and Application. 3s. net; abr., 3s. 4d. *Part II.*, The Indicator Diagram: Its Analysis and Calculation. 5th ed. 3s. net; abr., 3s. 4d. (Reviewed Nov. 28th, 1912.)  
Diesel Engines for Land and Marine Work. A. P. Chalkley. 8s. 6d. net; abr., 9s. 2d. (Reviewed Feb. 29th, 1912.)  
The Gas, Petrol, and Oil Engine. Dugald Clerk, F.R.S. *Vol. I.*, Thermodynamics of the Gas, Petrol, and Oil Engine, together with Historical Sketch. 12s. 6d. net; abr., 13s. 3d. *Vol. II.*, Gas, Petrol, and Oil Engines in Practice. Clerk and Burls, 25s. net; abr., 26s. 3d. (Reviewed March 13th, 1913.)  
The Internal Combustion Engine. H. E. Wimperis. 6s. net; abr., 6s. 6d. (Reviewed July 29th, 1909.)  
Primer of the Internal Combustion Engine. H. E. Wimperis. 2s. 6d. net; by post 2s. 9d. (Reviewed Nov. 28th, 1912.)  
Gas Engines. Marshall and Sankey. 6s. net; abr., 6s. 8d. (Reviewed May 18th, 1911.)  
Suction Gas Plants. C. A. Smith. 2nd edition. 5s. net; abr., 5s. 6d.  
Hydraulic Motors and Turbines. G. R. Bodmer. 3rd ed. 15s. net; abr., 15s. 8d.  
Electric Crane Construction. C. W. Hill. 25s. net; abr., 25s. 10d. (Reviewed May 18th, 1911.)  
Elements of Machine Design. W. C. Unwin, F.R.S. *Part I.*, General Principles, Strength of Materials, &c. 7s. 6d. net; abr., 8s. *Part II.*, Chiefly on Engine Details, &c.; abr., 6s. 6d.  
Foundations and Machinery Fixing. F. H. Davies. 2s. net; by post 2s. 2d. (Reviewed March 13th, 1913.)  
Standard Specifications of the Engineering Standards Committee, at net published prices. (List on application.)

### Electric Lamps, Wiring, &c.

- The Development of the Incandescent Electric Lamp. G. B. Barham. 5s. net; abr., 5s. 6d. (Reviewed May 16th, 1912.)  
Application of Arc Lamps to Practical Purposes. Justus Eck. 2s. 6d. net; by post, 2s. 9d. (Reviewed Dec. 15th, 1910.)

- Arc Lamps and Accessory Apparatus. J. H. Johnson. 1s. 6d. net; by post, 1s. 7½d. (Reviewed May 18th, 1911.)  
The Practice of Electrical Wiring. D. S. Munro. 3s. net; abr., 3s. 3d. (Reviewed Jan. 16th, 1913.)  
Electric Wiring, Fittings, Switches, and Lamps: Circuits. W. P. Maycock. 6s. net; abr., 6s. 8d. (Reviewed May 18th, 1911.)  
Theory and Practice of Electric Wiring. W. S. Ibbetson. 5s.; abr., 5s. 6d.  
Practical Electric Wiring. C. C. Metcalfe. 5s. net; abr., 5s. 8d.  
Electric Wiring. W. C. Clinton. 3rd ed. 2s. net; by post, 2s. 3d. (Reviewed Sept. 25th, 1913.)  
Mill and Factory Wiring. R. G. Devey. 2s. net; abr., 2s. 2d. (Reviewed Nov. 16th, 1911.)  
Ship Wiring and Fitting. T. M. Johnson. 1s. net; by post, 1s. 1½d. (Reviewed Jan. 18th, 1912.)  
Institution of Electrical Engineers' Wiring Rules, with Extracts from the Board of Trade Regulations and the Home Office Rules for Mines. 6th ed. 6d. net; by post, 7d.  
Phoenix Fire Office Rules for Electric Installations. 6d. net; by post, 7d.

### Motors, Generators, and Transformers (Theory and Design of).

- The Dynamo. Hawkins and Wallis. 5th edition. *Vol. I.*, 10s. 6d. net; abr., 11s. 6d. *Vol. II.*, 10s. 6d. net; abr., 11s. 6d. (Reviewed March 31st, 1910.)  
High-speed Dynamo Electric Machinery. Hobart and Ellis. 25s. 6d. net; abr., 26s. 10d. (Reviewed Dec. 10th, 1908.)  
Electric Motors. H. M. Hobart. 18s. net; abr., 19s. 4d. (Reviewed Dec. 15th, 1910.)  
Armature Construction. Hobart and Ellis. 15s. net; abr., 15s. 6d.  
Elementary Principles of Continuous Current Dynamo Design. H. M. Hobart. 7s. 6d. net; abr., 8s.  
Elementary Principles of A.C. Dynamo Design. A. G. Ellis. 12s. net; abr., 12s. 8d. (Reviewed March 16th, 1911.)  
The Design of Alternating-current Machinery. J. R. Barr and R. D. Archibald. 12s. 6d. net; abr., 13s. 5d. (Reviewed March 13th, 1913.)  
Continuous Current Dynamos and Motors and Their Control. W. R. Kelsey. 2nd ed. 7s. 6d. net; abr., 8s. 2d. (Reviewed August 11th, 1910.)  
Continuous Current Machine Design. For Advanced Students. W. Cramp. 5s. net; abr., 5s. 6d. (Reviewed Dec. 15th, 1910.)  
Single-phase Commutator Motors. F. Creedy. (Part I.) 7s. 6d. net; abr., 7s. 11d. (Reviewed May 22nd, 1913.)  
The Induction Motor. B. F. Bailey. 10s. 6d. net. (Reviewed Jan. 18th, 1912.)  
Transformers. Bohle and Robertson. 21s. net; abr., 22s. (Reviewed May 18th, 1911.)  
Design of Static Transformers. H. M. Hobart. 6s. net; abr., 6s. 5d. (Reviewed August 17th, 1911.)  
Insulation of Electric Machines. Turner and Hobart. 10s. 6d. net; abr., 11s. 3d.

### Electric Traction.

- Electrical Traction. Wilson and Lydall. *Vol. I.*, Tramways and D.C. Railways. 15s. net; abr., 16s. *Vol. II.*, Three-phase and Single-phase Alternating-current Traction. 15s. net; abr., 16s.  
Electric Traction. J. H. Rider. 10s. 6d. net; abr., 11s.  
Electric Traction on Railways. P. Dawson. 25s. net; abr., 26s. 4d.  
Electric Trains. H. M. Hobart. 6s. net; abr., 6s. 8d. (Reviewed Feb. 16th, 1911.)  
Elements of Electric Traction for Motormen and Others. II. W. Gant. 5s. net; abr., 5s. 8d.  
Electric Tramcar Handbook. For Motormen, Inspectors, and Depot Workers. W. A. Agnew. 1s. 6d. net; by post, 1s. 8d.  
Brakes for Tramway Cars. H. M. Sayers. 3s. 6d. net; abr., 3s. 10d.

### Mining.

- Application of Electric Power to Mines and Heavy Industries. W. H. Patchell. 10s. 6d. net; abr., 11s. 5d. (Reviewed March 13th, 1913.)  
Electrical Practice in Collieries. D. Burns. 3rd edition. 7s. 6d. net; abr., 8s. 2d.  
Electrical Mining Installations. P. W. Freudemacher. 2s. net; abr., 2s. 2d. (Reviewed Nov. 16th, 1911.)  
Electric Blasting Apparatus and Explosives. W. Maurice. 8s. 6d. net; abr., 9s.  
The Shot-Firer's Guide. W. Maurice. 3s. 6d. net; abr., 3s. 10d.

### Telephony, Telegraphy, Wireless Telegraphy, and Railway Signalling.

- Practical Telephone Handbook and Guide to Telephone Exchanges. J. Poole. 5th edition. 6s. net; abr., 6s. 8d.  
Manual of the Telephone. W. Aitken. 18s. net; abr., 19s. 4d. (Reviewed Feb. 29th, 1912.)  
Common Battery Telephony Simplified. W. Atkins. 3s. net; abr., 3s. 3d.  
Toll Telephone Practice. Theiss and Joy. 14s. net; abr., 15s. 1d. (Reviewed Sept. 26th, 1912.)

Telephone Erection and Maintenance. H. G. White. 1s. 6d. net; by post, 1s. 9d. (*Reviewed Sept. 25th, 1913.*)  
 Telegraphy. The Telegraph System of the British Post Office. T. E. Herbert. 6s. 6d. net; abr., 7s. 6d.  
 American Telegraph Practice. D. McNichol. 17s. net.  
 Submarine Telegraphs, Their History, Construction and Working. Charles Bright. 63s. net; abr., 63s., carriage forward.  
 Students' Guide to Submarine Cable Testing. Fisher and Darby. 7s. 6d. net; abr., 8s.  
 Submarine Cable-Laying and Repairing. H. D. Wilkinson. 15s. net; abr., 15s. 9d.  
 Principles of Electric Wave Telegraphy. J. A. Fleming, F.R.S. 2nd edition. 28s. net; abr., 29s. 8d. (*Reviewed Dec. 15th, 1910.*)  
 Elementary Manual of Radiotelegraphy and Radiotelephony for Students and Operators. J. A. Fleming, F.R.S. 7s. 6d. net; abr., 8s. (*Reviewed Dec. 31st, 1908.*)  
 Radio-Telegraphy. C. C. Monckton. 6s. net; abr., 6s. 6d.  
 A Handbook of Wireless Telegraphy. J. Erskine-Murray. 4th ed. 10s. 6d. net; abr., 11s. 3d. (*Reviewed March 13th, 1913.*)  
 Manual of Wireless Telegraphy and Telephony. A. F. Collins. 3rd edition. 6s. 6d. net; abr., 7s. (*Reviewed May 22nd, 1913.*)  
 Radio-telegraphists' Guide and Logbook. W. H. Marchant. 4s. 6d. net; abr., 4s. 9d. (*Reviewed Feb. 29th, 1912.*)  
 Wireless Telegraphy and Telephony. W. J. White. 2nd ed. 2s. 6d. net; by post 2s. 10d. (*Reviewed Nov. 28th, 1912.*)  
 The Year-book of Wireless Telegraphy and Telephony, 1913. 2s. 6d. net; by post, 2s. 11d.; abr., 3s. 4d. (*Reviewed Sept. 25th, 1913.*)  
 Bells, Indicators, Telephones, and Burglar Alarms, &c. Redfern and Savin. 1s. 6d. net; by post, 1s. 7½d.  
 Power Railway Signalling. H. Raynor Wilson. 18s. net; abr., 19s. (*Reviewed Nov. 5th, 1908.*)  
**Electrical Engineering (General), Text Books, &c.**  
 Electrical Engineering for Artisans and Students. Slingo, Brooker, and Wall. 12s. 6d.; abr., 13s. 6d.  
 Junior Magnetism and Electricity. Jude and Satterly. 2s. 6d. net; abr., 2s. 9d. (*Reviewed Sept. 26th, 1912.*)  
 Electrotechnics. J. Henderson. 3s. 6d.; abr., 3s. 9d. (*Reviewed August 11th, 1910.*)  
 Technical Electricity. Davidge and Hutchinson. 3rd ed. 5s. 6d. net; abr., 6s. (*Reviewed Jan. 16th, 1913.*)  
 Electrical Engineering. A. Thomälén. Translated by G. W. O. Howe. 15s. net; abr., 16s. 4d.  
 Practical Electricity. Ayrtton and Mather. 9s. net; abr., 9s. 10d. (*Reviewed March 16th, 1911.*)  
 Alternating Currents. Alex. Russell. 2 vols. 12s. net each; abr., 12s. 9d. each.  
 Alternating Currents. Alfred Hay. 6s. net; abr., 6s. 10d.  
 Continuous-Current Engineering. A. Hay. 5s. net; abr., 5s. 8d.  
 A Primer on Alternating Currents. W. G. Rhodes. 2s. 6d. net; by post 2s. 9d. (*Reviewed Sept. 26th, 1912.*)  
 Practical Alternating Currents and Alternating Current Testing. C. F. Smith. 6s. net; abr., 6s. 7d. (*Reviewed Sept. 25th, 1913.*)  
 Laboratory Manual of Alternating Currents. J. H. Morecroft. 7s. 6d. net; abr., 8s. 2d. (*Reviewed May 22nd, 1913.*)  
 Direct and Alternating Current Manual. Bedell and Pierce. 8s. net; abr., 8s. 8d. (*Reviewed May 16th, 1912.*)  
 Practical Testing of Electrical Machinery. Oulton and Wilson. 4s. 6d. net; abr., 4s. 9d. (*Reviewed Dec. 15th, 1910.*)  
 Exercises in Electrical Engineering. Mather and Howe. 1s. 6d. net; by post, 1s. 8d.  
 Examples in Applied Electricity. C. G. Lamb. 2s. 6d. net; by post, 2s. 7½d. (*Reviewed Sept. 26th, 1912.*)  
 Questions and Answers in Electrical Engineering. Moore and Shaw. 2s. 6d. net; abr., 2s. 9d.  
 Whittaker's Arithmetic of Electrical Engineering. 2nd edition. 1s. net; by post, 1s. 2½d. (*Reviewed August 10th, 1911.*)  
 Arithmetic of Electrical Measurements. W. R. P. Hobbs. 13th ed. 1s.; by post, 1s. 2d. (*Reviewed Dec. 30th, 1909.*)  
 Vectors and Vector Diagrams. Applied to the Alternating-current Circuit. Cramp and Smith. 7s. 6d. net; abr., 8s. (*Reviewed Oct. 21st, 1909.*)  
 Dynamo and Motor Attendants and their Machines. F. Broadbent. 7th ed. 1s. 6d. net; by post, 1s. 9d.

Solenoids, Electromagnets, and Electromagnetic Windings. C. R. Underhill. 8s. net; abr., 8s. 9d.  
 Modern Electric Practice. 2nd edition. In Six Vols. Edited by Magnus Maclean. 54s. net, or in nine monthly instalments of 6s. (Abroad, carriage forward.)

### Pocket Books and Hand-books.

Pocket Book of Useful Formulae and Memoranda for Civil, Mechanical, and Electrical Engineers. Sir G. L. Molesworth, K.C.I.E. With an Electrical Supplement by W. H. Molesworth. 27th ed. 5s. net; abr., 5s. 4d.  
 The Pocket Book of Pocket Books. Being Molesworth's and Hurst's Pocket Books (latest editions), printed on India paper and bound together in one volume. 10s. 6d. net.  
 Pocket Book of Electrical Rules and Tables for the Use of Electricians and Engineers. Munro and Jamieson. 19th ed. 8s. 6d.; abr., 8s. 10d.  
 Electrical Tables and Memoranda. S. P. Thompson. 2nd ed. 1s. net; by post, 1s. 1d. (*Reviewed Sept. 25th, 1913.*)  
 Engineering and Electric Traction Pocket Book. P. Dawson. 4th edition. 20s. net; abr., 21s. 6d.  
 Electrical Engineer's Pocket Book. H. A. Foster. 5th ed. 21s. net; abr., 22s.  
 The Electrician Wireman's Pocket Book and Electrical Contractor's Handbook. Robinson and Warrilow. 5s. net; abr., 5s. 3d. (*Reviewed May 16th, 1912.*)  
 Whittaker's Electrical Engineer's Pocket Book. K. Edgcumbe. 5s. net; abr., 5s. 4d.  
 Mechanical World Electrical Pocket Book for 1913. 6d. net; by post, 8d. (*Reviewed Jan. 18th, 1912.*)

### Miscellaneous.

Illumination. A. P. Trotter. 8s. 6d. net; abr., 9s. 2d. (*Reviewed Nov. 16th, 1911.*)  
 Resuscitation from Electric Shock. C. A. Lauffer. 2s. net; by post, 2s. 1½d. (*Reviewed Sept. 25th, 1913.*)  
 Simple Electric Cookery. May Little. 1s. 6d. net; by post, 1s. 9d. (*Reviewed Sept. 25th, 1913.*)  
 Industrial Electrical Measuring Instruments. K. Edgcumbe. 8s. net; abr., 8s. 10d.  
 Electric Furnaces in the Iron and Steel Industry. Rodenhauser and Schoenawa. 15s. net; abr., 15s. 9d. (*Reviewed May 22nd, 1913.*)  
 Storage Batteries. H. W. Morse. 6s. 6d. net; abr., 6s. 10d. (*Reviewed May 22nd, 1913.*)  
 Dynamo Lighting for Motor-cars. By M. A. Codd. 2s. 6d. net; by post, 2s. 10d. (*Reviewed Sept. 25th, 1913.*)  
 The Law relating to Electric Lighting. J. Shires Will. 4th ed. Revised by W. E. T. Jones. 27s. 6d. net; British Colonies, 29s. (*Reviewed March 13th, 1913.*)  
 Magneto and Electric Ignition. W. Hibbert. 2s. net; by post, 2s. 2d. (*Reviewed Nov. 28th, 1912.*)  
 Quick and Easy Methods of Calculating: A Simple Explanation of the Theory and Use of the Slide Rule, Logarithms, &c. R. G. Blaine. 3rd edition. 2s. 6d.; abr., 2s. 9d.  
 The Slide Rule. A Practical Manual. C. N. Pickworth. 2s.; abr., 2s. 3d. 12th edition. (*Reviewed March 16th, 1911.*)  
 Engineering as a Profession. Fleming and Bailey. 2s. 6d. net; by post, 2s. 9d. (*Reviewed Sept. 25th, 1913.*)  
 A Dictionary of Electrical Engineering. Edited by H. M. Hobart. 2 vols. 35s. net; British Colonies, 45s. net; Canada, \$11. Other countries carriage forward. (*Reviewed Feb. 16th, 1911.*)  
 Electrical Dictionary: A Popular Encyclopædia of Words and Terms used in the Practice of Electrical Engineering. T. O'Connor Sloane. 4th edition. 7s. 6d.; abr., 8s. 3d.  
 Technical, Industrial and Commercial Vocabulary, English-French-German. E. Hospitalier. Revised edition. 8s.; by post, 8s. 4d.  
 A Pocket Glossary of English-German and German-English Technical Terms. Horner and Holtzmann. 3s.; abr., 3s. 2d. (*Reviewed Sept. 25th, 1913.*)  
 Technical Dictionaries in Six Languages: English, Spanish, German, Russian, French, Italian. Edited by Deinhardt and Schlomann:—  
 Vol. II., Electrical Engineering. Cloth, 25s. net; abr., 25s. 10d. Leather, 30s. net; abr., 30s. 10d.  
 List of other volumes on application.

USE THIS LIST AS AN ORDER FORM.

WE WILL SEND YOU ANOTHER TO KEEP FOR REFERENCE.

To the KILOWATT PUBLISHING CO., LTD., 203 Temple Chambers, London, E.C.

Please send me the books which I have marked on this list. A remittance of is enclosed.

Please write very distinctly.

Name.....  
 Address.....

ALL ORDERS MUST BE ACCOMPANIED BY A REMITTANCE.



## THE DIESEL ENGINE EXPLOSION AT BRAY

THE official report by Mr. G. S. Taylor (Inspector of Factories) to the Home Office on the explosion which occurred at the Bray Electricity Works on July 10th, 1912 and resulted in the death of C. Coates, the head fitter, and serious injury to Mr. J. U. Sowter, Chief Engineer, and Mr. McDonnell, Assistant Engineer, has now been published.

The report commences with some general notes on the development and working of the Diesel engine, and describes the general arrangement of the particular engine in question, which was a vertical single-cylinder four-stroke engine of 12 in. bore, with a two-stage compressor driven off its own shaft, and the usual arrangement of air vessels and piping, made by Mirrlees, Bickerton & Day, of Stockport. In consequence of the air pressure in the air vessels having been found to be reduced below the value required for starting, a cylinder of compressed oxygen had been procured and connected to them as a convenient means of obtaining the necessary pressure in the absence of any auxiliary compressor or available means of running the engines own compressor. To facilitate starting, the pipe leading to the fuel injection valve had been charged with kerosene. The engine got away satisfactorily on the compressed air, but shortly after the lever controlling the cam shaft was shifted into the running position, an explosion occurred at the fuel valve on the cylinder, and after what is described as a blue flame had been seen to travel along the blast pipe to the blast air vessel, the latter exploded with great violence. The condition of the fragments is described in the report, and no fault is found with the construction of the blast vessel. Various possible causes of explosion are discussed, and finally the following conclusions are arrived at:—

The explosion of the blast vessel was caused by the ignition of an oily deposit on its interior. Ignition was transmitted by a flame explosion from the fuel valve casing passing along the blast pipe, but there is no evidence to show whether this ignition originated in the fuel valve casing or was transmitted from the engine cylinder. Ignition was facilitated, and the resultant explosions were intensified by the large volume of compressed oxygen contained in the blast vessel and blast pipe. This compressed oxygen had been used in the blast vessel in order to raise the pressure sufficiently to start the engine, and was so used in accordance with the printed instructions issued by the makers of the engines. Owing to the presence of deposits of lubricating oil carried over from the compressors, the same danger of ignition and explosion exists in blast vessels of Diesel engines as in the air receivers of air-compressing plants. There are considerable practical difficulties which prevent the removal of all the lubricating oil vapour from compressed air before it enters the blast vessels, although entire removal is very desirable. "Back fires" or explosions are sometimes transmitted from the cylinders of Diesel engines to the fuel valve casings and blast pipes; and ignitions, sometimes accompanied by explosions, occur in the high-pressure air delivery pipes of the compressors. Loss of air pressure from the blast and starting air vessels of Diesel engines occurs more frequently than the engine makers admit. This loss is often due to carelessness, but sometimes due to the inexperience of the engine attendant.

The various possible methods of recharging the air vessels of Diesel engines are discussed, and the danger of using compressed oxygen or combustible gases instead of air is insisted upon. It is pointed out that at least two explosions of blast vessels have occurred on the Continent owing to the use of compressed oxygen, and various points in connection with the prevention of accidents with Diesel engines are discussed, and finally it is suggested that the observance of the following recommendations would tend to reduce the risk of explosions and accidents in connection with the running of Diesel engines:—

Compressed oxygen, on account of its intense chemical affinity, and combustible gases like hydrogen, should not be used for the purpose of recharging air vessels, and a warning to this effect should be issued by the makers of Diesel engines. Definite instructions should be issued by the makers with regard to the adoption of safe methods for recharging air vessels. Only competent engineers, or experienced men under the direct supervision of a qualified engineer, should be employed as engine attendants on Diesel plants. Traces of oil or oil vapours should be removed as far as practicable from the compressed air before it passes into the blast vessel. Air vessels, especially blast vessels, should be cleaned and examined internally as far as practicable once every twelve months; they should also be tested hydraulically once in every four years, and the amount of expansion of the vessel

under the test pressure should be carefully gauged. Some device should be fitted for preventing the transmission of flame explosions along the compressed air pipes.

## ELECTRIC VEHICLES

IT will be remembered that at the meeting of the Incorporated Municipal Electrical Association in June it was decided to form a committee regarding the use of electric battery vehicles. This committee is now at work, with Mr. R. A. Chattock as chairman, and in addition to seven members of the I.M.E.A. will include co-opted representatives of the company-owned supply undertakings in London and the provinces, battery and vehicle manufacturers, the R.A.C. and the A.A. and M.U. In connection with the representation of the vehicle and battery makers, as there is no society able to nominate representatives, firms interested are invited to communicate with Mr. F. Ayton (Corporation Electricity Supply Dept., Ipswich), Hon. Sec. to the Committee, with a view to a meeting being arranged for the nomination of representatives.

It is proposed that the scope of the Committee's work shall, at the outset, cover the following:—To impress upon supply authorities the desirability of encouraging the use of the electric vehicle by agreeing to supply energy for charging at a reasonable price; by calling meetings of the motor-car traders and hotel proprietors to induce them to provide charging facilities; giving assistance to motor-car traders; advertising the whereabouts of charging stations; and impressing upon municipal bodies and others the advantages of the electric vehicle. Distributing information and literature among likely users, and providing charging outfits on hire. The Committee also propose to draw up recommendations as to standard sizes of charging outfits for D.C. and A.C. systems, and uniformity in battery charging instructions; to issue rules for the use and maintenance of electric vehicles, and to take up the standardisation of motor ratings, voltages, carrying capacities and speeds for commercial vehicles, wiring details, terminals, battery units, &c.

It is also intended to approach insurance companies with a view to obtaining favourable rates for insuring electric vehicles, in consequence of the reduced fire risk, &c.; to arrange for parades and exhibitions; to collate and to publish information; to take up with the authorities the question of the rating of electric vehicles for taxation purposes, and to issue maps with charging stations indicated, together with a list of the latter and tariffs.

**Switchgear Alterations at the Greenwich Generating Station of the L.C.C. Tramways.**—The alterations in the switchgear at this station, which were described in our issue of September 11th, and are to be carried out shortly, are largely based on recommendations made by Mr. G. W. Partridge, Engineer-in-Chief to the London Electric Supply Corporation, who was called in to report after the breakdowns which occurred last summer.

**Mercury Vapour Lamps and Market Gardening.**—The Westinghouse Cooper Hewitt Co., Ltd., have sent us a copy of an interesting communication which they have received from Miss E. C. Dudgeon, of Lincluden House, Dumfries, referring to some experimental work on the acceleration of plant growth under mercury vapour lamps. The results in two greenhouses were compared. In one of these mercury vapour lamps were placed about 4 ft. above the plant; the other was used as a "control" house to compare the results with the normal growth of the plants in question. The mercury lamps were turned on about an hour before sunset and kept on for about four and a half hours. It was found that seeds germinated very much quicker under the action of the mercury vapour lamps; for instance, French beans in thirteen days, instead of twenty-one days; carrots in eleven days, instead of twenty-six days; cauliflower six days, instead of twenty-six days; maize eight days, instead of fifty-seven days; and peas seven days, instead of sixteen days. Strawberries and various flowers showed a marked increase both in foliage and crop under the mercury lamp treatment. That the result was due to the lamps was indisputably shown by the fact that the plants nearer lamps showed additional growth to those further away in the same greenhouse. The houses were kept at a comparatively low temperature, and it is suggested that a considerable amount of heating may be saved by using mercury vapour lamps. The plants brought on by this means are also said to be hardier than those forced in the ordinary way, so that practically no hardening-off is required before they are planted in the open.

## ELECTRICAL POWER SCHEME AT THE WORKS OF THE SALT UNION

**A**N interesting example of economy in fuel obtained by the adoption of electrical methods is presented by the scheme which has just been carried out at the Winsford Works of the Salt Union, on the River Weaver, by the British Westinghouse Co. Here coal is utilised primarily for the evaporation of brine, but a considerable portion is also accounted for by the requirements of pumping and other machinery. In addition to the usual open evaporating pans, there is a triple effect vacuum evaporator, formerly supplied with steam through reducing valves from six Lancashire boilers operating at 60 lb. pressure. There was room for considerably increased efficiency here by raising the boiler pressure and utilising steam engines to reduce the pressure to that necessary for the vacuum evaporator, using the power developed by these engines to generate electricity for distribution all over the works. The scheme was prepared by Mr. H. L. Riseley, of Newcastle-on-Tyne, in collaboration with Mr. G. W. Malcolm, Chief Engineer to the Salt Union, and the contract for the complete work, including the provision of the generating sets, extensive overhead transmission lines, motors and control gear, and coupling up the various drives, ran into about £15,000. A separate contract was placed with the Stirling Boiler Co. for three water-tube boilers working at 200 lb. pressure. The steam from these is passed through either one or both of two 375-kw. three-phase, 600-volt 50-cycle alternators, driven by Browett-Lindley engines. Power is distributed throughout the works by overhead lines erected by British Insulated & Helsby Cables, Ltd., as sub-contractors to the Westinghouse Co.

In all about fifty motors have been installed at the works, ten in connection with brine pumps, previously driven by small isolated steam engines. These, which run at speeds between 7 and 14 r.p.m., are now driven through double reduction helical gears made by the Power Plant Co., which arrangement has proved eminently satisfactory.

Before the electrification of the Winsford Works had been put into operation, it was decided that a larger triple-effect vacuum evaporator, together with electrical generating plant, should be installed at the extensive works at Weston Point, Runcorn. These works are away from the brine fields, but the requisite brine is pumped through about ten miles of 15-in. diameter piping from Northwich, where it is raised by means of two Westinghouse-Rateau turbine pumps, each capable of dealing with 35,000 gallons of brine per hour. The electrical power plant at Weston Point forms part of an entirely new works, but it is our object here merely to describe briefly the power plant from the electrical aspect. The boiler-house at Winsford contains Stirling boilers working at 200 lb. pressure. Part of the steam raised was at first passed through either or both of two 725-kw. Browett-Lindley-Westinghouse generating sets, and from the exhaust of these engines is driven one 375-kw. three-phase, 50-cycle, 440-volt alternator, and a 350-kw. 240-volt D.C. machine, the former for supplying current for power, and the latter for electrolytic purposes. Since these sets were installed the whole scheme has grown so rapidly that they now only form part of the far larger project.

From the beginning it was realised that the amount of electrical energy available from the steam required for the vacuum evaporator would be far in excess of the requirements of the works, and, therefore, steps were taken to obtain Provisional Orders for the urban and rural areas of Runcorn and the town of Widnes. These being obtained, a subsidiary Company, known as the Mersey Power Co., was formed to deal with this part of the undertaking, and a further order was placed with the British Westinghouse Co. for two 1,500-kw. reducing turbines, the alternators being in this case designed for three-phase, 50 cycles, 6,600 volts. Static transformers with the requisite switchgear are provided to form a connecting-link between these alternators and those coupled to the reciprocating engines mentioned above. A third turbine, similar to the two now installed, is in course of manufacture, and will be erected and put into operation in the near future.

A brief description of the reducing and governing valve gear will doubtless be of interest. A governor valve, operated through an oil relay in the usual way, controls the admission of steam to the high-pressure section of the turbine. This valve governs for speed alone, and is entirely independent of the reducing valve gear. The high- and low-pressure stages of the turbine are divided by a solid diaphragm, the passage between the two parts being controlled by a balanced valve.

This valve is opened and closed by an oil relay, whose pilot piston is moved according to the position of a steam piston, one side of which is connected to the vacuum-plant main. Suppose the vacuum plant to be taking all the exhaust steam, then the low-pressure section of the turbine is entirely out of commission. If now the supply of exhaust exceeds the demand of the vacuum plant, the pressure in the vacuum plant main rises and moves the steam piston, which shifts the relay pilot valve, so that the oil relay opens the valve connecting the high- and low-pressure casings. Steam then passes through to the low-pressure part of the turbine, and thence to the condenser. Thus it will be seen that part or all of the steam may pass to the condenser or to the vacuum plant, according to the position of the valve connecting the high and low casings.

A central surface-condensing plant with turbine-driven auxiliaries is installed below the turbines. This is kept continually in service, so that whenever excess steam over and above that required by the vacuum plant is called for by the generating sets, it is efficiently expanded in the low-pressure stages of the turbine. A second smaller surface condenser is being installed to act as a stand-by to that already mentioned. This second condenser is being erected on the ground level just outside the engine room.

There are some forty-five motors installed at the new Weston Point Works, and of these ten are used directly in connection with the vacuum evaporator; four operating brine and air pumps, three the stirrers in the brine pans, and three the elevators which deal with the salt after it leaves these pans. The size of these motors varies from 12 to 150 h.p., and as it was desired to concentrate their control, as well as the control of the steam to the evaporator, at one point, a special centralised control platform was installed. The old Weston Point Works are driven by direct-current electric motors. A Westinghouse rotary-converter fed from the power station just described has been installed there to give the necessary direct-current supply.

Our thanks are due to Mr. G. W. Malcolm, Chief Engineer of the Salt Union, Ltd., and Engineer and Manager of the Mersey Power Co., and also to Mr. H. L. Riseley, Consulting Engineer, for permission to publish the information given in this article.

## STREET LIGHTING REFLECTORS

**A** STREET-LIGHTING appliance which the British Thomson-Houston Co. (Mazda House, Upper Thames Street, E.C.) have recently placed on the market is the radial wave reflector illustrated here. This can be used with any form of street-lighting bracket, post or cable-suspension equipment. In street lighting it is, of course, essential that the light should be distributed in such a way as to give the smallest possible diversity factor in the intensity of illumination. Many existing reflectors give a high intensity of light immediately



RADIAL WAVE REFLECTOR WITH HOOD.

under the lamps, which intensity decreases very rapidly until, midway between two posts, the illumination is quite inadequate. The B.T.H. radial wave reflector has been designed to overcome this difficulty, and its peculiar construction enables it to project a much higher candle power between the horizontal and an angle of 30° below the horizontal than the ordinary concave reflector.

Radial wave reflectors are made of stamped fluted steel, with a reflecting surface of white vitreous enamel, and are painted green outside. They are provided with heavy glazed porcelain hoods, and are fitted with Edison screw holders.

## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,357.

In horn lightning arresters, what clearance of gap is allowed per 100 or 1,000 volts?—"SPARK."

(Replies must be received not later than first post, Oct. 2nd.)

### ANSWERS TO No. 1,355.

Ventilation is required in a static transformer chamber to keep the transformer as cool as possible. Show how the size of openings is determined, how the difference in level between inlet and outlet louvres will effect the size, and how the cubic contents of the chamber affects the question. Assume two 200 k.v.a. oil-cooled transformers in a chamber 10 ft. by 8 ft. by 12 ft. high. Calculate the size of nett opening required, and show the difference if a chimney is built to a height of 20 ft. above ground.—"AIR SUPPLY."

The first award (10s.) is made to "A.G.R.," for the following reply:—

Assuming average figures for the temperature of the air, namely, 15° C. at the inlet and 25° C. at the outlet, this latter being the maximum air temperature allowable (10° C. rise in temperature above 15° C.), we may proceed as follows:—Cubic contents of room = 10 × 8 × 12 = 960 cub. ft.; weight of 1 cub. ft. of air at 0° C. = 0.0807 lb., and at 15° C. = (0.0807 × 273) ÷ 288 = 0.0793 lb. (273 and 288 are the absolute temperatures corresponding to 0° C. and 15° C., as the absolute zero is -273° C.).

The weight of the cubic contents of the room at 15° C. is therefore 960 × 0.0793 = 76.2 lbs.

Now the work required to raise 1 lb. of water through 10° C. is 1,390 ft. lbs., and the specific heat of air at constant pressure is 0.238, so that the work required to raise 1 lb. of air through 10° C. is 1390 × 0.238 × 10 = 3310 ft. lbs., and the work required to raise 76.2 lbs. of air through 10° is 3310 × 76.2 = 252,000 ft. lbs. Assuming the efficiency of the transformers to be 98 per cent., then the total losses on the two transformers will be 8 K.V.A., and 8 K.V.A. = 8000 ÷ 746 H.P. = 8000 × 550 ÷ 746 = 5900 ft. lbs. per sec. Therefore the room requires to be refilled with air every 252,000 ÷ 5900 = 42.7 secs. Thus 960 cub. ft. of air are required every 42.7 secs., so that the rate of flow of air must be 22.5 cub. ft. per sec.

Assuming that the air inlet is at the floor-level and the outlet at the top of the room, the distance between them being about 10 ft. (i.e., between centre lines), then the pressure causing the flow is the difference in weight of a column, 10 ft. high, of cold air, and one, 10 ft. high, of warm air.

Assuming 1 sq. ft. cross-section, we have that  $\left[ \frac{0.0807 \times 273}{288} - \frac{0.0807 \times 273}{298} \right] 10 =$  difference in pressure in lbs. per sq. ft. = [0.0764 - 0.0739] 10 = 0.025 lbs. per sq. ft. Now pressure head = (approx.) velocity head.

$\therefore (0.025 \div 0.0764) = v^2 \div 2g$ , where  $v$  = velocity in ft. per sec.,  $g$  = acceleration due to gravity = 32.2 ft. per sec. per sec., and pressure head = pressure in lbs. per sq. ft. ÷ wt. per cub. ft. at 15° C. Therefore the velocity of air =  $\sqrt{0.025 \times 64.4 \div 0.0764} = \sqrt{21.1} = 4.6$  ft. per sec. Area of opening required is therefore = 22.5 ÷ 4.6 = 4.9 sq. ft. (say 2 ft. 6 in. long by 2 ft. high).

With a chimney 20 ft. high, the effective height would be about 19 ft. above centre of inlet. Pressure causing flow, in lbs. per sq. ft. = [0.0764 - 0.0739] 19 = 0.0475 lbs. per sq. ft., so

that new velocity of air =  $\sqrt{64.4 \times 0.0475 \div 0.0764} = \sqrt{40} = 6.33$  ft. per sec. Area of opening = 22.5 ÷ 6.33 = 3.55 sq. ft. (say, 1 ft. 10 in. long by 2 ft. high).

No second award has been made.

## ANSWERS TO CORRESPONDENTS

A. E. J.—The system of stopping trains which have overrun a signal described in your letter is practically the same in principle as the "automatic train stop" employed on the London Underground Railways and elsewhere, although slightly different in detail.

## A SIMPLE ROTARY AIR-PUMP SYSTEM

TO meet the demand for a simple rotary air-pump system where space is a consideration, Willans & Robinson, Ltd. (Victoria Works, Rugby), have taken a licence to manufacture under the Müller-Josse patents. A large number of condensing plants on this system, up to 10,000 kw., have already been built on the Continent. There are two modifications of the systems, which may be called the "shunt" and "series" system respectively. In either case the air is extracted from the condenser by an air ejector, and the condensed steam is extracted by a separate centrifugal pump from the bottom of the condenser. Figs. 1 and 2 give an outline of the two systems. The first is used where the head across the circulating pump is sufficient to effect the air extraction.

In this case the main circulating pump is designed to deliver a greater quantity of water than is required as cooling water in the condenser, the surplus water being used as air ejector water, and is returned to the source of supply

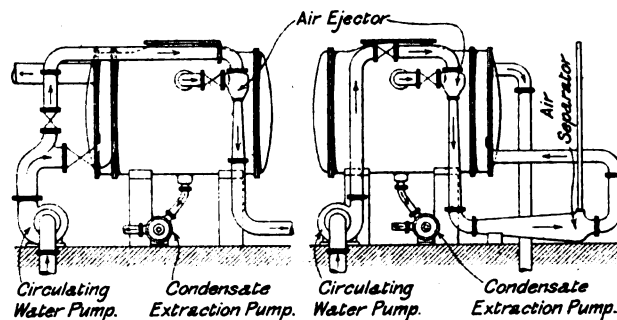


FIG. 1.

FIG. 2.

or to the suction side of the circulating pump. Where the "series" system is used, the whole body of the condenser cooling water is passed through the air ejector before entering the condenser. Thus, in the shunt system the power required for extracting the air is determined by the surplus quantity of water at the given head, and in the series system by the given quantity of water at a surplus head. In neither case is a greater quantity of cooling water consumed than where a reciprocating air pump or any other rotary air pump is used. Only one simple centrifugal pump is needed for supplying the condenser cooling water and the air extraction water. The power required in extracting the air is dependent on the design of the ejector and the power actually consumed in compressing the air. To reduce to a minimum the power required in air compression, the latter should be carried out at the lowest possible temperature, namely, the temperature of the cooling water, as is done in this system.

A plant of 8,500-kw. set capacity is in hand for the Sheffield Corporation, and the Glasgow Corporation Tramways Department has ordered a 5,000-kw. for the Pinkston Power Station, while the London & South Western Railway Co. has ordered plant totalling 25,800 kw.

**An Electrically-driven Pump.**—A useful little electric pumping set has just been fitted up by Messrs. Merryweather and Sons, of Greenwich, at the London offices of the *Daily Sketch* in Shoe Lane. The pump is of the rotary type, capable of delivering 250 gallons per hour against a total head of 6 ft. 6 in., and is direct-coupled to an electric motor of ample power to drive it, wound for a 200-volt direct current. The pumps and motor are mounted on a bedplate, forming a very compact set. The pump will be employed for emptying a sump in the basement, and is arranged to start automatically. In order to effect this, a float is provided, which operates a switch and starts the motor when the water in the sump rises above a certain level. As the water is pumped out the float falls and cuts off the current.

## CATALOGUES, PAMPHLETS, &c., RECEIVED

**HEATING AND COOKING.**—A pamphlet relating to the heating and cooking appliances suitable for the requirements of a small household has been got out by Simplex Conduits, Ltd. (116 Charing Cross Road, W.C.), in connection with the demonstrations of Plexsim apparatus which are now being arranged throughout the country. The pamphlet gives the cost of the apparatus, together with the cost of using it at various prices of electrical energy. It is neatly arranged for over-printing.

**METAL FILAMENT LAMPS.**—A card has been issued by the Osram Lamp Works, Ltd. (Hammersmith, W.), giving the names of the 12 different makes of metal filament lamps against the suppliers of which actions to restrain infringement of their patents and for damages have been commenced. Interim injunctions restraining infringement have been granted against the suppliers of four other makes of lamps and three cases made final.

**SWITCHGEAR AND FUSEBOARDS.**—A preliminary abridged issue of a catalogue dealing with switchgear and fuseboards has just been issued by the Sun Electrical Co., Ltd. (118-120 Charing Cross Road, W.C.). We note that the list contains an extensive range of switch and fuseboards, main switches, iron-clad switches, &c., for industrial and domestic purposes. Included also are boards designed to comply with the latest Home Office regulations.

**"SUPERLUX" REFLECTORS.**—A complete catalogue of "Superlux" reflectors (referred to in last week's *ELECTRICAL ENGINEERING*) has also just been issued by the Sun Company. These reflectors are divided into four classes: (1) pure white glass ware, (2) vitreous enamelled steel, (3) aluminium, and (4) glass mirror reflectors. All are designed to give definite quantities of light just where it is wanted. Useful data, tables, &c., are being prepared for publication to assist clients in selecting the correct reflector to fulfil any given condition.

**MAZDA LAMPS.**—Some further specimens of folders, leaflets, &c., which are being sent to contractors in connection with the Mazda "Arrow" advertising campaign, have reached us from the British Thomson-Houston Co., Ltd. (77 Upper Thames Street, E.C.), who urge all contractors to 'phone or wire for literature and supplies at once.

*Readers desiring copies of catalogues or pamphlets should apply to the firms in question, referring to the notice in "Electrical Engineering."*

**COOKERS.**—A leaflet from Ferranti, Ltd. (Central House, Kingsway, W.C.), gives prices, weights, and detailed particulars of Ferranti electric cookers. The whole cooker is well designed and of substantial construction. The elements can be very easily withdrawn for clearing or replacement by new ones, and the wiring is readily inspected. The heating units have been thoroughly standardised.

**OPAL REFLECTORS.**—Siemens Brothers Dynamo Works, Ltd. (Tyssen Street, Dalston, N.E.), has just got out a price list dealing with the "Marbella" opal reflector, which is obtainable in distributing or concentrating types. The light is reflected in the direction required by one reflection, and the lamp is hidden to the pip so that "glare" and "eye-strain" are avoided.

**POCKET LAMPS.**—A pamphlet covering the extensive range of "Geeko" pocket battery lamps, hand lamps, ceiling clocks, &c., supplied by the General Electric Co., Ltd. (67 Queen Victoria Street, E.C.), is now available.

**LANTERNS.**—A new edition of the General Electric Company's list of lanterns for shop, warehouse, and street lighting has also just been published. The lanterns are suitable for metal filament lamps from 20 to 1,000 watts.

**MOVABLE FITTINGS.**—A much wider range in movable fittings for lighting, telephones, and other purposes is embraced in the most recent edition of the catalogue of John Dugdill & Co. (Failsworth, near Manchester) than in the list which it supersedes. Besides spring-reel fittings, travelling lights, and telescopic pendants, special fittings for hospitals, altars, workshops, schools, engineering shops, &c., are included. Arc light brackets, portable adjustable standards, and shades and reflectors are also dealt with, as well as various accessories.

**TAPPING AND REAMERING MACHINES.**—The Power Plant Co., Ltd. (West Drayton, Middlesex), has now produced a new list illustrating and describing electric hand-drilling, tapping, and reamering machines.

**"ELECTRICAL SERVICE."**—This is the title of an attractive booklet which Electrical Installations, Ltd. (27 and 28 Martin's Lane, Cannon Street, E.C.), has produced for the purpose of impressing possible clients with the advantages of electricity for illumination in the private house, office, shop, or factory. Heating and power are also dealt with.

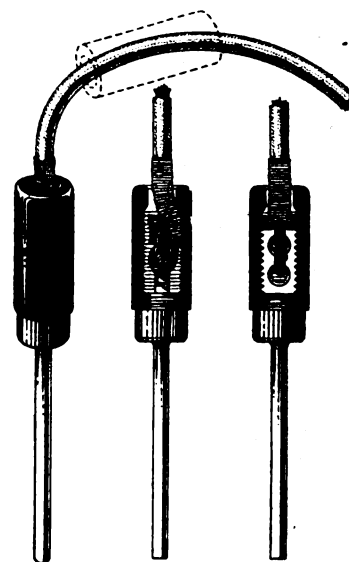
**IRONCLAD SWITCHGEAR.**—A number of recently pub-

lished leaflets have been sent us by A. Reyrolle & Co., Ltd. (Hebburn-on-Tyne). These deal with overload protection, telephone cable dividing boxes, explosion-proof quick make and break oil-switches, sheet steel panels, plug boxes with switches and fuses, enclosed high-pressure tubular fuses, flat-back switchgear, draw-out ironclad switchgear, and the company's "Merz Price" protective gear. The high standard of design and workmanship reached in these specialities is well known to our readers, who will doubtless remember that we have from time to time described and illustrated many of the apparatus referred to.

**INSTRUMENTS AND METERS.**—Additional copies of the lists referred to in *ELECTRICAL ENGINEERING*, May 15th, p. 276, have been received from Evershed & Vignoles, Ltd. (Acton Lane Works, Chiswick, W.). A supplementary list dealing with Murday's patent recording ammeters, voltmeters, and wattmeters has been published, and a new list takes the place of that dealing with the "megger" testing sets, while the one dealing with portable instruments has been reprinted.

## A NEW INSULATED TERMINAL

THE Gibson Terminal Co. (149 Strand, W.C.), are introducing a patented insulated terminal, or "tag end," for use with electrical apparatus. The arrangement of this terminal is clearly shown in the three views below. The left-hand view shows the terminal wired complete. To insert the wire the



ebonite sleeve is threaded on to the wire, as shown by the dotted line, and the wire is then passed through the holes in the flattened portion of the brass terminal at the threaded end, as shown in the two sectional views. The ebonite sleeve is then screwed down, the wire is held tight, and a self-acting cord-grip is provided by the thread of the sleeve biting into the insulation. The above drawings are full size.

**Cracking of Insulators.**—Transmission companies in America and Canada have been experiencing considerable trouble with insulators owing to the cracking of the porcelain. This is largely due to expansion differences, and is felt most on strain or dead-end insulators. As a protection against heavy surge over-voltages, says the *Electrical World* (New York), a lateral air path has proved useful for strings of insulators. The ratio of the total dielectric strength of the insulator string to that of the air path is called the factor of safety of the string, and in practice varies from 1:6 to 2:3.

**Magnetic Salvage.**—A large fire which occurred recently in an engineering works at Birmingham was a means of affording a Witton-Kramer magnet an opportunity of demonstrating its powers. The debris contained a considerable amount of iron in the form of screws, nails, bolts, &c., and this was of such value as to warrant salvage operations. A 42-in. Witton-Kramer magnet was rigged up on sheer legs, and after the larger masses of metal had been removed, smaller pieces were shovelled on the face of the magnet, which retained everything magnetic, the residue sliding down a board into a heap beneath. When the face of the magnet became filled, a box was placed underneath and the current switched off, the magnetic "catch" falling into it and then being removed. The work of the Witton-Kramer magnet was so thoroughly done that expectations were more than realised, and over two tons of metal, screws, &c., were salvaged, the bulk of which can be utilised. The magnet in question takes 5 kw., and was constructed by the Witton-Kramer Electric Tool & Hoist Co., Ltd., Witton, for whom the General Electric Co., Ltd., 67 Queen Victoria Street, London, E.C., are the sole selling agents.



HIGHEST  
QUALITY!  
SPECIFY

# IGRANIC

## SWITCHGEAR

IGRANIC ELECTRIC CO. LTD.  
LONDON

Works:  
BEDFORD

### ELECTRIC TRACTION NOTES

In view of complaints that have been made by drivers on the Great Northern Railway that certain mercury vapour lamps gave a light which could be confused with green signal lights, the Westinghouse Cooper Hewitt Co. (80 York Road, King's Cross, N.) inform us that special globes and reflectors can be used near railways by which the appearance of the lamps from a distance is altered, although the characteristic quality of the light for seeing purposes is maintained.

At a Congress of the Franco-British Travel Union on Tuesday evening, an address on the subject of the proposed Channel Tunnel was given by Baron E. d'Erlanger, who referred briefly to the electrical power plant that would be provided for running the trains as well as for lighting. Sir Francis Fox also read a Paper on the engineering aspects of the scheme. He said that the debris from the shields used for driving the tunnels would be carried by electrically-driven belt conveyors to the wagons, which would be removed in trains hauled by electric locomotives. The drainage heading would be excavated by some approved cutter or by Price's electrical digger, as used on the London tube railways. The use of electric traction in the tunnels would simplify the ventilation arrangements, and instead of blowing the air in a direction contrary to the traffic, as is done in long steam-worked tunnels to keep the driver and fireman free from smoke and steam, the air would be blown in the same direction as the train, which would assist and not retard the current. Again, much less air would be required. Reckoning as a maximum a train carrying 500 people every ten minutes, 45,000 cub. ft. of air per min. at a velocity of 6 ft. per sec. should be sufficient. The tunnels, he said, would be lighted throughout by electricity, and a separate and special circuit will be provided, so that in the event of the main traction current failing, the lights in the tunnels will not be extinguished. Carriage lighting would be independent, each vehicle carrying its own store of light. The electric locomotives would replace the steam locomotives on this side at a station at Maxton, just within the Borough of Dover. The main tunnels would consist of two single-track circular tunnels, each of 18 ft. net internal diameter, and thus large enough to accommodate the rolling stock of the British and French main lines, except only their locomotives, for which would be substituted electrical locomotives of ample power to deal with the heaviest trains running upon the main lines. No mention is, however, made of the system of electric traction to be adopted.

### TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

A beginning was made last week by the German cable ship *Stephan* in the laying of a new four-core telegraph cable connecting this country with Germany. The laying of the cable was commenced at Mundesley (Norfolk), where, owing to the gentle sandy nature of the fore-shore, no special shore-end is required. It goes to Emden, practically the nearest point in Germany. Here all the German Atlantic and also five Anglo-German cables terminate. The messages will be repeated at the cable stations at each end, i.e., at North Walsham, which is some twenty miles inland, and at Emden. The length of the cable is about 240 nauts. It consists of four conductors, each consisting of thirteen copper strands, the middle one being thicker than the others. The weight of copper is 210 lb. per naut, and the weight of gutta-percha 175 lb. per naut. The cable is laid up in the usual way—each conductor is surrounded by gutta-percha, and over this a layer of brass teredo tape, then jute worming to make the whole

circular, and an armouring of thirteen galvanised iron wires surrounded by a protective coating of tarred hemp. The overall diameter is about 1 $\frac{1}{8}$  in. The cable will, we believe, be worked Hughes at first (twenty-eight words per min.), and later Baudôt single, double or triple duplex (thirty, sixty or ninety words per min. in each direction). The effect will be to put Leipzig into direct communication with this country, and to increase the number of lines at present working between this country and Berlin, Hamburg and other towns in direct communication. Tests are now in progress, but it is not anticipated that the cable will be put into regular service for some time.

In the course of an article in the September issue of *The Central*, Mr. Maurice Solomon compares the different varieties of Leclanche cell at present obtainable. He gives the capacity of the three-pint porous-pot type of cell as 40 ampere-hours (i.e., until the open-circuit voltage is reduced from 1.5 to 0.75), of the quart size at 18 ampere-hours, and of the pint size as 8 ampere-hours. For the sack type he gives the capacity of the three-pint, quart, and one-pint sizes as 100, 75, and 40 ampere-hours respectively, and says that the quart-size sack element is only 50 per cent. heavier than the corresponding porous pot, although it has four times the capacity. About 42 per cent. of the manganese dioxide is used up, compared with 84 per cent. in the porous pot. When size and weight are taken into consideration, the carporous pot and agglomerate block types of cell do not show so high an efficiency as the simple porous pot, in which the grains of depolariser are of the best size.

The inaugural meeting of a new Association, known for the present as "The London Wireless Club," was held in the Westminster City Schools on Tuesday evening, under the chairmanship of Mr. F. Hope-Jones, who explained the objects of the Association. These include the reading of Papers and discussions among members, the formation of a library in club rooms, where, also, an aerial for the purpose of carrying out experiments on new and improved apparatus, is to be available to members. It is also intended that a sub-committee be appointed to judge of the qualifications of candidates for transmitting or receiving licences from the Post Office, and to co-ordinate research. This Department has already signified its approval of the objects of the Association. There are two classes of membership, and the subscriptions are 10s. 6d. per annum for London members and 5s. for country members. Full membership is now limited to those holding licences or having equivalent scientific qualifications, and to wireless operators. The Committee is constituted as follows:—Chairman, Mr. F. Hope-Jones; Vice-Chairmen, Mr. H. F. Brand and Mr. L. McMichael; Hon. Sec., Mr. R. H. Klein (18 Crediton Road, West Hampstead, N.W.); Treasurer, Mr. L. F. Fogarty, and Messrs. W. J. Shaw, V. W. Delves Broughton, W. J. Fry, E. W. Kitchen, F. C. Knight and A. G. Hansard. Arrangements are being made for the renting of club premises at 107 Hatton Garden from A. W. Gamage, Ltd., who will also lend their aerials. Dr. S. P. Thompson has already consented to become one of the Vice-Presidents. There are already nearly 100 members. The next meeting will be held in about a month's time.

At a meeting of the Liverpool and District Amateur Wireless Association, on September 11th, the question of "Receiving Outfits" was discussed, and Mr. Jardine described a new outfit giving very good results, and to a great extent obviating local jamming. Mr. J. T. Thompson, Mayor of Birkenhead, had consented to act as a vice-president of the Association. Mr. Frith exhibited a very compact receiving outfit for field work, contained in a case 8 $\frac{1}{2}$  in. by 1 $\frac{1}{2}$  in. by 5 $\frac{1}{2}$  in., holding inductance, silicon detector, blocking condenser, and a pair of headgear 3,000-ohm telephone receivers. The next meeting will be to-day.

The Directors of the Direct Spanish Telegraph Co. have decided to pay, in addition to the dividend at the rate of 10 per cent. per annum on the preference shares, a dividend at the rate of 4 per cent. per annum on the ordinary shares.

As a result of careful tests at the wireless station of the University of North Dakota, Professor A. H. Taylor suggests

## "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

### Specifications Published September 18th, 1913

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

Names in italics indicate communicators of inventions from abroad.

16,992/12. **Wireless for Aeroplanes.** C. GRAHAME WHITE and H. FOTHERGILL. To avoid the necessity for storage batteries in aeroplanes and hydroplanes, an A.C. generator is directly connected to the motor driving the propeller. Four figures.

19,118/12. **Motor Meters.** S. H. HOLDEN and CHAMBERLAIN & HOOKHAM. Instead of employing solid brushes in D.C. motor meters of the eddy-current brake type, the armature spindle is inclined so that the commutator dips into mercury at its lower side. An open-coil winding in which one end of each coil is permanently connected to the armature spindle so that only one brush is required is used. Cupro nickel is used for the commutator. An enclosed chamber is provided for the mercury, and arrangements are provided for expelling this when necessary. By means of floats attached to the spindle and immersed in a liquid, the weight on the pivots is reduced. Two figures.

19,585/12. **Ordnance Signals.** A. T. DAWSON and G. T. BUCKHAM (Vickers). For transmitting orders and particulars as to the range and deflection of guns on board ship, &c., a step-by-step receiving motor, a transmitter, and a positive mechanism for effecting the desired indications by current impulses, are described. A spring fly-back for restoring the armature of the receiver after each excitation works with two opposing movable pawl mechanisms in the armature so as to transmit the oscillatory movements to a counting or indicating device, and to de-energise the armature. Thirteen figures.

19,754/12 and 19,771/12. **Cooking Utensils.** A. J. KERCHER. The cooker consists of an inner vessel surrounded by an hermetically sealed space partly filled with water or other liquid, such as oil. A safety vent is provided. The liquid is heated by the element which is in contact with the outer sides of the space where the liquid is, and an external lagging is provided. The inner receptacle is in contact with an exhausted chamber, which, when a certain temperature is reached, is designed so as a diaphragm suddenly buckles, and so works a quick-acting switch in the heating circuit. By these means the temperature of the inner receptacle is kept constant. The spring of the switch may be fixed to the exhausted controlling chamber through a fusible alloy, so that an excessive temperature cannot be reached. Three figures and one figure respectively.

19,825/12. **Trolley Omnibuses.** E. CROSS. Means for effecting connection with tramway rails where these are in existence is provided through pilot wheels or runners on the 'bus. These wheels may be brought into contact with the rails, and they are connected with the steering road wheels, so that, in spite of some deviation of the latter, the rail contacts may still be effective. Additional brush contacts for reverse running may be provided. Two figures.

992/13. **Globes and Reflectors.** G. SCHANZENBACH and C. KNAPP. The specification covers a reflector in which the light source is hidden from the observer. It is composed of separate translucent lamellæ, while between each, and extending from the apex of the enclosure, and preferably curved, clear glass surfaces are provided. These are radial to the light source, and are as perpendicular as possible to the light reflected to them from the obscured lamellæ. Cleaning is said to be facilitated by this design. Four figures.

4,479/13. **Cooking Utensils.** J. MANN. Ceramic vessels provided with heating coils are made by applying the coils to the outside, and then an outer coating of ceramic material is applied so as to form a permanent casing. Four figures.

6,648/13. **Commutators.** SIEMENS DYNAMO WORKS (*Siemens-Schuckert*). To prevent brush sparking due to the projection above the segments of the insulating material, the edges at the surface of the commutator are left free, so as to yield under the brush pressure. Three figures.

### Specifications Published To-day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free.

Summaries of some of the more important of these patents will appear in our next issue.

**Arc Lamps:** SIEMENS-SCHUCKERTWERKE [Regulation of the light intensity] 17,086/13.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** BECKER [Protection of circuits against high frequency oscillations] 12,908/12; B. T. H. Co. (*G. E. Co., U.S.A.*) [Motor control systems] 20,662/12 and 20,744/12; [Resinous compositions] 25,776/12 and 24,059/12; ST. HELENS CABLE CO. and EVANS [Insulating gloves] 5,242/13; BECKER [Prevention of excess pressure in A.C. circuits] 19,029/13.

**Dynamos and Motors:** ROUZET [A.C. motors] 12,687/12; BERDON [D.C. dynamos] 20,225/12; ATELIERS DE CONSTRUCTIONS ELECTRIQUES DU NORD ET DE L'EST [Alternators] 25,207/12.

**Electrochemistry:** MARINO [Electrolytic pickling] 20,180/12.

**Heating and Cooking:** DIGBY [Heating apparatus for buildings and vehicles] 26,256/12; ALBRECHT [Heating apparatus] 26,347/12; WEAVING and the FERRANTI Co. [Switch arrangements for heaters] 12,935/13.

**Ignition:** SCHULTZ [Regulators for igniting apparatus] 8,758/13; GORDON and WRIGHT [Igniting and unlocking miners safety lamps] 13,694/13.

**Incandescent Lamps:** B. T. H. Co. (*G. E. Co., U.S.A.*) [Filament manufacture] 27,433/12.

**Instruments and Meters:** SIEMENS-SCHUCKERTWERKE [Meters, meter systems, and controlling relays] 26,439/12; ELSTER [Meters] 3,466/13; HARTMANN & BRAUN [Direct measurement of small differences in resistance] 8,602/13.

**Switchgear, Fuses and Fittings:** CHARLES [Tumbler switches] 22,477/12; VAN KERCKHOVEN [Combined dynamo regulators and switches] 1,512/13; CUNNINGTON [Contact for bells, alarms, &c.] 7,755/13; WALTER and DISPLAYER Co. [Automatic control of motors for compressing fluids in cylinders] 12,218/13.

**Telephony and Telegraphy:** DANNENBERG [Ear and mouthpiece protectors for telephones] 30,111/12; SIGNAL GES. [Wireless] 3,246/12; ROGERS-JENKINS [Pole stay-wire guards] 9,869/13.

**Traction:** JENNINGS [Railway signalling] 16,678/12; PURVIS and GRITMAN [Railway systems] 26,344/12; STOCKDALE [Railway signals] 16,920/13.

**Miscellaneous:** MASCORD [Massage apparatus] 19,661/12; SEVERY and SINCLAIR [Vibratory musical instruments] 19,869/12 and 16,860/13; GARDNER [Gyroscope] 20,135/12; WORTMANN [Agricultural machinery] 20,185/12; PARKER [Secondary clocks] 24,274/12; JORIS [Lamps for mines] 28,816/12; CLOES [Safety signalling for mines] 2,546/13; Soc L'ECLAIRAGE ELECTRIQUE [Electric driving mechanism for spindles, flyers, &c., in textile machinery] 3,759/13; STEVENS [Fire-alarms] 11,218/13.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Dynamos, Motors, and Transformers:** RUBEL [Iron alloy] 18,171/13; ALEXANDERSON [Polyphase commutator motors] 19,517/13.

**Telephony and Telegraphy:** HULL [Selecting apparatus for telephones] 19,249/13; SIEMENS & HALSKE [Calling on party-lines] 19,271/13; [Circuits for automatic and semi-automatic telephone systems] 19,518/13.

**Miscellaneous:** MAY [Increasing the strength of magnets] 7,898/13; ASH [Rat traps] 19,496/13.

### Expired Patents

The following are the more important Patents that have become void through non-payment of renewal fees.

**Arc Lamps:** VERITAS Co. and F. S. WORSLEY [Self-sustaining winches] 13,085/06.

**Dynamos, Motors, and Transformers:** B. T. H. Co. and K. AHLQVIST [Flexible coupling for turbo-generators] 11,704/05.

**Electrochemistry:** E. ALBERT [Electrotype] 11,527/05.

**Heating and Cooking:** C. G. NORBS and J. E. ROSENTHAL [Oil-filled radiator for heating buildings] 12,352/08.

**Incandescent Lamps:** B. T. H. Co. (*G. E. Co., U.S.A.*) [Machine for cementing caps to bulbs] 12,731/06; H. KÜZEL [Supports for tungsten filaments] 15,798/07.

**Instruments and Meters:** E. WESTON and A. O. BENEFKE [Sensitive recording motor meter] 12,463/02; [Electrical registration of the readings of pressure gauges, ships' compasses, &c.] 12,469/02; [Returning pointer of a recording instrument to zero] 12,476/02; S. EVERSHED and EVERSHED & VIGNOLES [Counting trains] 12,701/02.

**Switchgear, Fuses, and Fittings:** B. T. H. Co. and A. S. CURRITT [Magnetic blow-outs for fuses, &c.] 12,340/04; R. P. JACKSON [Pressure controller for transformer secondary] 1,391/05.

**Telephony and Telegraphy:** H. S. WARREN and G. A. CAMPBELL [To prevent loss by reflection of waves, subscribers' telephone circuits are connected to loaded trunk lines through graduated impedances] 12,476/03; BRITISH WESTINGHOUSE Co. (*American Westinghouse Co.*) [Compensating disturbing effects of neighbouring high-pressure A.C. traction circuits, &c.] 12,952/07; H. ROOST [Indicating duration of telephone calls] 12,336/08.

**Traction:** SIEMENS BROS. and A. SIEMENS [Electromagnetic detent for signalling mechanisms] 12,785/02; W. H. WHERRY [Rail bonding] 12,458/03 and 12,461/03; G. WESTINGHOUSE [Brake system with electrically-controlled valves] 12,374/04; W. R. SYKES [Motor-operated semaphore signals which are also held off electromagnetically] 12,751/04.

**Miscellaneous:** S. LAKE [Submarine control] 11,788/05; C. W. KAYSER and J. E. ROBINSON [Clutch release] 26,558/07; R. BRIGHT and J. M. W. WRIGHT [Advertising] 12,085/08.

# THE I.C.S. SCHOOL OF ELECTRICAL ENGINEERING

## ADVISORY BOARD :

**Mr. A. H. LAW,**

B.A.I., Assoc.M.Inst.C.E., M.I.E.E.,

Director of Electrical Department, Messrs. C. A. Parsons, Ltd.,  
Newcastle-on-Tyne.

**Mr. T. E. GATEHOUSE,**

F.R.S.E., A.M.I.C.E., M.I.E.E., M.I.M.E.,

Editor of the *Electrical Review*.

**Mr. H. P. BROWN,**

Chief Engineer, Central Telephone Exchange, London, E.C.

**Dr. MAX KAHN,**

Chief Electrician, The Brush Electric Engineering Co., Ltd.,  
Loughborough.

## Specialized Instruction

**S**PECIALIZATION is the secret of progress. In every walk of life, the man who can do some one thing better than any of his comrades can do it, is sure to receive a large salary. While the value of broad training is not questioned, many whose time for study is limited wisely conclude that it is better to try to learn all about some one thing than to attempt to learn something about everything. Others, having more or less general knowledge of electrical work, desire to perfect themselves in some one branch that from its financial rewards or its environment appeals particularly to them. The I.C.S. therefore, in addition to their Complete Electrical Engineering Course, offer Special Electrical Courses.

### No Unnecessary Subjects Included

Great care has been given to the preparation of these Courses, and the Papers contain the best and most useful information on the subjects covered. The student receives just the training he requires to enable him to become one of the fully competent, intelligent, and resourceful men so much needed in all departments of electrical work.

### Five Combination Courses

To those who desire a more extended treatment of steam engineering subjects than will be found in the Courses in the list below, we offer four combination Courses, namely :

**Steam Electric.                      Advanced Electric Traction.  
Advanced Electric Lighting.      Engine & Dynamo Running.**

Also, for those who are concerned with electric-power plants in which gas instead of steam is employed, we offer the **Gas-Electric Course.**

Anyone enrolling in one of these Courses will increase his opportunities of obtaining the most lucrative posts in connection with steam or gas-driven electric power and lighting plants. These five Courses are made up of Instruction Papers selected from our Electric Lighting and Traction, Gas-Power Operating and Steam-Engineering Courses. These Papers are the most valuable and the most modern engineering books in their particular line.

Men who have completed one of these combination Courses are doubly efficient in any position they may take up, and are in great demand in the steam engineering and electric power and lighting professions. In the Electrical Engineering Syllabus will be found detailed descriptions of the above-mentioned Courses.

## The Choice of a Course of Study

If you wish for a thorough general knowledge of lighting, power and traction plants, and the design, construction, and management of all kinds of electrical apparatus and machinery, write for prospectus of

### The Complete Electrical Engineering Course.

If you are a mechanical engineer and wish to acquire a wide knowledge of electricity refer to

### The Electrical Course.

If you desire to undertake the erection and management of electric lighting and traction plants, refer to

### The Electric Lighting and Traction Course.

If it is your ambition to obtain a responsible position in a power station or take charge of a steam-electric plant of any description, refer to

### The Steam-Electric Course.

If you wish to qualify for a position to run a self-contained electric light installation driven by gas engines, refer to

### The Gas-Electric Course.

If you wish to become a telephone engineer, refer to

### The Telephone Engineering Course.

**The International Correspondence Schools also give sound, practical training in Gas-Power and Motor-Engineering, Steam Engineering, Boiler Engineering, Mechanical Engineering, Draughtsmanship, Building in all its branches, Mining, &c.**

**For full syllabus of any course write, naming the subject in which you are interested, to International Correspondence Schools, Ltd., 115d, International Buildings, Kingsway, London, W.C. Please use our FULL address so as to avoid delay.**

# PHENIX

## ASSURANCE COMPANY, LIMITED.

ESTABLISHED 1782.

Head Offices: 19 & 20, LOMBARD STREET, LONDON, E.C.

TOTAL FUNDS EXCEED

£15,000,000

CLAIMS PAID EXCEED

£90,000,000

CHAIRMAN: RT. HON. LORD GEORGE HAMILTON, P.C., G.C.S.I.

### FIRE - LIFE - ACCIDENT - MARINE

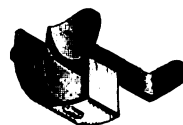
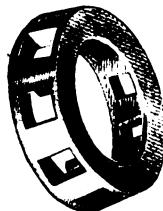
Loss of Profits following Fire, Workmen's Compensation, Fidelity Guarantee, Burglary, Trustee and Executor, &c.

#### ELECTRIC LIGHTING.

The Company has always encouraged the development of Electricity, and the well-known "Phoenix Fire Office" Rules for Electrical Installations are in use throughout the world. Copies will be supplied free on application to Head Offices.

General Manager: SIR GERALD H. RYAN.

SEE THESE  
PIECES OF  
INTRICATE  
REPETITION  
WORK. They are



CAST AND  
FINISHED

by the

"PRANA" DIE FINISHED  
CASTING PROCESS

which can save time as well as money. Write for a little booklet which will show you how, to

AERATORS LIMITED,  
UPPER EDMONTON, LONDON, N.

### ELECTRICAL PORCELAIN

OF  
HIGHEST QUALITY

APPLY TO

JAMES MACINTYRE & CO., LTD.,  
BURSLEM.



## BLAKE & INSULATING STAPLES

Write for Samples and Prices.

**MOSES & MITCHELL,**

Ohlswell Works, 122-124, GOLDEN LANE, E.O.

STEATITE  
INSULATORS  
SUPPLIED  
FOR ALL KINDS OF  
ELECTRICAL WORK  
WILLIAM SUGG & CO. LTD.  
WESTMINSTER.

## THE India-Rubber, Gutta-Percha & Telegraph Works Co., Ltd. (The SILVERTOWN Company),

manufacture  
CABLES for Telegraphy, Telephony, Lighting and Power, BELL WIRES, TELEPHONE CORDS and FLEXIBLES, India-Rubber and Gutta-Percha Insulated WIRES, SHOT-FIRING WIRES, DYNAMOS, BALANCERS, BOOSTERS, MOTOR-GENERATORS, ROTARY CONVERTERS, PETROL-ELECTRIC SETS for Country House Lighting, Yacht and Ship Lighting, and Isolated Plants generally. MOTORS for all classes of service, SWITCHBOARDS, INSTRUMENTS for Telegraph and Testing Purposes, POWER SWITCHBOARDS for Telegraph and Telephone Purposes, PRIMARY BATTERIES (Leclanché, Daniell, Bunsen, &c.), INSULATORS, INSULATING TAPES and JOINTING MATERIALS, RUBBER INSULATING GLOVES, &c., &c.

# SILVERTOWN

MANUFACTURES HAVE ALWAYS BEEN NOTED FOR EFFICIENCY  
AND A HIGH STANDARD OF WORKMANSHIP AND FINISH.

Estimates and Price Lists on Application.

HEAD OFFICES: 106, Cannon Street, London, E.C.

WORKS: Silvertown, London, E.

BRANCHES:

HOME:—Belfast, Birmingham, Bradford, Bristol, Cardiff, Dublin, Glasgow, Liverpool, Manchester, Newcastle-on-Tyne, Portsmouth, Sheffield.

ABROAD:—Adelaide, Brisbane, Buenos Ayres, Bulawayo, Calcutta, Christchurch (N.Z.), Durban, Hobart, Johannesburg, Launceston, Melbourne, Perth, Sydney.



that the varying absorption of signals due to atmospheric conditions is probably caused by a sun-created conductivity close to the earth's surface (below the normal cloud layers). According to the *Electrical World* (New York), this solar ionisation is insufficient to account for the tremendous changes in transmission distances noted from night to night, and the observations of Professor Taylor might be further interpreted by considering that after a cloudy day the earth's surface retains more of the moisture deposited nightly, and so permits the passage of radiated waves and their accompanying earth currents with smaller conduction losses.

Rumours that the Marconi Co. is intending to increase its capital have been current recently, but no definite information has been vouchsafed by the Company.

The West India Committee announces that wireless telegraphy has been successfully established in the Bahamas. The station is at Fort Charlotte, Nassau. The quenched-spark system has been adopted.

## LOCAL NOTES

**Airdrie:** *Electrical Exhibition.*—The Coatbridge & Airdrie Electric Supply Co. has promoted an exhibition of electrical apparatus in the town, in conjunction with the Carron Co., which has recently been giving much attention to electric cooking apparatus.

**Flintshire:** *Electric Lighting.*—A scheme for giving a supply of electricity in the industrial districts of Queen's Ferry, Connah's Quay and Shotton is under consideration.

**Manchester:** *Wages in Electrical Trade.*—The Manchester section of the Electrical Trades Union has passed a resolution to give electrical firms in Manchester a month's notice failing an advance in wages of from 9d. to 10d. per hour.

**Market Weighton:** *Electric Lighting.*—Mr. C. Pullan, Electrical Engineer, Bradford, proposes to form a company to supply this district with electricity.

**Rawtenstall:** *Street Lighting.*—The electric lighting of all the streets in the town is to be considered.

**Rothsay:** *Electrical Extensions.*—Mr. J. A. Robertson, the Greenock Burgh Electrical Engineer, has been preparing a scheme for working a refuse destructor in conjunction with the electricity undertaking.

**Stirling:** *Proposed Purchase of Electricity Undertaking.*—The terms, offered by Messrs. Balfour Beatty & Co. for taking over the Corporation's electricity undertaking, and converting their existing horse tramways to electric traction, are the payment of £28,642 to cover the unredeemed debt on the undertaking, £2,250 to refund the Council the difference in accumulated debit balances up to the year 1908, and the credit balance carried to reserve since that date, and in addition the sum of £2,000, making a total of £32,892. A reduction in the prices for current is also promised.

**Tyldesley:** *Inauguration of Electric Supply.*—The bulk supply which is being given by the Lancashire Electric Power Co. was inaugurated last week, and the occasion was celebrated by a dinner given by the Power Co. to a large number of district representatives and others.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

### Generating Stations, Sub-Stations, Mains, &c.

**Carlisle.**—A L.G.B. inquiry was held last week concerning a loan of £7,500 for the electricity undertaking.

**Grimsby.**—Sanction has been given to the borrowing of £16,000 for extensions at the electricity works.

**Keighley.**—Two miles of overhead transmission line in duplicate for 6,600-volt three-phase 50-cycles. Borough Electrical Engineer. October 1st.

**Littleborough.**—An expenditure of £4,000 upon the electricity undertaking is contemplated.

**Moffat.**—Details of an electric lighting scheme at an estimated cost of £8,000 has been placed before the Council.

**Preston.**—The Guardians have decided to purchase a 250-kw. generating set.

**Salford.**—Rotary-converters. Borough Electrical Engineer.

**Walthamstow.**—L.T. feeder cable. Borough Electrical Engineer. October 8th.

**Wigan.**—A L.G.B. inquiry was held last week concerning a loan of £6,700 for electrical extensions.

**Worthing.**—Diesel engine generating set. Borough Electrical Engineer.

## Wiring

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Aberdare.**—New police station.

**Bristol.**—Labour Exchange. H.M. Office of Works, Storeys Gate.

**Carlisle.**—New school.

**Chesterfield.**—Sanatorium. Architects, Messrs. W. H. Ward, 30 Paradise Street, Birmingham.

**Dunfermline.**—Extensions to central library (£14,000).

**Greenock.**—New school.

**High Wycombe.**—New Grammar School.

**Kilmarnock.**—Extensions to infirmary (£14,000).

**Limavady.**—New court house.

**Limerick.**—New theatre. Architect, J. O'Malley, 10 Glentworth Street.

**London.**—New Science Museum, South Kensington.

**Sheffield.**—A Committee has been appointed by the Corporation to consider the lighting of all schools by electricity.

**Torquay.**—Extensions at St. Luke's schools. Architects, Appleton & Son, 23 Abbey Road.

## Miscellaneous

**Australia.**—A 15-ton electric crane for the Victoria Railway Commissioners. Further particulars, 73 Basinghall Street, E.C.

The date for receiving tenders for the haulage engine and electric motor and equipment, referred to in our last issue, has been extended to November 12th.

The Melbourne Electric Supply Committee requires 6,700 yds. of lead-covered cable, seven single-phase transformers, and 33,300 incandescent lamps. Further particulars from Messrs. McIlwraith, McEacharn & Co., Biliters Square Buildings, E.C.

**Dundee.**—Overhead equipment, bonds and conduits. General Manager Tramways Department.

**New Zealand.**—Telephone instruments and accessories are required in connection with the Lake Coleridge power scheme. The Wellington Council requires a switchboard and accessories. Further particulars, 73 Basinghall Street, E.C.

## TENDERS RECEIVED AND ACCEPTED

**Cardiff.**—Fifty tenders have been received for the extension of the plant in the Roath Power Station. These are now under consideration by Mr. A. Ellis, the Borough Electrical Engineer.

**London:** *London Electric Supply Corporation.*—A 13,200-k.v.a. Richardson's-Westgarth-Brown, Boveri set has been ordered. This set, which will be required for the extra load in consequence of the extensions of the London Brighton & South Coast Railway's electrified lines, will consist of a Richardson's-Westgarth turbine driving two 6,600-k.v.a. single-phase alternators at 1,600 r.p.m.

**Hammersmith.**—The tender of Messrs. Langdon Davies & Co. has been accepted for a 2-h.p. motor at £15 15s.; a 3-h.p. motor at £17 5s., and a 9-h.p. motor at £29 16s. Delivery in three weeks. Messrs. Siemens Bros. Dynamo Works, T. Harding Churton & Co., the British Westinghouse Co. also tendered, but their prices were not only higher, but the period for delivery was considerably longer.

FOR  
**STEAM JOINTS**  
USE



JOHN HUDSON & CO.'S SUCCESSORS, Mansell St., London, E.

**Hackney.**—The following tenders have been received for the H.T. ring main conduits in connection with the extensions now being carried out:—Foote & Milne, £16,019; William Griffiths, £20,773; Dick, Kerr & Co., £22,835. The Electricity Committee, in bringing these tenders before the Council, pointed out that Messrs. Foote & Milne have not executed any work exactly of this character, their experience having chiefly been with large installation work, and with cables laid in the solid or armoured systems. They appeared, however, to be a good firm, as they were constantly at work for the Admiralty and War Office, and could point to some very large contracts executed for the Government. In recommending that the contract should be placed with this firm, the Committee states that it has provided for the usual sureties for the sum of 10 per cent. on the total value of the work contemplated, viz., £16,019, but reserves the option of placing orders for one-quarter, one-half, three-quarters, or the whole of the work. It seems to be the intention, from the report, to order the work to be proceeded with in two sections, and in the event of the satisfactory completion of these sections the contractors will be ordered to proceed with the remaining two sections.

The following tenders have been received for substation plant:—G.E.C., £6,991 10s. (Westinghouse transformers) and £6,691 10s. (Brush transformers); British Westinghouse Co., £7,006; Siemens Bros. Dynamo Works, £7,051 (Siemens transformers) and £6,931; B.T.-H. Co., £7,159 (Brush transformers), £7,555 (Westinghouse transformers), £7,793 (British Electric transformers), £6,999 (Brush transformers and step starting), £7,395 (Westinghouse transformers and step starting), and £7,658 (British Electric transformers and step starting); Bruce Peebles, £8,166 (La Cour converters); Vickers, £8,189 (Brush transformers); E.C.C., £8,436 (motor generators). With the exception of Messrs. Bruce Peebles, who, of course, quote for La Cour converters, all the tenderers specify rotary-converters. In view of the fact that La Cour converters are used at Poplar, Stepney and Stoke Newington, and the possibility in the not distant future that the East London Boroughs will be linked up, the Committee recommends the adoption of this type of machine.

For substation switchgear and connections the following tenders were received:—Johnson & Phillips, £4,748; G.E.C., £5,187; E.C.C., £5,632; A. Reyrolle & Co., £5,759; Siemens Bros. Dynamo Works, £5,778; B.T.-H. Co., £5,909; British Westinghouse Co., £6,212; Ferranti, Ltd., £6,832; Switchgear & Cowans, £5,985. In bringing these tenders to the notice of the Council, the Committee pointed out that with the exception of Messrs. Ferranti all the tenderers have submitted drawings which are not at all clear either as to details or general arrangement, or both. On the other hand, Messrs. Ferranti's tender is a high one. The Borough Electrical Engineer, however, has finally come to the conclusion that the Council will be safe in accepting the tender of Messrs. Johnson & Phillips.

The Edison & Swan United Electric Light Co., Ltd., advise us that they have recently secured the following important contracts for Royal Ediswan Lamps:—British Admiralty, G.P.O., British L.M. Ericsson Manufacturing Co., and the United River Plate Telephone Co.

### APPOINTMENTS AND PERSONAL NOTES

We are informed that by arrangement with the Directors of Messrs. Siemens Bros. Dynamo Works, Ltd., Mr. E. P. Barfield will sever his connection with the Dalston Lamp Works at the end of the present month. He will, therefore, take up his new appointment as General Commercial Manager with the Edison & Swan United Electric Light Co. early next month.

The Rhondda Urban District Council have appointed Mr. James Bowman as Engineering Clerk of Works, to supervise the erection of their refuse destructor and electric generating works.

Mr. W. H. Johns, Assistant Engineer to the Birmingham Gasworks, has been appointed Electrical and Gas Engineer to the Malvern U.D.C. in succession to Mr. J. Rendell Baker, who, as we announced last week, has gone to Mansfield.

A proposal to increase the salary of Mr. R. L. Horsfield, Tramway Manager at Walsall, from £400 to £500 per annum by half-yearly increments of £25, has been rejected by the Council.

Jointers are wanted for electrical work in the South of Scotland. (See advertisement on another page.)

An assistant telegraph engineer is required by the Great Peninsula Railway. Applications to R. White, Consulting Engineer, 3 Victoria Street, S.W.

### MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. G. Smith & Son, of 5 Philpot Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night, was £77 15s. to £78 5s. (Last week, £77 10s. to £78.)

**Lea Recorder Co., Ltd.**—Mr. W. H. Lund (Caxton House, Westminster, S.W.) has been appointed the representative for London and the south of England of the Lea Recorder Co., Ltd. The Company has been awarded a gold medal at the Ghent Exhibition for its standard integrating machine for the measurement of flowing water. The machine is described in two circulars.

**Advertising and Salesmanship.**—A technical session on the arts of advertising and salesmanship was commenced yesterday at the Birmingham Y.M.C.A. (Dale End), by the Forward Publicity Co. (Temple Row, Birmingham). Lectures are given every Wednesday evening (advanced) and Thursday evening (elementary) by Mr. A. C. Huckstepp, Principal of the Company.

### COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &c.

**Crompton & Co.**—A statutory meeting of the reconstructed company was held last week, when it was announced that the whole of the preference shares offered have been allotted, and the reconstruction of the company carried out without any interruption to business. The orders since April 1st, when the new company took over the business, have shown a considerable increase compared with the previous year.

**British Westinghouse Co.**—The capital reorganisation scheme which has been promised for some time has now been placed before the shareholders. It is recommended that a reduction to the extent of £725,000 be made, of which £225,000 will be devoted to writing down patents and goodwill to £150,000. The balance of the reduction, together with the balance at the credit of profit and loss account on December 31st last, will be devoted to the depreciation of buildings, plant, machinery, and investments, the writing off of the expenses of the issue of prior lien debentures, and the loss sustained in connection with the Lot's Road turbine contract, which has now been definitely fixed at £52,050. To effect this reduction in capital, £1 per share will be written off the 500,000 preference shares, and £5 per share off the 75,000 ordinary shares. On the other hand, in order to maintain the same relative position of the two classes of shares as it stood at the incorporation of the company, it is proposed that the dividend on the preference shares shall be increased from 10 to 15 per cent., and on the ordinary shares from 12 to 30 per cent., the division of any surplus profit between the two classes of shareholders remaining as at present, viz., one-fourth among the preference, and three-fourths among the ordinary shares.

### NEW COMPANIES

**SANDBANKS RAILLESS ELECTRIC CAR CO.**—Registered by Jordan & Son, 116 Chancery Lane, W.C. Capital £1,000.  
**CLONAKILTY ELECTRIC LIGHT & POWER CO.,** 45 Sovereign Street, Clonakilty (Cork). Capital £2,500.

# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 353 [Vol. IX., No. 40]  
*All rights reserved.*

THURSDAY, OCTOBER 2, 1913.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES and TECHNICAL COLLEGE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

*Other Advertisement Rates on Application.*

### Latest Time for Receiving

Letters for Insertion, Tuesday first post.

Small Advertisements and Official Announcements, Wednesday first post.

Displayed Advertisements, Tuesday first post.

Corrections in Standing Advertisements, Monday first post.

All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 208-206, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Circling, Fleet, London."

Telephone No.: 5509 Holborn.

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

OWING to pressure on our space we have been obliged to omit our usual fortnightly cartoon this week.

THE new horizontal Diesel engines, one of the four-stroke and one of the two-stroke type, which form the latest extensions of the plant at the Kingston Electricity Works, were inaugurated last Friday. (Page 552.)

A WELL-CONSTRUCTED steel reflector combined with a lampholder, a new dimming lampholder, a new pattern of adapter, and other fittings are described on page 554.

SOME of the temperature limits for the rating of electrical machinery agreed upon by the International Electrotechnical Commission are published. (Page 554.)

AN increase of about 250 per cent. in the number of electric safety lamps in use in mines during 1912, compared with 1911, is shown by the reports of the Government District Inspectors. Satisfactory increases in the number of electrically-driven coal-cutters and in the applications of electricity generally are also shown. (Page 555.)

A HOME OFFICE order requires the use only of approved patterns of safety lamps in mines, and gives particulars of several electric lamps which are permitted. (Page 555.)

EXPERIMENTS carried out by Professor Thornton relating to gas and coal-dust explosions indicate that the dust is the principal and the gas the auxiliary agent. (Page 556.)

THE Home Office inquiry into the fatal fire which occurred at the Cadder Pit a month ago has been held.

There was no evidence to show that the fire was due to the electrical installation, although this had at first been suspected. (Page 556.)

IN connection with a Home Office prosecution under the Coal Mines Act, the ingenious plea was raised that an electrician was only liable to "examine" the plant under the Special Rules, and was not personally liable for faults in construction or for failure to keep in repair. (Page 556.)

AN interesting automatic telfer equipment in a gold mine is illustrated and described. (Page 557.)

A VISUAL signal indicator for mine shaft and haulage signalling is illustrated. (Page 557.)

A SHORT report appears of the discussion on Mr. Frick's paper on electric steel refining at the Brussels meeting of the Iron and Steel Institute. (Page 559.)

THE specifications published by the Patent Office last month of interest to mining electrical engineers and metallurgists include two dealing with miners' safety lamps, one with shaft signalling, and one with the production of the alkali metals by electrolysis. (Page 559.)

THE Patent Office last week published specifications by the B.T.-H. Co. dealing with metallised carbon filaments, the control of motors and motor generators, and the production of infusible moulded insulators. R. Weaving and the Ferranti Co. describe in a patent specification how two heats may be obtained from two heating elements by the use of two single-pole switches. The other specifications include one for a single-phase commutator motor by L. Rouzet. (Page 560.)

THE design of single lamp dimmers is dealt with in our Questions and Answers column. (Page 561.)

SOME protected hot-bar heating elements and a new design of grill are illustrated. (Page 561.)

MARCONI'S Wireless Telegraph Co. has acquired the Goldschmidt patent rights.—The Post Office has issued a new regulation as to portable wireless sets. (Page 562.)

THE Municipal Tramways Association held its annual conference in Sheffield last week, when various matters relating to tramway management were discussed. The unfair competition of motor omnibuses received considerable attention. There is a possibility of the Hove trolley bus scheme being abandoned. (Page 562.)

THE Board of Trade has at last sanctioned the transfer of the Cromer electricity undertaking to Messrs. Edmundsons'.—There is a dispute between the Bury Corporation and the Lancashire Electric Power Co. with regard to a supply in bulk to Heywood.—It is proposed to shut down the smaller power stations belonging to the Stoke-on-Trent Corporation.—A L.G.B. inspector has severely criticised the Leeds Electricity Department for having such a small reserve fund.—The Manchester Corporation has acquired a site for a 100,000-kw. power station.—There is a suggestion that the Hove Corporation shall hand over to the Brighton Corporation the working of the local electric

supply company's undertaking recently acquired. (Page 563.)

SANCTION to the following loans has been received:—Swansea, £40,000; Bridlington, £3,000; Stalybridge, £9,200. Inquiries have been or will be held as follows:—Carlisle, £12,334; Burnley, £36,227; Bacup, £2,800; Leeds, £168,000. Cable is required at Haslingden; a 2,000-kw. generating station at South

Shields; metallic filament lamps at Birkenhead; and electrical fittings in Johannesburg. (Page 563.)

THE capital reorganisation scheme of the British Westinghouse Co. has been passed.—The Victoria Falls & Transvaal Power Co.'s station will have a capacity of 265,000 h.p. by 1915. Mr. A. E. Hadley has reported very favourably upon the Company's power transmission system. (Page 564.)

## DIESEL ENGINES AT THE KINGSTON ELECTRICITY WORKS

THE new extensions of plant at the Kingston-upon-Thames Electricity Works, which take the form of alternators driven by Diesel engines, were formally inaugurated on Friday last. The Mayor, Councillor C. H. Burge, F.I.C., presided, and a number of visitors enjoyed his hospitality. Mr. J. E. Edgcome (Borough Electrical Engineer), under whose supervision the extensions have been carried out, explained the features of the new plant.

The two sets that have been installed are somewhat different in design and are for somewhat different purposes. One was required to have the maximum possible economy in fuel consumption, as it was intended to be run every day at times of light load, so that the

being of the horizontal type, which, however, has been fully standardised by its makers on the Continent. Although, of course, occupying relatively more floor space than the vertical type more familiar to us, the horizontal design has important advantages in the way of accessibility, notably in the possibility of drawing out the pistons without disturbing the valve gear or breaking the joints in the cylinder-head. In the ordinary land vertical type this cannot be done, although in some of the marine pattern Diesel engines with cross-heads it is possible. Some interesting comparisons will be able to be made between the fuel consumptions of the two types of engine, but as they have only been running on regular load for a few weeks, no figures

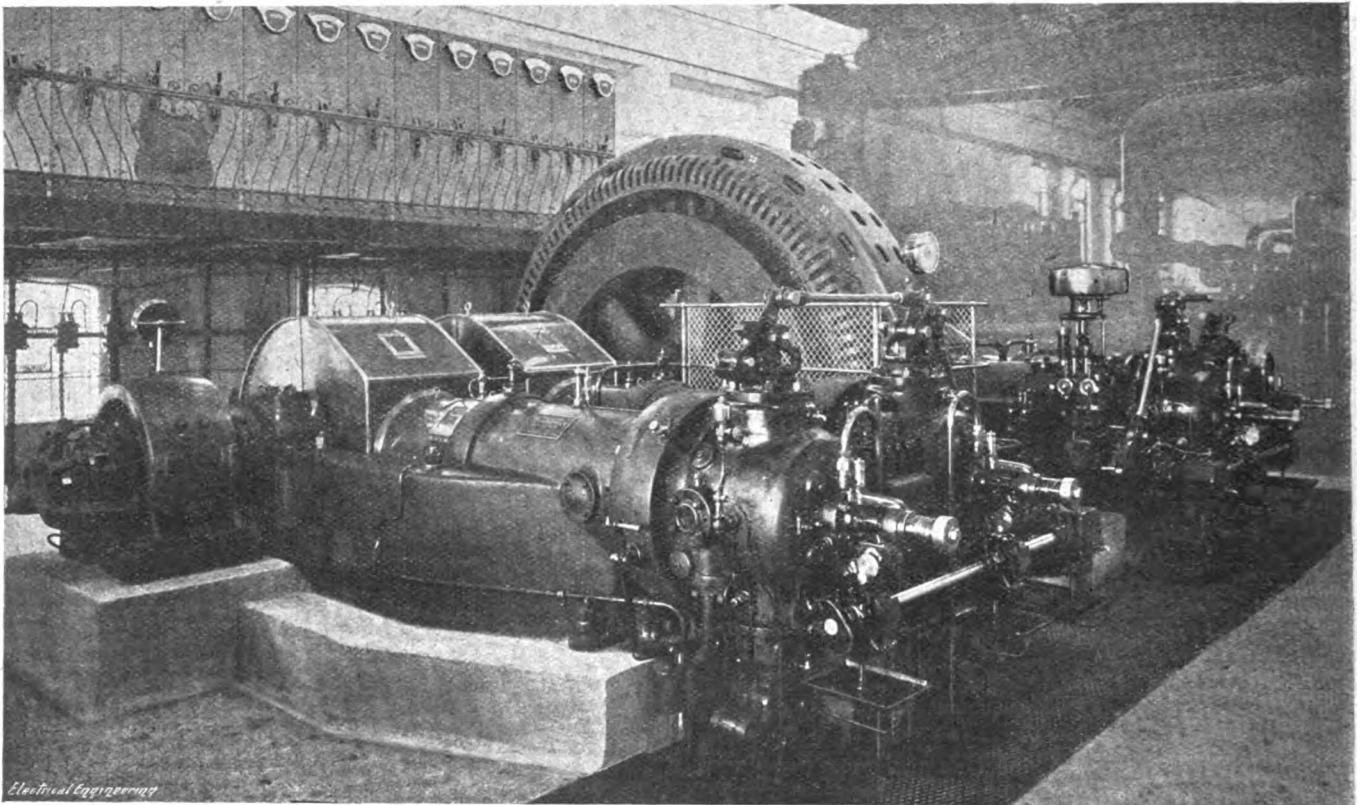


FIG. 1.—FOUR STROKE HORIZONTAL DIESEL ENGINE.

steam plant could be entirely shut down, while in the other case it was more important that the economy should lie in the direction of capital cost than fuel consumption, as it was to be used mainly as stand-by plant, so as to obviate the necessity of having extra boilers waiting with their fires banked, and to assist generally at times of heavy load. It is particularly interesting to realise these two distinct fields of usefulness in which Diesel engines are eminently suitable as auxiliaries to steam plant for the improvement of the over-all efficiency of the station.

With these requirements in view, it was decided that the day-load engine should be of the four-stroke cycle pattern, and the stand-by engine of the slightly less efficient but cheaper two-stroke design. Both engines were supplied by the M.A.N. Co. (Maschinenfabrik Augsburg-Nürnberg A.G.), and strike a note of novelty, as far as this country is concerned, in

are yet available. It may be opportune, however, to give the consumptions guaranteed and realised on the tests. The four-cycle set is guaranteed to take 0.603 lbs. of fuel oil per kw.-hour on full load, 0.64 lbs. on  $\frac{3}{4}$  load, 0.7 lbs. on  $\frac{1}{2}$  load, and 1.14 lbs. on  $\frac{1}{4}$  load. The corresponding figures for the two-cycle engine are 0.64 lbs. per kw.-hour on full load, 0.68 on  $\frac{3}{4}$  load, 0.83 lbs. on  $\frac{1}{2}$  load, and 1.25 lbs. on  $\frac{1}{4}$  load. All these figures were subject to a margin of 5 per cent.

The four-cycle engine is rated at 400 h.p. at 192 r.p.m., and has four horizontal cylinders, with their cranks covered in, two on either side of the flywheel alternator, and all controlled by a single governor. The fuel injection valves are of the same pattern as those used in the ordinary vertical Diesel engines, but they are placed horizontally in the centres of the cylinder heads and are worked by a cam-shaft running at the top and bottom of the cylinders respectively, are across the cylinder ends. The air inlet and exhaust valves,



very much of the pattern usually adopted in large gas-engine practice, actuated by a side cam-shaft, rocking levers and linkages, and, indeed, there is a good deal in the design of the engines which reminds us that it is founded to a large extent on the lengthy experience of the makers in the building of large gas engines. The valves and their seatings are particularly easy to remove for cleaning, and the whole engine strikes us as being of simple, straightforward and robust design. The flywheel, with the rotor of the alternator, weighs over 25 tons, and the engine runs at 192 r.p.m.

The alternator is of the standard slow-speed revolving field pattern, with outwardly radiating poles, of Siemens Bros. Dynamo Works, Ltd., rated at 270 k.w. at 2,100 volts single-phase, at the peculiar frequency of 77 cycles (that of the original twenty-year-old alternators in the station). The exciter is mounted on one end of the shaft and the compressor on the other.

The two-cycle engine, which is rated at 500 h.p., has two working cylinders, both on the same side of the flywheel, and a scavenging pump, which, at the end of the outward stroke, after the working piston has uncovered a ring of ports in the cylinder walls, sweeps out the products of combustion and fills the cylinder with air to be compressed by the next inward stroke. Thus each cylinder gives one

The main water-cooling supply is obtained from a 5,000-gallon tank on the roof, to which water from the river is pumped by a pair of centrifugal pumps driven by single-phase motors from the ordinary mains. Two large fuel storage tanks, each large enough to contain 60 tons of fuel oil, equivalent to a two or three months' supply, have been provided, and fuel is pumped into these from oil tank barges on the river by electrically driven pumps; another set of pumps is also provided to take the fuel as required to the working tank, from which it passes through filters to the engines. The exhaust from both engines is led through silencers to the main chimney shaft of the station.

Both sets are regularly paralleled with the steam-driven plant, which consists of old-pattern Siemens air-core revolving armature disc-type alternators, some of which have now been running about twenty years. The extensions also include a new 24-panel switchboard constructed by Switchgear & Cowans, Ltd. (Springfield Lane, Salford, Manchester), which contains the necessary generator and synchronising panels for the new Diesel sets, and sixteen feeder panels to which feeders formerly connected to the old board have been transferred. The actual high-tension gear

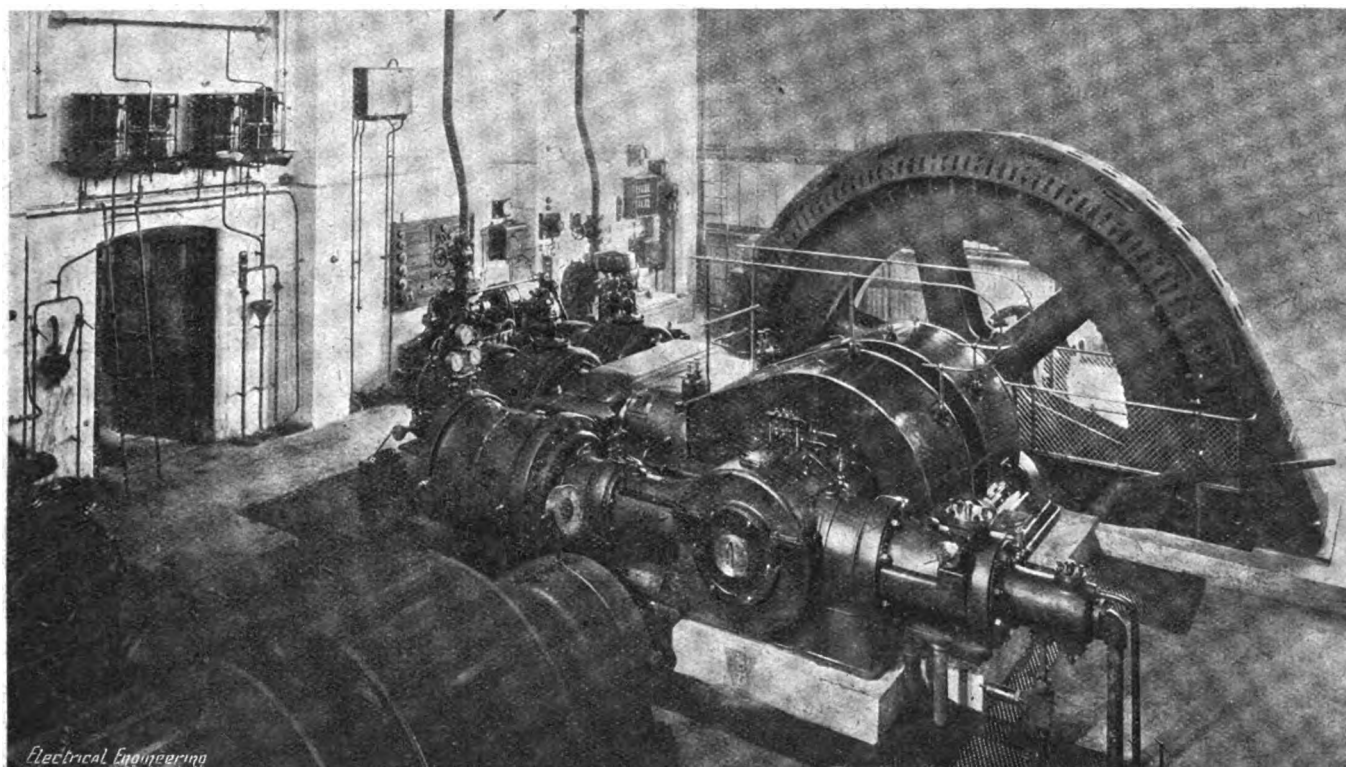


FIG. 2.—TWO STROKE HORIZONTAL DIESEL ENGINE.

explosion for every revolution. The scavenging valves occupy similar positions to the inlet and exhaust valves of the four-cycle engine, and in the gear operating them many of the same standard parts are used. The cylinders are of approximately the same size as those of the other engine, but owing to the greater heat developed by the more frequent explosions, more cooling is necessary, and the pistons have to be water-cooled, which is not the case with the four-stroke engine. The water for this purpose is led in by the jointed elbow tube arrangement, familiar in large horizontal gas engines, and is supplied by special electrically-driven pumps separately from the main cylinder cooling circulation system. Lubrication in the case of both engines is from pumps driven off the cam-shaft. The alternator is of the same pattern and is rated for the same output as is that driven by the other engine.

The set of compressed-air receivers or "bottles," for the two engines comprises two starting and one blast receiver for each engine, but they are arranged so that any bottle can be connected to either engine for either purpose. The compressors on both engines are of the two-stage pattern with water jacketed intercoolers. To ensure absence of vibration, the two engines are mounted on one massive foundation block consisting of a block of concrete 60 ft. long by 20 ft. wide by 11 ft. 6 in. deep.

is in cubicles behind the board, and the oil switches are worked by hand-operated remote control from the grey marble operating panels on the switchboard gallery. Overload trips are fitted to all the feeder switches, and the generator switches are also provided with reverse current releases.

The operating panels are provided with automatically-controlled coloured indicator lamps, which show the position of each switch. The bus bars are contained in stoneware troughs running the full length of the back of the board. The cells for the high-tension gear belonging to each panel are of moulded "stone" with iron doors. These are immediately below the bus bar troughs, and the connections are taken through porcelain tubes. Elaborate mechanical interlocking of the doors, switches, &c., renders access to any live metalwork absolutely impossible. An earthing bar runs below the switchboard, where the alternator field rheostat are also placed, surrounded by expanded metal screens.

We should not conclude without a word of thanks to Mr. J. E. Edgcome (Borough Electrical Engineer) for special facilities for inspecting the plant, and to the M.A.N. Co. for kindly putting at our disposal the photographs from which our illustrations are reproduced.



## SOME NEW "BENJAMIN" FITTINGS

THE works of the Benjamin Electric Co., in Roseberry Avenue, have been considerably enlarged during the past six months, and are now, we are informed, capable of turning out over 50,000 reflectors a year in addition to the Company's other manufactures; they also accommodate the designing and engineering staff and a laboratory equipped with the necessary testing instruments in connection with the work of scientific illumination which they carry out.

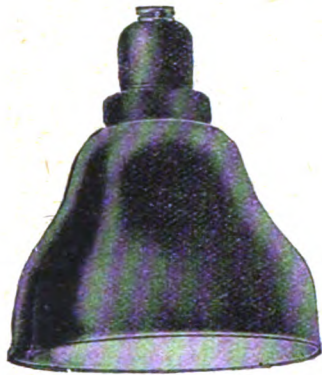


FIG. 1.—STEEL REFLECTOR COMPLETE WITH LAMP HOLDER.

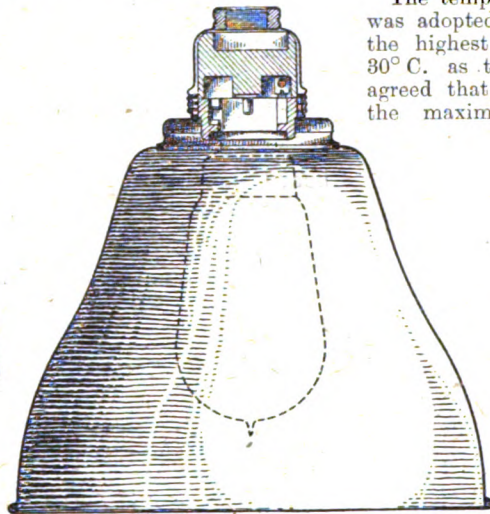


FIG. 2.—STEEL REFLECTOR, SHOWING LAMP HOLDER IN SECTION. (One third size.)

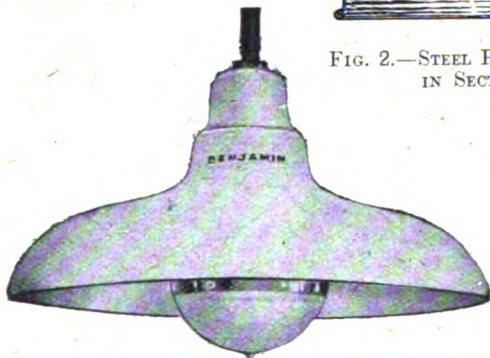


FIG. 3.—BENJAMIN REFLECTOR FITTING WITH LAMP HOLDER FOR OUTDOOR USE.



FIG. 4.—A "MARBELLA" OPAL REFLECTOR.

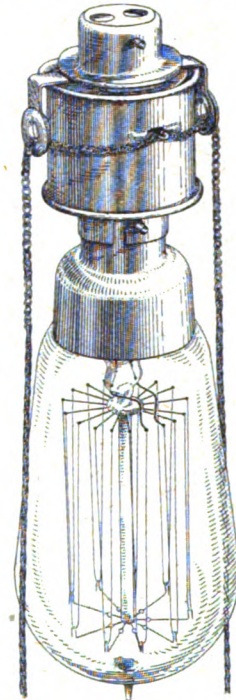


FIG. 5.—DIMMING LAMP HOLDER. (Half full size.)

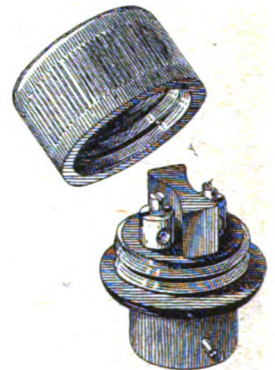


FIG. 6.—"BEN-GRIP" ADAPTER. (About two-thirds full size.)

Several of the Company's newest specialities, designed principally for works and shop lighting, were shown us on the occasion of a recent visit to their showrooms at 117 Victoria Street, S.W. The Benjamin steel reflectors are now made up complete with the "Benco" lamp-holder. The reflector is shown in Fig. 1, and Fig. 2 is a drawing to scale showing the lampholder in section. It is a thoroughly sound mechanical job with large porcelain insulating surface, and should be in every way preferable to the ordinary shade-carrier lamp-holder. A pattern with the addition of a lever switch is shortly to be placed on the market also. The reflector itself is of substantial thickness and weight, and is aluminium plated inside. Four shapes are made, the "extra-extensive," "extensive," "intensive," and "focussing," giving the illumination which their names imply. Fig. 3 shows the "Benjamin Reflector Fitting," intended for outdoor use and still harder usage. It is of white enamelled steel, is all in one piece, and also contains its own lamp-holder on the same principle as the one illustrated in Fig. 2. This pattern is largely employed on the Underground Railways of London.

Fig. 4 is one of the pleasing designs of the new "Marbella" Opal Reflectors, which were introduced by the Company last month. They may be used with advantage as a substitute for the ordinary conical opal shade, and they are not unduly expensive.

Two of the miscellaneous specialities of the Company are the dimming lamp-holder (Fig. 5) and the "Ben-grip" adapter (Fig. 6). The lamp-holder contains the dimming resistance, and on pulling one of the cords a simple rubbing contact brush within a brass sleeve covering the resistance is rotated and inserts the resistance in circuit in several steps. As the collar leaves a fair air-space above and below it, the holder should not get unduly warm. The adapter, which is made of hard insulating composition, is so designed as to grip the flex when screwed up, so that there is no strain on

the terminals; its contacts are long and oval shaped, an important point not always observed in the construction of lamp-holder adapters.

## RATING OF ELECTRICAL MACHINERY

WE are now able to give the salient points in regard to the temperature limits adopted for the rating of electrical machines at the meeting of the International Electrotechnical Commission at Berlin.

The temperature limit recommended at Zurich in January was adopted with a few modifications. This was 90° C. as the highest observable limit for impregnated cotton, with 30° C. as the cooling air temperature. It has now been agreed that, instead of an average cooling air temperature, the maximum probable temperature is to be given;

and in view of differences in opinion whether 35 or 40° C. should be adopted, the matter was referred back to the National Committees. Under the conditions of maximum cooling air temperature, the permissible limits of observable temperatures given below were adopted as approved practice for continuous running. These apply only to windings for rotating machinery, the terminal pressures of which do not exceed 4,000 volts, and to dry transformers with solidly impregnated coils up to 10,000 volts. The question of temperature limits for oil-immersed transformers has been deferred for future consideration. It is assumed that in the windings to which the limits are to apply, the hottest internal spots will not be more than 10° C. in excess of the highest temperatures observable by the methods of measurement recommended by the I.E.C., and of which details will be given later in the official Report. The observable temperature limits permissible in windings for higher pressures than those stated above will be less than indicated in the table, so that the same temperature limits at the hottest internal spot shall not be exceeded.

Non-impregnated cotton ... ..	80° C.
Impregnated cotton or paper, general ... ..	90° C.
" single-layer field coils, stationary or moving ...	95° C.
" stationary coils, solidly impregnated through-out ... ..	95° C.
" rotor and stator windings having the slot portion solidly impregnated or moulded ...	95° C.
Enamelled wire (without cotton) ... ..	105° C.
Mica, micanite, asbestos, general ... ..	115° C.
" single-layer field coils, stationary or moving ...	120° C.
" stationary coils, solidly impregnated or moulded ...	120° C.
Windings permanently short-circuited :	
Insulated ... ..	100° C.
Non-insulated ... ..	110° C.
Commutators—slip-rings ... ..	90° C.
Bearings ... ..	80° C.



## ELECTRICAL ENGINEERING IN THE MINING AND METAL INDUSTRIES

Correspondence on any of the subjects dealt with in this Section is cordially invited from our Readers.

The Editor is willing to insert letters over a *nom de plume*, but Correspondents should send their full names and addresses in all cases.

Letters should be addressed, "THE EDITOR, ELECTRICAL ENGINEERING, 203-206 Temple Chambers, London, E.C.," and should reach this office by the 21st of the month.

Correspondents are requested to write on one side of the paper only.

### REPORTS OF DISTRICT INSPECTORS OF MINES

FROM the reports of the Government District Inspectors of Mines for the year 1912 we find that the total number of coal-cutting machines in use was 2,444, compared with 2,106 the previous year. Of these 1,134 were electrically driven, compared with 998 in 1911. Of the machines using electricity, 623 were of the disc type, 345 of the bar type, 147 of the chain type, 14 were of the percussive type, and 4 rotary heading. The number of electric safety lamps totalled 10,715, compared with 4,110 in 1911. The figures indicate a very satisfactory progress. The returns of the aggregate horse-power in motors installed are given for the first time. These show that 305,000 h.p. is installed below ground and 194,000 h.p. on the surface. These figures are made up approximately as follows:—Below ground: haulage, 130,000; pumping, 144,000; portable machinery, 31,000; miscellaneous, 11,000; on the surface: winding, 24,000; ventilation, 31,000; haulage, 24,000; coal-washing or screening, 44,000; miscellaneous, 72,000. We give here abstracts of the reports, which could not be included with the others in the last ELECTRICAL ENGINEERING, Mining and Metallurgical section (September 4th, p. 500).

#### Yorkshire and North Midland Division.

Mr. T. H. MOTTAM reports that the number of electrically driven coal-cutting machines has increased by 22 since 1911, while the number of compressed air machines has increased by 68. The total number of machines in use was: compressed air, 311; electric 290. Of the latter 143 were of the disc type, 63 of the bar type, and 84 of the chain type.

There were 4,609 electric safety lamps in use, compared with 922 the previous year. The total number of safety lamps in use was 218,993, compared with 211,356. Of this number 58,924 were magnetically locked, compared with 56,102.

The aggregate horse-power in motors installed on the surface was: winding, 657; ventilation, 3,947½; haulage, 2,088; coal-washing or screening, 6,836; miscellaneous, 18,729; for underground working the figures are: haulage, 24,132; pumping, 11,880; portable machinery, 7,250; miscellaneous, 2,353. Thus the totals are 42,257½ and 45,615 respectively.

One fatal and five non-fatal accidents were reported, as well as one fatal and five non-fatal on the surface. The latter fatality was due to an employee taking a "short cut," which necessitated his climbing over a protecting fence. He came in contact with the contact wires for a coke stamper. The fatal accident below ground was due to a coal-cutter not being earthed. Two of the non-fatal accidents were due to defective cables. An underground fire was due to sparking at the commutator of an unenclosed motor. There were five prosecutions of men for contravention of the electrical special rules.

#### Midland and Southern District.

Mr. H. JOHNSTONE's report shows that the number of electrically driven coal-cutting machines has decreased by four, while the number of compressed air machines has increased by 28. The total number of machines in use was: compressed air, 89; electric, 58. Of the latter 27 were of the disc type, 18 of the bar type, and 13 of the chain type.

There were 81 electric safety lamps in use out of a total of 68,408. The number the previous year was 64,250. Of this number 28,070 were magnetically locked, compared with 25,227 the year previous, while 45,022 were ignited electrically, com-

pared with 43,184. The aggregate horse-power in motors installed on the surface was: ventilation, 715; haulage, 861½; coal washing or screening, 2,276; miscellaneous, 3,309½; for underground working the figures are: haulage, 14,714½; pumping, 14,309½; portable machinery, 1,674; miscellaneous, 464½. Thus the totals are 7,162 and 31,162½ respectively.

Two fatal and three non-fatal accidents due to electricity were reported. Both the former were due to the carelessness of the men killed. In one case an old unearthed trailing cable was temporarily brought into service on a coal-cutting machine in which one of the terminals of the plug box worked loose. In the second case a steel girder was being erected near some 550 volt cables which were not made dead as required by the colliery regulations. One of the non-fatal accidents, which, however, resulted in a horse being electrocuted, was due to faulty earthing connections.

### ELECTRIC SAFETY LAMPS FOR MINES

A NEW order under the Coal Mines Act has been made by the Home Secretary regarding the use of safety lamps in mines, approving certain types of lamp and consolidating previous orders. The following electric safety lamps are approved for general use:—(1) The "Ceag" lamp, made by the "Ceag" Electric Safety Lamp Co. (Dortmund, Germany); (2) the Gray-Sussmann lamps Nos. 3 and 4, made by W. E. Gray (19 Archer Street, Camden Town); (3) the Oldham lamp, made by Oldham & Son (Denton, Manchester), and (4) the Wolf Alkaline and Wolf Lead lamps, of the Wolf Safety Lamp Co. (Bank Street, Sheffield). The following are approved for use by officials or for special purposes only:—(1) The Float patent lamp of the Float Electric Co.; (2) the Oldham Emergency and Oldham Shaft and Roadway lamps, of Oldham & Son. Descriptions of the lamps accompany the order. The Ceag and Gray-Sussmann lamps and the Oldham lamp of the hewer's type were described in ELECTRICAL ENGINEERING, June 5th, p. 317. The Wolf lamps are approved both in the forms containing lead and alkaline cells, and are contained in pressed steel cases with vertical ribs and special arrangements for airtight joints to the upper part containing the lamp bulb. They have a magnetic lock, and weigh under 5 lb. when made to give 1 c.p., all round in a horizontal plane for nine hours, and not less than 1½ c.p. over an arc of 45° in a horizontal plane. The Float lamp for the use of officials is of the bull's-eye pattern, containing a two-cell primary battery. The light is switched on and off by inverting the lamp. The lamp is designed to give 1½ c.p. for nine hours, and weighs 4½ lb. The Oldham emergency lamp was described in ELECTRICAL ENGINEERING, April 3rd, p. 187, and the Oldham shaft and roadway lamps are much larger forms of lamp with some of the same general features as the other Oldham lamps. They give 8 c.p. for nine hours, and weigh respectively 34 and 28 lb.

**Electrical Mining Fatality.**—At the Broomrig No. 2 pit of the Banknoch Coal Company last month, the death of a pit fireman named Waugh was attributed to electric shock while engaged in extending the cable of a coal-cutting machine. His mate had left him, to switch the current on, but on returning found him dead.

**"Wireless" Telephones in Mines.**—Experiments have been in progress at the Dinnington Colliery, near Rotherham, on a system of telephony without special wires, designed by a German engineer named Reinecke, which is said to be in use to a considerable extent on the Continent, and is being taken up by an English company. In the course of the experiments conversation has been carried on through over a mile of solid rock with apparatus of very simple nature such as would be cheaper than an ordinary telephone installation. It appears that connection is made to masses of metal buried in the ground, and in some cases water-pipes, &c., may be made use of for the purpose. In the Dinnington experiments one instrument was placed in the transformer house near the pit bottom, and the other 1,000 yards inbye; a portable set can be used and connected up to suitable metallic substances at any part of the mine. In other experiments conversation was carried on from the moving cage, but in this case an insulated wire was clamped to the winding rope. A demonstration of the system has also been given at a colliery near Kilmarnock. Some particulars of the patents covering these systems were given in ELECTRICAL ENGINEERING, December 5th, 1913, Mining Supplement, page lxxiv.

## COAL DUST EXPLOSIONS

PROFESSOR W. M. THORNTON read a Paper, entitled, 'The Influence of the Presence of Gas upon the Inflammability of Coal Dust in Air,' before the British Association, Section B (Chemistry), at the recent meeting in Birmingham, as briefly noted in *ELECTRICAL ENGINEERING* for September 18th. The Paper describes experiments made to determine the least current which will ignite a mixture of coal dust and a fixed percentage of gas by breaking an electric circuit with different currents flowing. Each reading was obtained by five full ignitions taking place in 100 trials. To copy, as far as possible, the conditions actually existing in a pit the explosion vessel was closed on one side by a flap which prevented air entering during the mixing, but yielded to pressure from within. One result of enclosure is to increase the probability of full ignition. Coal gas and natural pit gas were both used in the tests. The results obtained with coal gas are shown in Fig. 1, whence we see that  $\frac{1}{4}$  per cent. of gas has little effect in forwarding ignition, though with more than this there is a rapid increase in sensitiveness. A similar result is obtained with pit gas. These experiments were, however, made a year later with a different sample of coal dust, but the least igniting current with dust alone was 2.8 amperes at 480 volts, compared with 3.5 amperes with the previous dust. Comparing the results with those for coal gas, it is found that coal gas has slightly more effect in helping the ignition of the dust than pit gas. The ratio of the currents, coal gas to pit gas, is 0.9 at 1 per cent. Above 2 per cent. and below  $\frac{1}{4}$  per cent. there is no difference between the influence of the gases.

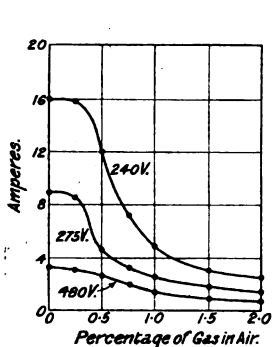


FIG. 1.—LEAST IGNITING CURRENTS FOR CLOUDS OF COAL-DUST IN AIR WITH COAL GAS PRESENT.

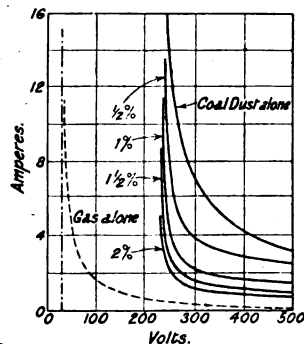


FIG. 2.—RELATION BETWEEN VOLTAGE AND LEAST IGNITING CURRENT WITH COAL-DUST AND GAS PRESENT.

In dealing with the mechanism of ignition the author points out that the effect of the combustion of dust is to provide in each particle a centre of heat which burns the gas. The igniting gas forms a bridge between the dust particles, and the heat transmitted is sufficient to produce a full explosion by the aid of a quantity of gas which could not in itself be exploded. By plotting the results obtained so as to show the relation between the voltage and the least igniting current, as is done in Fig. 2, it is seen that there is a voltage (about 200 in this case) below which, where very large flashes are not possible, ignition of clouds of dust, even with 2 per cent. of gas present, is exceedingly difficult. The curves also show that the gas is the auxiliary and not the principal of the combined low temperature mixtures. Professor Thornton regards the results of these experiments as confirming the view previously put forward by himself, that the real agent in starting a gas explosion is direct ionisation, or splitting off the electrical charges in a molecule by collision with the charges shot out from the spark. At these low percentages the mixture is too weak for an explosion of gas to be set up by ionisation from the spark, but, since ionisation is probably the essential factor in gaseous ignition, it is possible to regard it as the accelerating agent in the gas-dust explosion. Such a view would explain why coal dust is somewhat more readily ignited in coal gas than in methane mixtures of the same percentage strength. This view also receives support from the results of the Prussian Firedamp Commission of 1886.

**Mining Regulations.**—A series of books containing parts of the abstract and general regulations in respect of the different classes of persons employed in mines is now ready, and can be obtained from the usual Government sale agents. The books are published at the uniform price of  $\frac{1}{4}$ d. each, or 3s. a hundred, and the one concerning the duties of Electricians and Assistant Electricians is known as Mines and Quarries Form No. 58.

## INQUIRY INTO THE CADDER PIT FIRE

## No Evidence that it was Electrically Caused

THE Cadder Pit, in which a disastrous fire occasioning the loss of twenty-two lives, occurred at the beginning of last month, is a naked light pit. The possibility of the fire having been caused by an explosion of gas or coal dust may therefore be ruled out. The first reports of the disaster gave the cause as the fusing of an electric cable, but evidence given in the Home Office inquiry, which was held last week in Glasgow by Sir Henry Cunynghame, and has just been concluded, shows that there was little, if any, justification for this. Some of the witnesses from the colliery went so far as to say that it would have been impossible for the fire to have been electrically caused, and Professor Thornton, who was called in as an expert, said that it was highly improbable that electricity could have caused the fire. He pointed out, however, that the cables were of vulcanised bitumen, which supported combustion better than any other kind of cable he knew of.

The point at which the fire apparently broke out was in or near to a cabin with timber sides used by the workmen as they went to and from their work, and in which they customarily hung their coats. It seemed quite possible that the fire may have been due to a hot pipe left in a man's pocket, to a thrown-down match or cigarette end, or to a piece of lighted or smouldering lamp wick. Smoking was permitted in the mine. Mr. Walker, Chief Inspector of Mines for Scotland, seemed to favour the lamp wick theory. Adjoining this cabin, however, was a switchroom, and both this and the cabin itself were absolutely burned out. The condition of the electrical apparatus in the switchroom itself could therefore not be ascertained, but Mr. R. Nelson, Electrical Inspector of Mines, in his evidence, gave it as his opinion from inspection of other parts of the installation that it was possible that the fire might have been electrically caused, although in the circumstances there could be no proof of it.

The inquiry concluded on Saturday last, but of course it may be some time before the Home Office Report is issued. On the whole, the evidence given at the inquiry seems to offer encouragement rather than discouragement in connection with the proper use of electricity below ground.

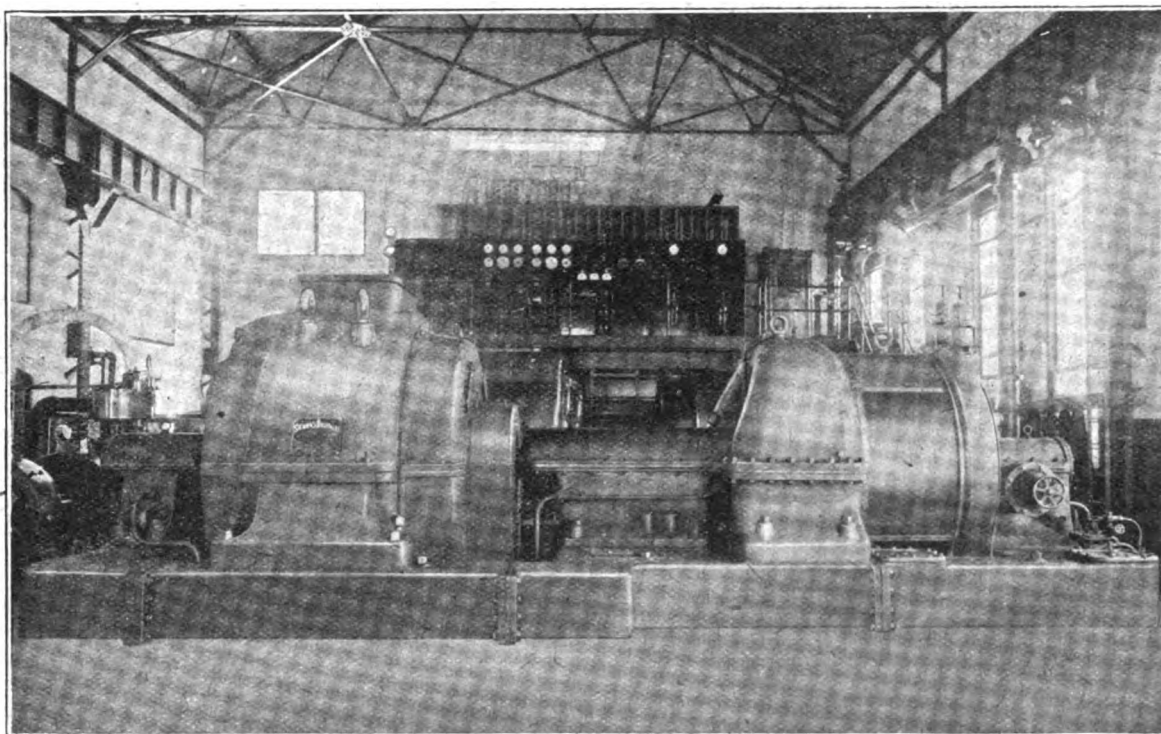
**Home Office Prosecution.**—A case was commenced on Friday last against the Agent and Manager of the Dalzell & Broomside Colliery, Motherwell, with regard to alleged contravention of the Coal Mines Act, by failing to take proper precautions in connection with the colliery plant, including some parts of the electrical installation. The electrician of the colliery was originally included in the charge, but his counsel had taken preliminary objection on the plea that the electrician was only liable to examine the plant in accordance with the "duties" cited in No. 14 (c) of the electrical special rules, and that he could not therefore be held personally responsible for the construction, or even the condition, of the plant. The Sheriff upheld the objection. It was decided, therefore, that the electrician could only be proceeded against for failure to examine the plant properly. The hearing of the case against him will be held on Wednesday, October 29th. The case for the prosecution against the Agent and Manager was not concluded on Friday, and was adjourned until yesterday (Wednesday), when the case for the defence was heard; the ultimate result has not yet reached us as we go to press. Mr. Prichard, an inspector of mines in the Scottish district, gave general evidence with regard to the state of the electrical installation. He said, among other things, that the cables were in a very bad condition, and that on one of his visits he discovered fifty-seven bare places, that is to say, places in which the insulation of the cables was entirely lacking.

**Electrical Shot Firing.**—A new Order has been made by the Home Secretary on explosives in coal mines, under the new Coal Mines Act, which contains a few alterations from the former Order. The paragraph on electric shot-firing apparatus is now paragraph (i) instead of (h) and reads as follows:—(i) Every electrical firing apparatus shall be provided with a push button, and with a removable handle which shall not be placed in position until the shot is required to be fired, and which shall be removed as soon as a shot has been fired. The removable handle shall at all times remain in the personal custody of the authorised person whilst on duty. For the push button there may be substituted an arrangement by which the firing contact is automatically made at the end of the travel of the handle, and on the release of the handle is automatically broken.



# SIEMENS

## COMPLETE MINING EQUIPMENTS



**TURBO-ALTERNATOR**  
 INSTALLED AT A COLLIERY IN CANADA.  
 OUTPUT: 2,500 K.W., 1,500 R.P.M., 6,600 VOLTS,  
 3-PHASE, 25 FREQUENCY.

### SIEMENS BROTHERS DYNAMO WORKS LIMITED.

**Head Office:**  
 CAXTON HOUSE, WESTMINSTER, S.W.  
 Telephone: GERRARD 880.  
 Telegrams: "SIEMBRALOS VIC LONDON."

**Supplies Dept. & Stores:**  
 38 & 39, UPPER THAMES STREET, E.C.  
 Telephone: CITY 6350.  
 Telegrams: "SIEMOTOR CENT LONDON."

**"Tantalum" Lamps & Fittings:**  
 TYSSON STREET, DALSTON, N.E.  
 Telephones: CENTRAL 8387/9 & DALSTON 2440.  
 Telegrams: "SIEMODYN KINLAND LOND.JN."

#### Works: STAFFORD.

#### BRANCHES:

AUCKLAND (N.Z.)	CALCUTTA	DURBAN	MANCHESTER	OSAKA	SHANGHAI	TOKYO
BIRMINGHAM	CAPE TOWN	GLASGOW	MELBOURNE	PEKIN	SHEFFIELD	TORONTO
BOMBAY	CARDIFF	HONG KONG	MEXICO	PENANG	SINGAPORE	VALPARAISO
BRISTOL	DELHI	JOHANNESBURG	MONTREAL	RANGOON	SOUTHAMPTON	WELLINGTON (N.Z.)
BUENOS AYRES	DUNEDIN (N.Z.)	MADRAS	NEWCASTLE	RIO DE JANEIRO	SYDNEY	WINNIPEG

WHEN CORRESPONDING WITH ADVERTISERS. PLEASE MENTION "ELECTRICAL ENGINEERING."

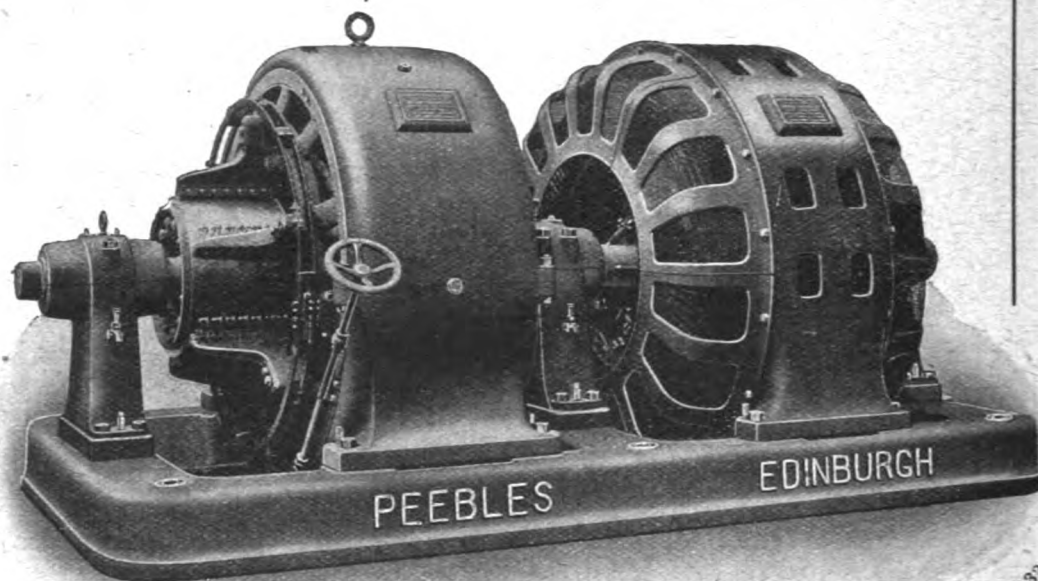
**LONDON:** Hastings House, Norfolk St., Strand, W.C.

**BIRMINGHAM:** Exchange Bldgs., Stephenson Place

**MANCHESTER:** ..... 30, Cross Street

# PEEBLES MOTOR- CONVERTERS

(Peebles—la Cour Patents)



— 500 K.W. Three-Bearing Peebles Motor Converter. —

For full particulars regarding these machines, see Pamphlet No. 20C, to be had on application.

Over 250,000 K.W. of  
PEEBLES MOTOR-CONVERTERS  
in successful operation in Great  
Britain, Japan, South Africa, India,  
Australia, Canada, &c.

**BRUCE PEEBLES & CO. LTD.**  
— ENGINEERS —  
**EDINBURGH**

*When corresponding with Advertisers, please mention "Electrical Engineering."*

### AUTOMATIC TELPHER LINE IN A GOLD MINE

THE Randfontein Estates Central Gold Mining Company has installed an interesting automatic telfer line. The gold quartz is first crushed in a tube mill, and then transported, by means of belt conveyors, to a pebble bin, and on to a second mill building provided with 600 stamps. This,

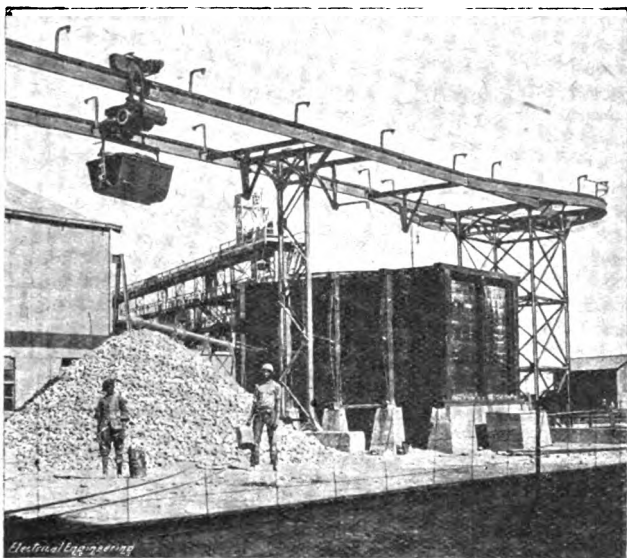


FIG. 1.—AUTOMATIC TELPHER LINE SHOWING TERMINAL.

we are informed, is the largest ore-stamping plant in the world. From here the tailings, which still contain some gold, are taken by belt conveyors to a crushing station. The dead rock is separated and conveyed to hoppers for removal to the dump by means of a surface line. The separated tailings still containing gold come from the crushers into a bunker having 120 tons capacity, and are then conveyed again into the tube mill, where they once more undergo the process of dressing.

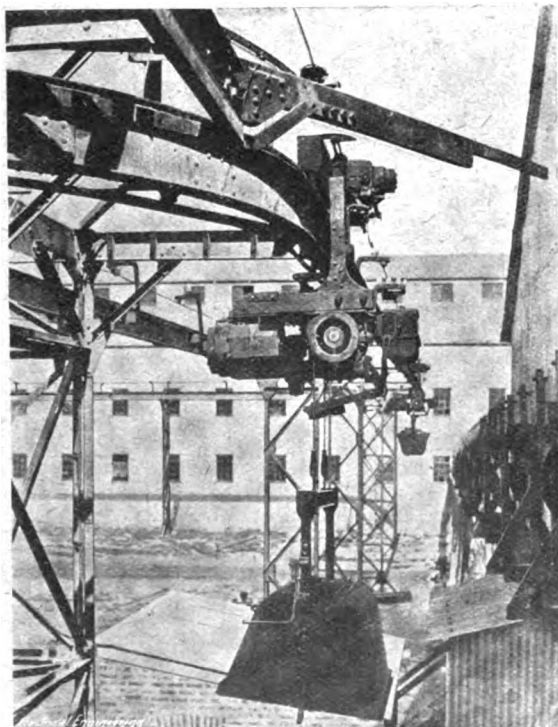


FIG. 2.—"ELECTRO-WINCH" TELPHER WITH LOWERED BUCKET BEING TIPPED.

The connection between the quartz bunker behind the crusher station and the ore bunkers is effected by means of a "Bleichert" telfer round the mill building. The telfer buckets are loaded from hoppers underneath the pebble bins, raised, and then travel round the mill building to the pebble bin (see Fig. 1), where they automatically tip their contents. The track is about 1,200 ft. long, and handles about 700 tons

of gold quartz per 55-hour week. The telfer car, on arrival at the pebble bin, comes to a standstill, lowers its bucket which is placed upon a bogie, and conveyed under the hoppers of the pebble bins, where it is loaded. It is then conducted back by the same route in order to be suspended again on the telfer track. The track of the telfer line is horizontal, and is 24 ft. above the ground level, so that it clears any obstacles on the ground. The "Bleichert" telfer is arranged to work so that the cars following each other mechanically throw over switches, which interrupt the current on the section of the conductor wire behind them. The current is only restored when the car has passed the following section of the track, and thrown over the next switch. Thus there is always a section without current between two cars, so that collisions are impossible. The cars stop automatically before the loading point, and then move up and restart on the actuation of a portable controller.

On the property of the Randfontein Company, a so-called electro-winch line has been installed. On arrival at the loading station the car stops automatically, and the workman on duty gives it current through a controller, which he closes with a plug, thus causing the car to lower its bucket. The latter can then either be placed on a bogie, as at Randfontein, or loaded direct by shovelling or from hoppers. The current is switched on, and the skip is raised. All further movements are automatic, as the winch is self-contained, as may be seen from Fig. 2, which shows a car on the track after having been tipped. As soon as the end station is reached, the car tips and returns automatically. The next car, in the meantime, proceeds to the loading station. The serviceable nature of the equipment can be appreciated from this illustration, and, obviously, it is a great labour-saving device. We understand that in one installation at the blast furnaces of Gebrüder Stumm, Neukirchen on the Saar, the services of 125 men were dispensed with. During the last eight years over 400 "Bleichert" telfers have been constructed. The installation of these plants in England and the Colonies is in the hands of Bleichert's Aerial Transporters, Ltd., Egypt House, 86 New Broad Street, London, E.C.

### SIGNALLING IN MINES

AN electrical signalling indicator for use with mechanically-operated bells for mine shafts and haulage has been put on the market by Siemens Bros. & Co., Ltd. (Woolwich), as a result of the recent revisions to the mining regulations requiring a visual indicator to be installed when the uniform code of bell signals comes into force (see ELECTRICAL ENGINEERING for July 3rd, p. 395). The apparatus consists of a dial indicator with a pointer, which is moved one step for each bell stroke, a contact-maker actuated by the bell rope,



FIG. 1.—ROPE-OPERATED SWITCH.

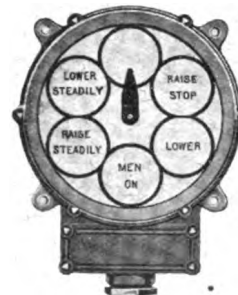


FIG. 2.—DIAL INDICATOR.

and a switch with gearing attached to the winding gear for returning the pointer to zero. The switch, shown in Fig. 1, is fitted near the bell rope or chain, so that a stop on it operates the switch when it is pulled. This causes the pointer on the indicator, Fig. 2, to move to the order given. The pointer is reset to zero by a switch which is worked automatically as soon as the engine driver moves the engine to carry out the order. Similar apparatus is supplied for use with electric bells, whilst apparatus to give a luminous signal is also made by the Company.

### Energy and Electrode Consumption in a Steel Melting Furnace.

—Observations made upon a Rennerfelt steel melting arc furnace at the Hallstahmoner Iron Works in Sweden have shown that the electrode consumption was 2.5 kg. per ton of finished steel, and the energy required was about 590 kw. As the result of the trials has been considered satisfactory, furnaces for 200 kg. and 1,000 kg. capacity are being built.

# "SYNCHRON" THE LIFE-SAVER

The latest invention for restoring animation after apparent death from Electric Shock, Drowning, Mine Gas Poisoning, etc.

A boy can use it, no technical knowledge necessary.

*The Star, Nov. 28th, says:—*

"Electric shocks need not necessarily prove fatal, and people who have been victims of a shock appear to be like people who have been immersed in a pond; both may be revived by means of artificial respiration.

"Some very interesting information regarding this is given in the 'Lancet' by Dr. Reginald Morton, President of the Section of Electro-Therapeutics in the Royal Society of Medicine, who states that practically no shock, however severe, need necessarily prove fatal.

"Death from electrical shock is only an apparent death at first, and whatever the conditions or severity of the accident, there is practically always a time, varying from a few minutes upwards, during which it is possible to resuscitate the victim by artificial respiration if resorted to at once.

"So important is it to commence artificial respiration quickly, that it is the first duty of the bystander to see to this before everything else."

## YOU CAN DO THIS WITH THE SYNCHRON

it is always ready.

### AGENTS:

Messrs. HASLAM & SCHONTHEIL, Ltd.; Messrs. SIEBE GORMAN & CO., Ltd.

British South Africa Messrs. GEORGE ANGUS & CO., Ltd.

Rhodesia - - - Messrs. HUBERT DAVIES & CO., Ltd.

Canada - - - Messrs. CHAPMAN & WALKER, Ltd.

For full particulars apply to the sole selling agents for Great Britain and the Overseas Dominions—

**THE SYNCHRON CO.,** (Proprietors, *Albans, Ltd.*, 11, Serjeant's Inn, London, E.C.

**THE HOLMQUIST ELECTRIC CO. (1911) Ltd.,** 27, Kingley Street, Regent Street, London, W.

*When corresponding with Advertisers, please mention "Electrical Engineering."*



FOR  
BRITISH  
MANUFACTURED  
PAPER  
INSULATED  
CABLES  
THE  
UNION  
CABLE  
CO., LD  
DAGENHAM DOCK,  
ESSEX.

### STEEL REFINING IN AN INDUCTION FURNACE

THERE was an interesting discussion on the Paper read at the meeting of the Iron and Steel Institute in Brussels by Mr. Otto Frick, in which the induction furnace designed by the author was described. This has a rotating cover, small bath inclination, low energy consumption, and a lining giving a regular life of between two and three months. Two of these furnaces are in use in Germany for melting cold scrap. The Paper itself was dealt with at some length in *ELECTRICAL ENGINEERING*, September 4th, page 498.

The discussion was opened by Mr. Campbell, who pointed out that the conditions in Belgium were not quite the same as elsewhere. Although there, probably, electric steel could be made as cheaply as any, in America there was no basic Bessemer, and the cost of melting and refining was higher, but a duplex process might turn out to be the cheapest. In England the quality of open-hearth steel was already so good that it would be difficult to show an improvement on present practice. There was a disadvantage in using alternators of specially low frequency for furnaces, as they could not assist in general power supply if required. He was not in favour of very large-sized furnaces, and thought that 15 tons was a convenient limit. Mr. Ledingham, the next speaker, emphasised the point that raw material with a good analysis was usually necessary to make a good steel, but if the electric furnace could make good steel out of common scrap, it was doubly interesting. Mr. Greville Jones asked for some costs of converting cold scrap. Mr. Frick in his reply to Mr. Campbell expressed the opinion that a 15-ton furnace was already large, but did not anticipate any difficulty in making them up to 25 tons. The efficiency went up considerably with the input. He did not think that the electric furnace would very largely replace the crucible, but its importance lay more in the treatment of such material as structural steel. The great advantage of the electric furnace was the absence of oxide in the slag. In reply to Mr. Jones, the best way was to melt the cold scrap first in an open-hearth furnace, and then transfer it to the electric furnace. Mr. E. Houbauer, of the Cockerill Co., sent a communication doubting that the author's reasoning would apply to very large refining furnaces, and generally preferred the arc type of furnace.

### ELECTRIC MINING AND METALLURGICAL PATENTS OF SEPTEMBER

THE following patent specifications, of particular interest to mining electrical engineers, have been published by the Patent Office during September. In No. 28816, of 1912, by H. Joris, of Liège, Belgium, a construction of miner's electric safety lamp, in which the lamp is switched into or out of circuit by a rotary motion of the top part, is described. To protect the switch chamber from the external atmosphere as well as from the accumulator gases, the contacts are arranged in a sealed chamber in the removable cover of the accumulator casing. The chamber is closed at the top by a baseplate screwed on to a raised part of the cover, and carrying the head of the lamp which effects the switching by a rotation, limited by a screw in the casing engaging a groove on the base-plate. The terminal contacts are made by balls arranged in metal sockets under the action of springs. A set of similar springs and balls serves to balance the pressure of the terminals. In No. 13,694, of 1913, W. W. Gordon and J. Wright, of Hetton-le-Hole, Durham, claim a method of unlocking and igniting safety lamps by a single-phase transformer giving 25 and 6 volts. The 25-volt supply is applied to an electromagnet through a switch to unlock the lamps, and the 6-volt supply is used on an induction coil to effect ignition. In No. 2,546, of 1913, J. Close, of Glengarnock, Ayrshire, describes a signalling system consisting of electrical visual indicators at the pit bottom and engine-room respectively, and operated by a local battery put into operation by pull wires or ropes from the workings, so that no live conductors need be taken down the shaft. Connections are made through the gates to the engine-room to indicate when they are closed.

Of special interest to electro-metallurgists is Specification No. 1,933, of 1913, by Deutsche Gold and Silber-Scheide-Anstalt, of Frankfurt-on-Maine, who, through G. W. Johnson, claim a modification in the Castner process for the production of alkali metals by the molten electrolysis of caustic alkali at a temperature a little above the melting point, which consists in coating the collecting vessels on the outer walls up to the level of the electrolyte with a substance which withstands the action of chlorine. One method of effecting this is by the use of asbestos rope soaked with a thin pulpy mixture of water glass and asbestos meal. This rope is wrapped round the vessel, which is then ready for use with cheap materials, as the anode products cease to have a detrimental effect.

**Iron Ore Smelting in Sweden.**—According to the *Board of Trade Journal*, Mr. Assar Grönvall, an engineer and director of the firm of "Aktiebolaget Elektrometall," has petitioned the Swedish Government for the right to crush iron ore on the State-owned fields in Norrbotten, for electric smelting. It is proposed to erect two furnaces in Kiruna of 4,000 h.p. capacity each, at a total cost of 1,000,000 kr. (about £55,500). The Government asked the Committee of the Swedish Iron and Steel Institute to report on the matter, and it has advised the Government not to approve the petition, chiefly on the ground that the manufacture of charcoal pig iron for export is not desirable either for the works turning out pig iron or for the local steel works. The Committee considers it would have been more satisfactory had the petition originated from some association representing Swedish iron works which intended by using this ore to produce a comparatively cheap pig iron for the refining works in Sweden. The whole question has now been submitted to the Swedish Board of Trade for report.

**Electricity in Mines in Pennsylvania.**—The U.S. Geological Survey *Press Bulletin* shows that in this important coal mining district in 1912 no less than 81 million tons, or 50.8 per cent. of the total, was mined by machines. In 1911 the quantity of coal so mined was 68 million tons, or 47.78 per cent. of the total. The number of machines in use in 1912 was 6,176, and most of these were electrically driven. The *Electrical Review and Western Electrician* (Chicago) points out that in 1882 the coal mined in Great Britain was 70 per cent. in excess of that mined in the U.S., but at the present time the position is reversed. The U.S. contributes 40 per cent. to the world's supply of coal, but consumes 99 per cent. of this itself.

**Electric Blasting in South African Mines.**—In connection with the inquiries being made into the condition of labour in the South African mines, experiments are being made into the possibility of firing the whole of the blasting charges simultaneously, while all the men are withdrawn from the mine. The whole of the eighteenth level of the Meyer and Charlton mine, comprising some 800 shots, was fired together recently from one station, and the cables are now being placed to enable all the blasting to be effected from the surface.

# "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

## Specifications Published September 25th, 1913

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

**Names in italics indicate communicators of inventions from abroad.**

12,642/12. **Metallising Ceramic Surfaces.** Q. MARINO. The surface is given a coating of copper, tin, cadmium, or cobalt fluoride, which is then reduced by brushing on a metallic powder.

12,687/12. **Single-phase Commutator Motor.** L. ROTZER. The armature winding is connected to a commutator with short-circuited brushes, and also to two slip rings, so that certain points in the armature may be short-circuited. With this path open, the motor is started up as a repulsion motor, and as synchronous speed is reached, the short-circuit is automatically brought into operation. The motor now runs synchronously with any load. Four figures.

12,908/12 and 19,029/13. **Circuit Protection.** F. A. BECKER. Circuits are protected from foreign waves by an inductance, with capacity and damping resistance in parallel, in series with the line. Compensation shunts may be provided. One figure. Excess pressures in an A.C. circuit brought about by switching are prevented by adjustable shunt circuits containing capacity or inductance. These circuits and the load constitute a tuned resonance path through the switch, which is locked unless the current and pressure are practically in phase. Two figures.

20,185/12. **Agricultural Machines.** W. WORTMANN. Current is conducted to the travelling machine through the insulated lead of an armoured cable, which is wound up by, and unwound from, the machine. A bare earthed wire is used for the return in conjunction with the armouring.

20,225/12. **Vehicle Lighting.** A. E. BERDON. A variable speed dynamo is regulated by a differential magnetic shunt, while a storage battery in parallel with the load is controlled by a switch equipped with a pressure and a current coil. A coil is also mounted on the shunt, in series with the pressure coil, and connected in the battery circuit. Three figures.

20,662/12 and 20,744/12. **Motor Control.** B.T.-H. Co. (*G.E. Co., U.S.A.*). The first specification relates to a series parallel control system in which the necessary changes in connection are effected by contactors energised through a master-controller and locked by a combined time and current limiting relay. Three figures. The second specification relates to the control of motor-generator sets, in which the motor is of the variable speed type. To compensate for the pressure drop in the generator as the speed falls, resistance in the generator field circuit is automatically short-circuited by a switch worked by current taken from the motor slip rings. One figure.

23,776/12 and 24,059/12. **Resinous Insulators.** B.T.-H. Co. (*G.E. Co., U.S.A.*). An insulator which can be moulded is produced by bringing an infusible reaction product of phthalic anhydride and a polyhydric alcohol into contact with a liquid solvent. In another process camphoric acid is heated with a polyhydric alcohol, *e.g.*, glycerol.

25,207/12. **Alternators.** ATELIERS DE CONSTRUCTIONS ELECTRIQUES DU NORD ET DE L'EST. Momentary short-circuit currents are reduced by an inductance in the field circuit, obtained by linking part of the field windings with a subsidiary magnetic circuit. One figure.

26,256/12. **Heating of Rooms.** T. J. DIGBY. An element in a quartz tube protected by a reflector is fixed along the lower edge of the door so that the incoming air is heated. When the door is open, a sliding contact opens the heater circuit. Six figures.

26,344/12. **Railway Systems.** W. B. PERVIS and A. D. GRITMAN. To do away with the necessity for a constantly energised third rail, this is sectionalised, and each section is connected to terminals in a separate closed conduit, where also is a sectionalised conductor connected to the main feeder. Magnets in connection with the rail vehicle attract the conductor sections to the third rail terminals, so that only one or two sections of this are simultaneously alive. Five figures.

26,347/12. **Heaters.** M. ALBRECHT. Resistance strips separated by strips of mica are tightly rolled and inserted into a tube, which is compressed so that the walls press tightly on the mica. Several constructions are described. Eight figures.

27,455/12. **Metallised Carbon Filaments.** B.T.-H. Co. (*G.E. Co., U.S.A.*). Raw carbon filaments are impregnated with a boron solution (1 per cent. solution of sodium borate), then carbonised, and finally metallised.

3,246/13. **Wireless Telephony and Telegraphy.** SIGNAL GES. At least two pairs of earthed plates are used at both ends. The signalling current is passed between the pairs of plates at the transmitting station. If the plates are disposed horizontally, one plate pair is angularly displaced from the others. The currents for each plate pair differ slightly in phase. On board ship the plates may be disposed vertically—one is comprised by the hull of the vessel. Four figures.

5,082/13. **Submarine Signalling.** E. C. R. MARKS (*Submarine Wireless Co., U.S.A.*). A mechanically operated reed is controlled by a key through an electromagnetic clutch. Five figures.

12,935/13. **Switching Arrangement on Heaters.** R. WEAVING and FERRANTI Co. Two heats are obtained by the use of two single-throw switches. Two elements may be connected in series across the mains through one switch, while the other is used to short-circuit one element. The elements may also be connected so that they are both in parallel or one short-circuited. Two figures.

## Specifications Published To-day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free.

Summaries of some of the more important of these patents will appear in our next issue.

**Distributing Systems, &c.:** BOOTH [Series system of incandescent lamp lighting] 1,002/13.

**Dynamos, Motors, and Transformers:** HARTMANN [Metal vapour rectifiers] 15,937/12; CROMPTON & Co. and BURGE [Polyphase motors and generators] 3,227/13.

**Electrometallurgy and Electrochemistry:** GUTERMAN [Electrolysis] 8,352/13; A.-G. FÜR ANILIN FABRIKATION [Electrolytic production of hydrosulphites] 13,901/13.

**Heating and Cooking:** NATHAN [Heaters] 24,131/12; RAVES [Liquid heaters] 14,562/13.

**Ignition:** BRISTOL WAGON & CARRIAGE Co. and COPSEY [Magnet trip-gear] 25,374/12.

**Incandescent Lamps:** POULTON [Storage and transit] 22,209/12; WOLFRAM LAMPEN A.-G. [Filament supports] 12,753/13.

**Switchgear, Fuses, and Fittings:** GREEN [Junction boxes] 20,831/12; COTTIER and DOWNES [Conduit fittings] 21,971/12; DAWSON [Controller contact] 23,402/12; STATTER [Time elements for circuit breakers] 25,606/12; SCHUCHARDT [Balance weight suspension for lighting] 8,467/13.

**Telephony and Telegraphy:** BLOCK [Disinfecting telephones] 2,215/13; SHREEVE [Telephone repeater system] 4,611/13; SIEMENS & HALSKE [Construction of the bank-contact sets of selectors] 15,164/13.

**Traction:** ALLARD [Block-signalling and train control] 6,185/13.

**Miscellaneous:** FARBER [Safety battery lamps] 20,352/12; OLDHAM [Miners' safety lamps] 24,438/12; SUTER [Reflectors for incandescent lamps] 25,536/12; SMITH (*Smith*) [Engine-room telegraph alarm] 29,311/12; ELIA [Submarine mines] 16,379/13.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Electrometallurgy and Electrochemistry:** CONSORTIUM FÜR ELEKTROCHEMISCHE INDUSTRIE [Manufacture of per acids from aldehydes] 16,849/13; [Manufacture of aldol] 19,463/13; MÖLLER [Separation of suspended bodies from non-conducting fluids] 19,732/13.

**Storage Batteries:** RABBIDGE [Electrolyte] 19,782/13

## Amendment to Specification

14,478/11. **Vehicle Lighting.** S. W. RUSHMORE. Owing to the extended investigation under Section 8 of the Act, this specification has been amended by way of disclaimer. A vehicle lighting system, in which a variable speed dynamo and iron wire ballast resistance are used is described.

## Expired Patents

The following are the more important Patents that have become void through non-payment of renewal fees.

**Arc Lamps:** SIEMENS DYNAMO WORKS (*Siemens-Schuckert*) [Negative electrode for search-lights] 12,556/08

**Distributing Systems, &c.:** A. E. G. [Motor-generator sets and fluctuating load systems] 9,977/08; B. T.-H. Co. (*G. E. Co., U.S.A.*) [Centrifugal compressor driving] 12,515/08.

**Dynamos, Motors and Transformers:** E. ARNOLD and F. COLLISCHÖNN [Cross-connecting wave-wound armatures] 11,857/01.

**Electrometallurgy:** F. T. SNYDER [Zinc ore furnace] 13,254/07.

**Incandescent Lamps:** G. MICHAUD and E. DELASSON [Oxide filaments are heated by a conducting core] 4,461/08.

**Switchgear, Fuses and Fittings:** E. WESTON [Pneumatically operated carbon plate resistance, for large currents] 13,027/05; W. F. JONES [Resistance unit] 15,582/07.

**Telephony:** W. AITKEN [C. B. systems and relay] 13,216/04.

**Traction:** SIEMENS BROS. & Co. (*Siemens & Halske*) [Motor-operated points and signal locking gear] 10,579/00.

**Miscellaneous:** H. CORLIAND [Automatic central station fire alarm system] 11,667/01; W. H. HOYLE and T. BARKER [Lift control] 13,204/04; H. B. BARLOW (*International Postal Supply Co., U.S.A.*) [Postmarking and printing] 13,466/07.

## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,358.

It is required to drive an existing planing machine with a 20ft. travel and vertical and horizontal feeds of 10in. with provision for three tools by individual motor drive. The machine is at present driven by belting on to a 24in. pulley running at 300 r.p.m., and there are stepped pulleys on the counter-shaft so that a 50 per cent. variation in the speed of the cutting stroke can be obtained in several stages. The usual automatic belt-shifting arrangement is provided to obtain a quick return, but the pulleys for this purpose could easily be removed if it is decided to obtain all the variation of speed by control of the motor. Give a specification which would enable an electrical firm to quote alternatively for a constant or variable-speed 500-volt continuous-current motor with complete control equipment.

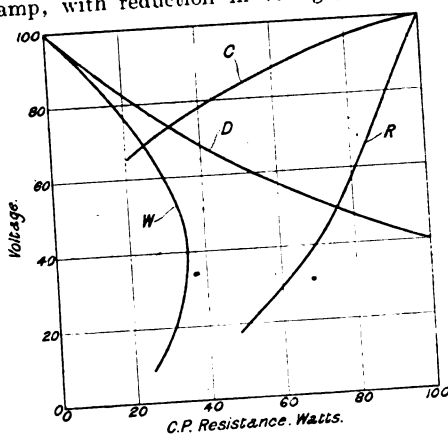
(Replies must be received not later than first post, Oct. 9th.)

### ANSWERS TO No. 1,356.

Work out, in terms of the rated wattage and voltage of a tungsten lamp when run at normal efficiency, the range of resistance necessary for a dimming switch in series with the lamp to reduce the candle-power to from 5 to 60 per cent. of the normal. Over what range of candle-power will the various dimming switches on the market regulate a 55-watt 200-volt lamp?—"H. T."

An award of 10s. had been made to L. BOOTHMAN for the following reply:—

Curve "C" shows the variation in candle power of a tungsten lamp, with reduction in voltage, in percentage of



the normal. "D" shows the resistance required in series with lamp to reduce candle power and voltage on lamp. This resistance is measured in percentage of the lamp resistance at normal voltage, i.e.,  $(\text{normal volts})^2 \div \text{rated watts}$ . Curve "R" shows the variation in resistance of the lamp with voltage. "W" shows the watts absorbed in resistance as the candle power is reduced. These watts are measured in terms of the rated lamp watts.

Example:—A 55-watt 200-volt lamp has a resistance at rated voltage of  $(200)^2 \div 55 = 727$  ohms. To reduce the candle power by 60 per cent., from curve C, volts on lamp must be 78 per cent. of 200=156 volts, and lamp resistance at this voltage is about 90 per cent. of 727 ohms=655. Then resistance of lamp plus dimmer  $= (655 \times 200) \div 156 = 840$  ohms, i.e., dimmer resistance  $= 185$  ohms  $= 25.5$  per cent. of 727 ohms. Watts on dimmer  $= (200 - 156)^2 \div 185 = 10.5$  or 19.1 per cent. of 55. Curves D and W have been drawn for a number of these points. Curve D with another 100 per cent. increase of resistance reaches to 20 per cent. of voltage.

The "Twilight" dimming switch effects a saving of 65 per cent. in watts, of normal, at full dim, the lamp voltage being about 20 per cent. of normal. The candle power is extremely low—about 5 per cent. only. Any successful single lamp dimmer must give a glimmer only at full dim. (The curves given are compiled from an article in the *Electric Journal*.)

No second award has been made.

## COOKING AND HEATING APPARATUS

IN addition to many designs of the older types of luminous electric radiator in which the radiation and convection principles are combined on the Dowsing system, a large proportion of the current catalogue on electric heating and cooking apparatus, supplied by the Dowsing Radiant Heat Co., Ltd. (105 Great Portland Street, W.), is devoted to hot-bar radiators. These, like the luminous radiators, convector and radio-convectors, are obtainable in numerous attractive designs suitable for industrial or residential apartments. The hot-bar elements are made with or without quartz coverings as desired. Each takes 500 watts, and they are

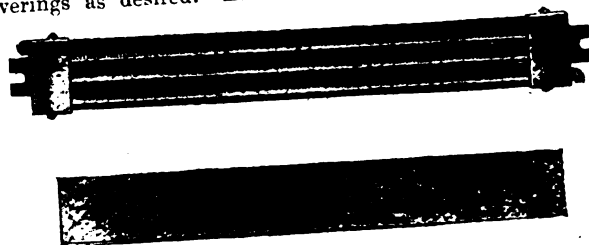


FIG. 1.—HOT-BAR GRID SHOWING RESISTANCE SPIRAL IN POSITION. THE QUARTZ PROTECTING PLATE IS REMOVED AND SHOWN BELOW.

all run in parallel on each apparatus. They are strongly constructed and rarely break. As may be seen from Fig. 1, a very large heating surface is exposed, so that full dispersion of the heat is produced, and by means of the reflector a ruby illumination is obtained. Red-glow radiators on the Bastian system are also listed. All the elements can be easily inspected and renewed when necessary, and a reflector is used which forms a hot-air chamber through which the heated air passes, so that a strong current of air is kept in circulation. Attention has also been given to the many mechanical and electrical constructional details.

In addition to the heating apparatus listed may be mentioned the latest design of cooking range, irons, hot-plates, water urns, sterilisers, &c. In particular there is a number of improved electric kettles fitted with special elements, while the toaster grill and hot-plate combined, shown in Fig. 2, is a very useful piece of apparatus. It is made of sheet metal with nickel facings, and is fitted with

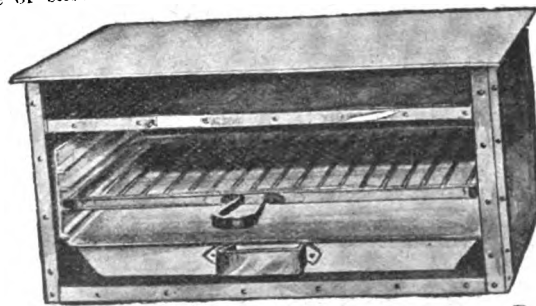


FIG. 2.—COMBINED GRILL AND HOT-PLATE, IN WHICH PROTECTED HOT-BAR ELEMENTS ARE USED.

the new quartz-protected hot bars previously mentioned, so that there is no danger of short-circuits due to the meat or the fork touching the elements. These grillers are in

YOU WANT  
THE BEST!  
SPECIFY

# IGRANIC

## SWITCHGEAR

IGRANIC ELECTRIC CO. LTD  
LONDON

Works:  
BEDFORD

daily use at the Company's medical institution in London, where cooking for sixty persons is carried out. Still another speciality is a breakfast toaster and dish warmer. Plates and dishes may be kept warm on the hot-plate, while the under-portion is fitted with two toast racks, so that it may be regarded as a most useful breakfast-table adjunct.

### TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

The definite announcement has been made that the Marconi Co. has acquired the Goldschmidt patents held by Compagnie Universelle de Telegraphie et Telephonie sans Fil of France, and with a view of developing these it is proposed to increase the capital of the Marconi Co. by 500,000 ordinary shares. It is proposed to offer immediately 250,000 of these shares to the preference and ordinary shareholders at £3 5s. per share, or a premium of £2 5s. per share. The whole of the new issue has been guaranteed at this price. It has been stated that the price to be paid for the Goldschmidt patents is 200,000 shares, which at the present price represents a sum of £800,000 less £200,000 cash, which is to be provided by the French Co.

The wireless station erected by the Anglo-French Wireless Co., Ltd., at Nassau, in the Bahamas Islands, has been completed and accepted by the Government. The power of the station is 5 kw., and it has a normal day range of 400 miles; satisfactory communication has been established between Key West, Jupiter and St. Augustine. A similar station will shortly be erected at Georgetown, Barbadoes.

In order to secure as far as possible privacy of wireless messages, all licencees of portable wireless sets must now carry with them a small pocket card, which is issued by the Post Office with the licence. This card must be shown on demand to any Government officer, including the police.

At the fortnightly meeting of the Liverpool and District Amateur Wireless Association, on September 25th, the subject of "Loose-coupled Receiving Sets" was discussed by Messrs. Coulton & Frith. The next meeting will be on Thursday, October 9th.

The Tangier-Arzila line has been restored by the Spanish Government, and the Chorillos-Mollendo cable is also in working order again.—The Indo-European Telegraph Co. suffered a breakdown of their lines between Kertch and Soukhoun-Kale on the 25th inst., which was speedily put right.—Telegrams may be again sent to Chihuahua in Mexico, as communication has been restored.

**L.C.C. and Repayment Periods.**—The L.C.C. has recently revised the periods for repayments of electrical loans, which now stand as follows:—Land, 60 years; buildings, 30 years; mains, 25 years; machinery, 15 years; services, 12 years; meters, 10 years. In reporting upon this Mr. J. Horace Bowden, Chief Electrical Engineer and Manager of the Poplar electricity works, points out that he has hitherto advocated a policy of borrowing only for periods of 20 years and over. In his opinion the action of the L.C.C. is most drastic, and places severe restrictions upon expansion of business.

**"The Lighting Journal and Engineer."**—A new monthly journal bearing this title has made its appearance, and its first issue, published on Tuesday, contains several interesting articles. In addition to those of a general nature, there is a short article on the artificial lighting of lawn-tennis courts—on which subject however, more information of a quantitative nature would be useful—and a serial on "Period" Designs of Lighting Fixtures is commenced. Messrs. A. W. Robinson and A. J. Greenly are responsible for the editorial and business management respectively, and Messrs. Haydn T. Harrison and C. W. Hastings are "Honorary Advisory Editors."

### ELECTRIC TRACTION NOTES

In his presidential address to the Annual Conference of the Municipal Tramways Association, held last week at Sheffield, Mr. A. R. Fearnley (General Manager, Sheffield Corporation Tramways) said that no better proof could be given that municipal tramways were not marking time in any way than the fact that nineteen applications for provisional orders were deposited in Parliament at the beginning of the year. The present tendencies in tramway operation were in the direction of improved running time and the small equipments with which cars were provided twelve or fourteen years ago were being replaced with equipments double the size, often with interpole motors. Much better work was being put into tramway tracks than formerly, and the mechanical joint was being fast superseded by electric, thermit, or cast welding. The idea of keeping the tramway power-house separate from the other supply stations was being abandoned. In Sheffield arrangements were being made for any of the three power-houses to be available at times of heavy load or emergency. Board of Trade returns showed an increase of 220 million passengers over the previous year. Mr. Fearnley touched on the Report of the Motor Traffic Committee, which appeared to him to assist in many ways the demand for equality of treatment for which they were asking. With regard to trolley and motor omnibuses he thought that good types of vehicles were to be obtained, but their accommodation was very limited, and there were very few roads really suitable for them. The subject of platform fare collection was dealt with by Ald. S. Flint, of Leicester, who described in detail the pay-as-you-enter system which is being experimented with in that town. Cr. W. C. Fenton's Paper on "Maintenance of Paving on Tramway Routes" contained a plea for the revision of the section of the Tramway Act of 1870, which requires the tramway promoters to maintain the road surface. The last Paper, entitled "Urban Passenger Transport," was by Mr. J. B. Hamilton (General Manager, Leeds Corporation Tramways), and contained a comparative investigation into the relative economy of electric tramways and motor omnibuses under the conditions obtaining in provincial towns. He first showed how electric tramways had alleviated overcrowding, had created and supplied a demand for travel, and proceeded to demolish some of the arguments advanced by those interested in motor omnibuses. After going into the matter in some detail, he put forward 9'167d. per car mile, with fifty-six seats, as a fair inclusive figure for tramway cost, and 10'06d. for a thirty-four-seated bus. Taking the earning power of a bus as 80 per cent. of that of a tramcar, he reckoned that on a basis of 36,740 miles per annum there would, in the case of the tramways, be a surplus of £291 per car after payment of rates and paying maintenance charge, while the bus service would result in a deficit of £176 per vehicle. These figures relate to the comparison of complete provincial services, but it is admitted that in London there are special conditions more favourable to motor omnibuses. With regard to the use of motor-buses as feeders for tramways, Mr. Hamilton prefers railless traction as costing 20 to 25 per cent. less to run, and being more reliable. Ald. Tinsley, of Salford, has been elected President for next year, and Mr. P. Fisher, Tramways Manager, Dundee, Vice-President.

Ever since Parliament sanctioned the Brighton and Hove trolley omnibus schemes, two years ago, a strong difference of opinion has existed between the two Corporations as to the best means of carrying out the through-running arrangements imposed by Parliament. As a matter of fact, the Hove Corporation has never been very favourably disposed towards trolley buses, and, according to the local papers, negotiations are in progress by which the Brighton Corporation will agree to Hove abandoning its trolley bus scheme if the supply of electricity in Hove—now that the Hove Corporation has acquired the local electric supply company—is given from Brighton.



## LOCAL NOTES

**Bristol: Wages in Electrical Trade.**—The Bristol electrical contractors have held a meeting to consider the demands of the Bristol branch of the Electrical Trades Union for an increase of 1d. per hour for electrical workmen, making 9d. per hour for men, and 10d. an hour for foremen. A deputation was appointed to meet the Electrical Trades Union, and it is stated that there is every prospect of an amicable result, although, as a matter of fact, the men ceased work on Saturday in accordance with their notices.

**Bury: Bulk Supply.**—In connection with the arrangement entered into with the Heywood Corporation for a supply in bulk to that authority, it has been necessary to seek the consent of the Lancashire Electric Power Co., which has statutory powers to supply local authorities within its area in bulk. The Power Co. has refused its consent to the proposed arrangement between Bury and Heywood, and, acting upon the instructions of his Corporation, the Bury Town Clerk has made an application to the Board of Trade for an order dispensing with the Power Co.'s consent.

**Gromer: Transfer of Electricity Undertaking.**—The Board of Trade has decided to sanction the transfer of the Council's electric lighting undertaking to Edmundsons' Electricity Corporation. As we have reported from time to time in these columns, the present state of affairs is that Edmundsons' are managing the undertaking on behalf of the Council, but it is intended to transfer the undertaking completely to Edmundsons'. To this proposal, when it was first made, there was considerable local opposition, but a local inquiry was held on behalf of the Board of Trade by the Hon. T. H. Pelham, with the result stated above. All the expenses incidental to the inquiry will be borne by Edmundsons', who will also take over the outstanding debt upon the undertaking, which amounts to some £18,000.

**Hove: Electric Lighting.**—As announced in our "Electric Traction Notes," there is a rumour that the Corporation is bargaining to transfer the Hove Electric Lighting Co.'s undertaking, recently acquired, to the Brighton Corporation.

**Ilford: Rateable Value System of Charging.**—The rateable value system of charging is to be introduced as from the December meter readings. The primary charge is to be 12½ per cent. of the rateable value, plus ¾d. per unit for all units consumed.

**Leeds: Electricity Reserve Fund.**—During the course of the L.G.B. inquiry last week into an application by the Corporation for sanction to borrow £168,000 in connection with the electricity undertaking, Mr. H. R. Hooper, the inspector, expressed himself very strongly upon the inadequacy of the reserve fund of the electricity undertaking. This, he said, was a paltry £3,000, which was not worth considering, and, further, there was apparently no intention of increasing it. He also called attention to the fact that in 1907 the reserve fund was £14,000, whilst the profits were £3,400; yet in 1913, when the profits were £15,500, the reserve fund has been reduced to the small figure of £3,000. The Town Clerk pointed out that the reason for the decrease in the amount of the reserve fund was that the whole of the £14,000 in 1907 was transferred in aid of the City rates consequent upon a decision by the Corporation. Mr. Hooper replied that he was looking at the matter from a commercial point of view, because he could foresee a time not very far distant when there would be a considerable debt outstanding upon plant which would be obsolete, and for which no provision was being made in the finances of the undertaking. It was, he said, a position which would have to be met sooner or later. The Town Clerk replied that the Inspector's comment was upon the policy which the Corporation had decided to follow. Hitherto the Corporation had dealt with the reserve fund as part of the general basis of rating, and when the necessity arose the Corporation would have to provide money to meet the position foreshadowed by the Inspector.

**Manchester: New Power Station.**—The Electricity Committee has under consideration the acquisition of eleven acres of land at Trafford Park with a view to erecting a 100,000-kw. power station. The preliminary estimates provide for a first instalment of 25,000 kw. Considerable economies are anticipated from a power station on this site, inasmuch as coal can be delivered much more cheaply than at present, whilst arrangements could also be made for the use of the water from the Manchester Ship Canal for condensing purposes.

**Stoke-on-Trent: Consolidation of Electricity Works.**—There has been some talk of an amalgamation of the various elec-

tricity works now owned by the Corporation, and which were in existence before the Federation scheme was passed by Parliament. Under the Corporation's Act the policy of maintaining the various power stations as separate generating stations may be discontinued, with the consent of the Local Government Board, and one of the advantages of the high-tension scheme, described in *ELECTRICAL ENGINEERING*, Vol. VII., July 27th, 1911, p. 425, would lie in the direction of shutting down, at any rate, the smaller works as generating centres. Some action of this sort was the inevitable result of the scheme by which the four boroughs of Burslem, Hanley, Stoke and Longton were converted into one borough.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

## Generating Stations, Sub-Stations, Mains, &amp;c.

**Aboyne.**—An Aberdeen firm of electrical engineers has placed an electric lighting scheme before the Council.

**Bacup.**—Application has been made for sanction to borrow £2,800 for H.T. feeder and services.

**Bridlington.**—The L.G.B. has sanctioned the borrowing of £1,500 for mains, repayable in twenty years, and £1,500 for services repayable in fifteen years.

**Burnley.**—Application is to be made for sanction to borrow £36,227 for electrical extensions.

**Carlisle.**—A L.G.B. inquiry has been held concerning an application to borrow £8,034 for plant extensions and £1,300 in connection with H.T. supply to outside districts. There was no opposition.

**Chobham.**—A supply by either the Ascot or Woking Companies is possible in this district.

**Haslingden.**—Tenders are invited for cable.

**Leeds.**—A L.G.B. inquiry was held last week concerning a loan of £168,000 in connection with the electricity undertaking. Of this £28,000 is required for machinery, £100,000 for mains, and £30,000 for sub-station transformers. We refer to some comments by the inspector as to the reserve fund under Local Notes.

**Manchester.**—One 1,800–2,200-kw. motor-converter or rotary-converter and static transformers; high-tension switchboard; static transformers. Chief Electrical Engineer, Dickinson Street. October 16th. (See an advertisement on another page.)

**South Africa.**—The Worcester Council, says the *African World*, has decided to erect an electric power station. Consulting Engineer, Mr. T. Stewart, P.O.B. 712, Cape Town.

**Southampton.**—A L.G.B. inquiry was held last week concerning a loan of £16,720 for electrical extensions. During the course of the inquiry Mr. T. C. Ekin, the inspector, criticised the action of the Corporation in 1912 in transferring £3,000 to relief of rates from the electricity undertaking.

**South Shields.**—One 2,000-kw. turbine direct-coupled to two three-phase generators in tandem; condensing plant, rotary-converter, transformers, switchgear, &c. Borough Electrical Engineer. October 15th.

**Stalybridge.**—Sanction has been received to the borrowing of £9,200 for electrical extensions.

**Swansea.**—Sanction to the borrowing of £40,000 for electrical extensions has been received from the L.G.B.

**Warrington.**—L.T. cable and L.T. feeder panel. Borough Electrical Engineer, October 14th.

## Wiring

The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.

**Arbroath.**—Public baths.

**Birmingham.**—New Post Office.

**Bolton.**—New P.O. H.M. Office of Works, London.

## THE RECORD ELECTRICAL Co., Ltd.

LONDON OFFICE:  
CAXTON HOUSE,  
WESTMINSTER, S.W.

Telephone:  
3057 Victoria.  
Telegrams & Cablegrams:  
"Infusion,"  
London.

CIRSCALE  
INSTRUMENTS.

RECORD'S PATENT.

Write for Prices & Particulars.

WORKS:  
BROADHEATH,  
MANCHESTER.

Telephone:  
164 Altrincham.  
Telegrams & Cablegrams:  
"Infusion,"  
Altrincham.

**Gradley Heath.**—New schools.  
**Luton.**—Extensions to Hitchin Road school.  
**Mansfield.**—Extensions at free library.  
**Newport (Mon.).**—New town hall and courts, £164,000.  
**Oldham.**—New school.  
**Peterborough.**—New theatre.  
**Preston.**—New Wesleyan school, £4,000. Architect, F. Howarth.  
**Stockport.**—New trades hall. Architects, W. Swann & Stockton.  
**Trowbridge.**—Cinematograph theatre.

### Miscellaneous

**Birkenhead.**—A twelve months' supply of metallic and carbon filament lamps and fittings for Mersey Railway Co. General Manager, October 9th.  
**Edinburgh.**—The Midlothian & Peebles District Asylum requires a twelve months' supply of electrical fittings. Treasurer, 19 Heriot Row.  
 A telephone installation is required at the Craiglockhart poorhouse. Architect, R. M. Cameron, 53 Great King Street.  
**Johannesburg.**—Electric lighting fittings for the Town Hall and municipal buildings. Town Clerk. November 24th. Particulars from E. W. Carling & Co., St. Dunstan's Buildings, St. Dunstan's Hill, E.C.  
**London:** Great Western Railway.—One year's supply of electric sundries. Secretary, Paddington Station. October 13th.  
**Manchester.**—Special contract work for Tramways Department. General Manager. October 21st.

### TENDERS RECEIVED AND ACCEPTED

**Derby.**—The tender of the British Thomson-Houston Co. for switchgear has been accepted at £943.  
**Dublin.**—The following tenders have been received for the supply of single and three-phase meters:—Electrical Co., British Westinghouse Co., Chamberlain & Hookham, G.E.C., Ferranti, Ltd., and Siemens Bros. & Co. As the result of tests, Mr. Mark Ruddle, the City Electrical Engineer, recommended the acceptance of the G.E.C. tender, although the prices were not the lowest, owing to the smaller energy losses.  
**Ingleton.**—The tender of the Ingleton Electric Lighting & Power Co. for public lighting has been accepted.

### APPOINTMENTS AND PERSONAL NOTES

It is feared that Dr. Diesel, inventor of the engine bearing his name, has met with his death. He was on board the Antwerp-Harwich boat on Monday night, on his way to attend the Annual General Meeting of the Consolidated Diesel Engine Mfrs. Co., but was missing on Tuesday morning. On making inquiries at the Company's offices yesterday afternoon, we were informed that there was no further news of him.

Mr. Justus Eck, Engineer-in-Chief and General Manager of the Union Electric Co., is leaving by the R.M.S. *Majestic* on October 1st for a protracted tour in the United States.

The Exeter Electric Lighting Committee recommend that the salary of Mr. H. D. Munro, the Borough Electrical Engineer, be increased to £475 per annum, and that Mr. E. A. Chesnutt be appointed Mains Assistant at a salary of £90 per annum.

Mr. J. S. D. Moffet, who recently resigned the position as Tramways Manager at Rochdale to take up a similar opening at West Ham, has been presented with a canteen of cutlery from the Rochdale tramway officials and employees.

In consequence of the appointment of Mr. W. A. Turnbull, Assistant Engineer at the Stoke Works, as Electrical Engineer to the Aylesbury Council, Mr. C. Cuthbertson has been appointed Station Superintendent at the Stoke and Longton Works at a salary of £190 per annum. Mr. W. Adams has been appointed Station Superintendent at the central power

house and the Hanley Works, at a salary of £220 per annum. Mr. A. T. Gilbride, shift engineer at Burslem, has been appointed charge engineer at Longton at a commencing salary of £2 per week, and Mr. H. S. Digney, a switchboard attendant at Burslem, has been appointed shift engineer at £1 10s. per week.

We are asked to state that Mr. C. S. Luke has severed his connection with the *Engineering Review*, and, as joint managing director of W. Cawood, Ltd., will devote himself entirely to trade and other exhibition work.

Mr. H. B. Tilley, of Marconi's Wireless Telegraph Co., and formerly of Bruce Peebles & Co., was married on Thursday last at Chelmsford to Miss W. Norris.

The Derby Electric Lighting Committee recommend that the salary of Mr. E. G. Boissier, mains superintendent, be increased from £200 to £220 per annum.

Fife Electric Power Co. requires experienced cable jointer for paper, lead-covered, L.T. and E.H.T. concentric and three-core cables. (See an advertisement on another page.)

Mains superintendent required in Stoke-on-Trent Electricity Department. (See an advertisement on another page.)

Cable jointer required for nine months' engagement in Madras. (See an advertisement on another page.)

### MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. G. Smith & Son, of 5 Philpot Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night, was £77 to £77 10s. (Last week, £77 15s. to £78 5s.)

**Agency.**—The Electrical Engineering & Equipment Co., Ltd. (109-111 New Oxford Street, W.C.), inform us that they have secured the sole selling rights in this country and the Colonies for the products of the Ateliers de Constructions Electriques, of Charleroi, Belgium.

**Canadian Agency.**—A Toronto firm wishes to get into touch with British manufacturers of A.C. machinery with a view to an agency. Further particulars at 73 Basinghall Street, E.C.

**Removal.**—The Sterling Telephone & Electric Co., Ltd., inform us that their offices and showrooms are to be transferred from Saturday next to Nos. 210, 211 and 212 Tottenham Court Road, W. Telephone, Regent 4144. The telephones will be manufactured at the Sterling Works, Dagenham, as heretofore.

**Dissolution of Partnership.**—R. S. Belsten and T. O. Morgan, trading as the Electrical Wiring & Accessories Co., 1 Boot Buildings, Aberdare, have dissolved partnership. Debts by T. O. Morgan.

### COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &c.

**Electrical Power Storage Co.**—Particulars have been filed of an issue, on July 30th, of £5,000 debentures.

**British Westinghouse Co.**—The capital reorganisation scheme referred to in our last issue has been sanctioned by the shareholders.

**County of Durham Electric Power Co.**—An interim dividend of 2½ per cent. has been declared upon the preference shares.

**Victoria Falls & Transvaal Power Co.**—At the annual meeting last week the report and accounts given in our issue for September 18th were adopted. The Marquis of Winchester, Chairman of the Company, said that in January, 1915, the Company would have plant installed with a capacity of 265,000 h.p. Mr. A. E. Hadley, the Managing Director, said that the Company was at present supplying 145,000 h.p., whilst further business in sight represented an increase of 40 per cent. upon this. A careful study of power transmission in all parts of the world, he said, enabled him to inform the shareholders that the system of the Company was as up-to-date as it could possibly be, and that if he had to start again to-day he would not modify the installations in any way. The efficiency of the early stations which were supplying from machinery four or five years old showed no diminution, whilst the reliability was steadily improving. In addition to that, the plant was working with a lower consumption than he had seen in any other installation, and the tendency was to improve it still further.

# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 354 [VOL. IX., No. 41]  
*All rights reserved.*

THURSDAY, OCTOBER 9, 1913.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*]

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES and TECHNICAL COLLEGE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

*Other Advertisement Rates on Application.*

### Latest Time for Receiving

Letters for Insertion, Tuesday first post.

Small Advertisements and Official Announcements, Wednesday first post.

Displayed Advertisements, Tuesday first post.

Corrections in Standing Advertisements, Monday first post.

All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 308-306, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Orcing, Fleet, London."

Telephone No.: 5509 Holborn.

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

THE "Ideal Home" Exhibition at Olympia, which opens to-day, includes a model house in which all kinds of electrical domestic appliances are demonstrated. (Page 566.)

THE "half-watt" lamp is already in the market in Germany; half-watt lamps are also being manufactured in this country, and stocks may be ready for the market in about four to six weeks. We illustrate one of these British-made lamps. We also publish an account of the investigations made in America which culminated in the production of the half-watt lamp. (Page 567.)

SOME of the difficulties which presented themselves in the electrical working of the Loetschberg tunnel are described in an article, which also gives some notes on the experience of seven years' working in the Simplon tunnel. In both cases the insulators of the high-tension contact line have given trouble under the conditions of dampness. (Page 569.)

AN illustration is given showing the style of lighting adopted in the vestibule of a theatre. (Page 570.)

THE setting of the gap of horn lightning arresters is dealt with in our Questions and Answers columns. (Page 571.)

A PATENT specification describing an elaborate process for the production of ductile tungsten suitable for the

manufacture of wire-drawn filaments was published by the Patent Office last Thursday. The specification is in the names of P. Schwarzkopf, S. Burgstaller, and Wolfram Laboratorium Dr. Ing. P. Schwartzkopf Ges. Among the other specifications published is one by Crompton and Co. and H. Burge for power factor regulation of self-exciting polyphase synchronous machines, and one for pliable filament supports by Wolfram Lampen A.G. Two patents expire during the week after a full life. (Page 572.)

IN announcing at an extraordinary general meeting of Marconi's Wireless Telegraph Co. last week the acquisition of the Goldschmidt patents, Mr. Godfrey Isaacs said there was not an atom of foundation for the statement recently made in the Press that the Goldschmidt station at Hanover had succeeded in transmitting wireless messages to the United States, at a regular rate of 100 words per minute for several hours.—A site has been acquired for a new 10,000 line telephone exchange in the City of London.—A small Strowger automatic telephone exchange is to be installed at Chepstow.—In order to avoid aeroplanes and airships coming into collision, at night, with the wireless aerials of the Telefunken station at Nauhen, a warning signal, consisting of two 1,000 c.p. metal filament lamps, has been fitted, so arranged as to give the Morse signal "N" continuously. (Page 573.)

THE construction of tube electric railways from the east to west of Glasgow is to receive consideration.—The Croydon Corporation has passed a resolution asking the Government to give effect to the report of the Select Committee on Motor Traffic at the earliest possible moment.—A proposal that first-class tramcars shall be run in Manchester has been rejected by the Tramways Committee. (Page 574.)

THE supply of coal to the Dublin electricity works is being interfered with by the labour troubles in that city.—The Countess of Glasgow will open the Glasgow Electrical Exhibition on October 23rd.—An increase of 30 per cent. in the number of units sold is reported by the Marylebone electricity undertaking for the June quarter.—The Poplar electricity accounts show a net profit of £3,170 for last year, during which period 72 gas lamps were converted to electric lighting.—The York Electricity Committee has been asked for a reduction in their charges for street lighting as the result of a reduction by the York Gas Co. for the portion of streets lighted by gas. (Page 574.)

THE Burnley Corporation requires a turbo-alternator, condensing plant, rotary converters, transformers, switchgear, boilers, &c.—An electrically driven pumping installation is required in Australia; mains at Bootle, Battersea, and Shanghai, and a 1,000 kw. generating set in Auckland (N.Z.).—Considerable extensions are contemplated to a number of electric lighting under-

takings in South Africa, and electrical supplies are required in a number of towns. (Page 575.)

A PROFIT of £18,600 is shown by Dick, Kerr & Co.'s accounts for the past year, compared with a loss of £8,600 in the previous year.—Callender's Cable & Construction Co. declare an interim dividend at the rate of 10 per cent. per annum, and 5 per cent. is recommended by Drake & Gorham.—An issue of £130,000 5 per cent. first mortgage debentures is offered by the Cleveland & Durham Electric Power Co., and an issue of capital is also being made by Edison Accumulators, Ltd. (Page 576.)

### ARRANGEMENTS FOR THE WEEK

SATURDAY, OCTOBER 11TH.

*Mining Institute of Scotland.*

3 p.m. At Heriot Watt College, Edinburgh. Among papers to be read is "The Electric Winding Plant at South Kenmuir Colliery," by W. M. Dunn.

MONDAY, OCTOBER 13TH.

*Institution of Post Office Electrical Engineers.*

6 p.m. At Institution of Electrical Engineers. "Telegraph Traffic and Power Plant for Pneumatic Tubes in Post Offices," by A. B. Eason.

WEDNESDAY, OCTOBER 15TH.

*Dynamicables.*

7.30 p.m. Dinner at Trocadero Restaurant.

FRIDAY, OCTOBER 17TH.

*Electro-Harmonic Society.*

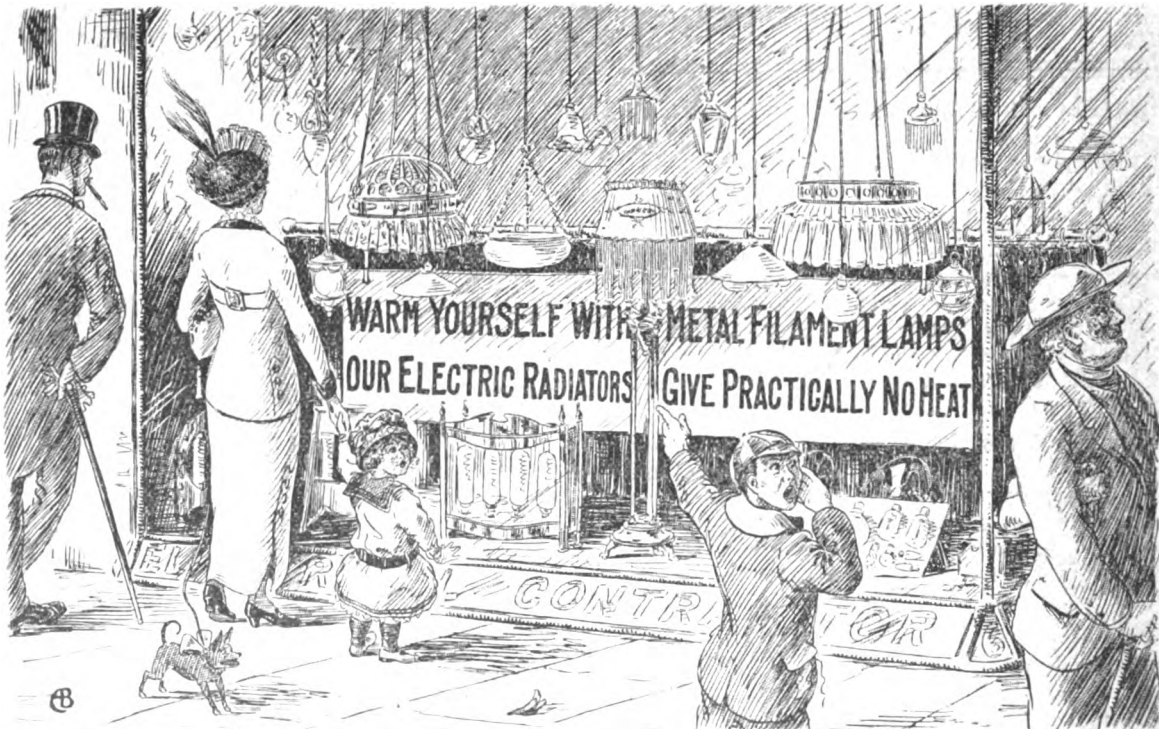
8 p.m. Smoking Concert at Holborn Restaurant.

**The Association of Engineers-in-Charge.**—Dr. R. T. Glazebrook's Presidential Address to this Association, given last night, dealt with the bearing upon engineering practice of experiments made by reproducing phenomena by models where there are difficulties in the quantitative observation of the phenomena themselves. He instanced the well-known method of studying current distribution in conductors by the stream line experiments of Dr. Hele Shaw. He also described some of the methods employed at the National Physical Laboratory for investigating wind pressure, the aeronautical researches carried out in the wind channels and stream line tanks, and the work done on the resistance of models of ships in the Froude experimental tank. He indicated the nature of the result arrived at, and showed how useful they had been in the design of aeroplanes and ships.

### THE "IDEAL HOME" EXHIBITION

THE Ideal Home Exhibition at Olympia, which opens its doors to the public to-day, will be found quite cosy and comfortable, so that the exhibits may be seen to advantage. For instance, the large roof has been covered with canvas painted in the Pompeian style, and the arc lamps have been enclosed in braziers. Perhaps of chief electrical interest is "La Maison Electrique." This is a fully-equipped electric house containing pantry, kitchen, business office, dressing and bath-room, bedroom, and dining-room. Almost every kind of electric lighting available for domestic purposes, as well as apparatus for heating, cooking, ventilating, ironing, cleaning, polishing, &c., is shown. Very few duplicates of apparatus are found, and in no case are duplicates placed together in any one room. Apertures are cut in the walls so that visitors may look in, and those interested will be conducted over the building by a special staff of attendants. In the dining-room is a dining-table fitted with electrophone, periscope, service lift, and travelling-rails on which a car runs, so that the diners' wants are administered without visible human presence. This equipment has been brought over from Paris. The exhibit has been arranged by the Electric Supply Publicity Committee.

After the "Maison Electrique," the most important stand of electrical appliances is that of Rashleigh Phipps & Co. (147 Oxford St., W.). Here one sees a variety of fittings, cooking apparatus, irons, an electrically-driven sewing machine, lamp radiators, as well as a petrol-electric set. These appliances are all supplied by the General Electric Co., Ltd. Besides numerous self-contained cooking utensils, there is a cooker and a new design of a cheap air-lagged oven with polished external walls. It has top and bottom elements, and provision for boiling at the same time is provided. A feature is also made of the self-contained utensils and irons in which a design of the "Archer" easily replaceable element is used. On this stand also may be seen several fine designs of the glowing fire radiators made by Belling & Co. (Edmonton, N.). In proximity to this stand, which occupies a prominent position on the ground floor near "La Maison Electrique," will be found the exhibit of the Dowsing Radiant Heat Co., Ltd. (115 Great Portland Street, W.). This firm manufactures almost every kind of radiator and convector, and a very representative display is made, while some cooking apparatus, vibrators, and the "Solarium" electric bath are also on view. In addition, the British Electric Vacuum Cleaner Co., Ltd., the Linolite Co., Electric Appliances, Ltd.,



In view of the variable state of the climate Mr. Blinks has prepared two fine placards, one adjuring his customers to warm themselves with his electric radiators, and the other pointing to the small heating effect of electric lamps. A new window-dresser has used them simultaneously with the above disastrous result.



and some other firms have representative exhibits. The model house fitted up by Arding & Hobbs, Ltd., contains interesting half-hundredweight service lift without a permanent receiving cabinet. This comes through the floor in advance of the lift proper. It was supplied by F. Hodgson & Co. (24 Queen Victoria Street, E.C.). A display of automatic petrol-electric sets and equipment for country houses is

made by Spensers, Ltd., and some very handsome examples of electric light fittings are to be found on the stands of many other exhibitors. A brilliant arc and incandescent lighting scheme has been arranged for the Russian Village. Edmundsons' Electricity Corporation will also have a good display, but this was not ready at the time of our representative's visit.

## HALF-WATT LAMPS

THE "half-watt" lamp has now been placed on the market in Germany by the AuerGesellschaft (who are the makers of the Osram lamp in that country), and the Allgemeine Elektrizitäts Gesellschaft (the makers of the Aegma lamp), and these two makes are being advertised in our German contemporaries.

A short article on the new Osram lamp, published in last week's *Elektrotechnische Zeitschrift*, states that the efficiency is in all cases half a watt per mean hemispherical Hefner candle, and four sizes are listed:—600 c.p. for 50 to 65 volts; 1,000 c.p. for 50 to 65 and 100 to 130 volts; 2,000 c.p. and 3,000 c.p. both for 100 to 130 volts and 200 to 240 volts. The filament is of drawn wire, and the bulb is filled with an inert gas at atmospheric pressure. The average life is given as 800 hours. These lamps are suitable for both D.C. and A.C. circuits, and can be run in series if desired.

In this country half-watt Osram lamps may reasonably be expected to be on the market in about four or six weeks' time. The Osram Lamp works are already busy manufacturing and accumulating stock, but are not proposing to issue lists or to sell the lamp until they have sufficient stock in hand to make deliveries in quantity, as, of course, a very great demand is anticipated. Figs. 1 and 2 are drawings which we have

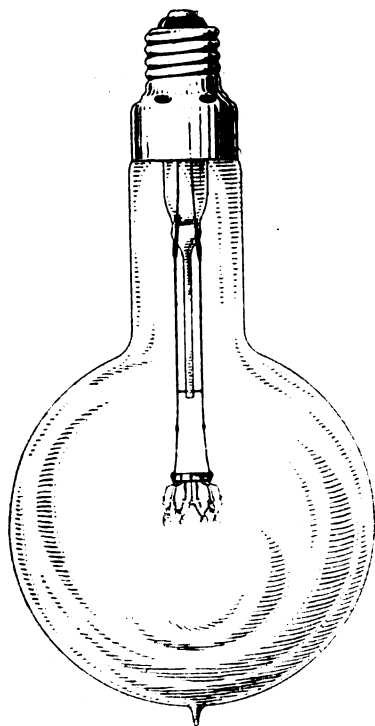


FIG. 1.—ENGLISH-MADE 2,000 C.P. "HALF-WATT" OSRAM LAMP,  $\frac{1}{4}$  SIZE.

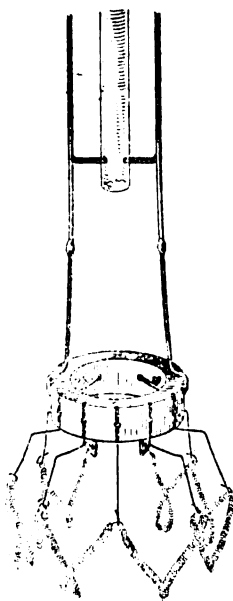


FIG. 2.—THE FILAMENT FULL SIZE.

made of one of the British-made lamps (rated at 2,000 c.p. and 220 volts) shown us by Mr. Hugo Hirst, Chairman of the General Electric Co., on Tuesday. As will be seen from Fig. 2, which shows the filament on a larger scale, the filament is a closely-wound helix of drawn wire, bent in a zig-zag form, and supported by comparatively thick wires from a ring of fire-clay.

Fig. 4 is a drawing of the A.E.G. half-watt lamp in its lantern, and it is seen that the lamp is in many respects similar to the Osram. The A.E.G. Co. are calling it

the "Nital" lamp. The Electrical Co., their selling agents in this country, have favoured us with a copy of the German company's list of these lamps. The candle-powers and voltages are the same as those mentioned above for the Osram lamp, except that the 2,000 and 3,000 candle-power sizes are both made for three ranges of voltage: 50 to 65, 100 to 130, and 200 to 240. The price of the "Nital" lamps in Germany is

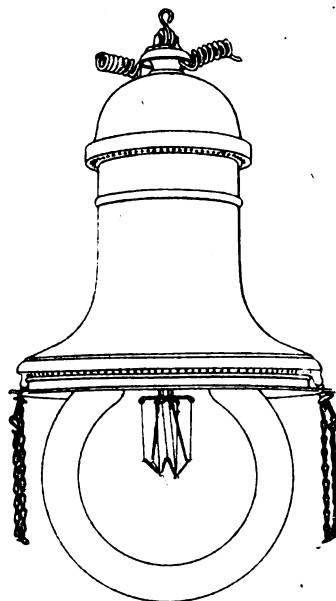


FIG. 3.—A.E.G. "NITAL" LAMP IN LANTERN.

15 M. for the 600 c.p. size, 18 M. for the 1,000 c.p., 27 M. for the 2,000 c.p., and 36 M. for the 3,000 c.p., to which is added the German lamp tax of 1'40, 2'20, 4'20, and 6'20 marks respectively. The above prices are for the lamps alone; an additional 20 to 27 M. must be added for lanterns. The diameter of the lamp itself varies from  $4\frac{1}{2}$  ins. to  $9\frac{1}{2}$  ins. according to candle-power, and the globes of the lanterns from 9 ins. to 12 ins. The life of the "Nital" lamps is estimated at 800 hours.

An interesting article on the half-watt lamp appears in the October issue of the *General Electric Review* describing the course of the experimental work which led to the development of this lamp at the research laboratory of the American General Electric [Thomson-Houston Co.] in Schenectady. It was first noted that ordinary tungsten lamps blackened badly within a couple of hours at 0.5 watt per candle, and it was concluded that unless this could be prevented the running of lamps at this high efficiency would be impossible. An investigation was therefore carried out to find the real cause of the blackening of bulbs and the laws governing it. The article continues:—

It had long been a theory that blackening was largely, if not entirely, due to the presence of gas in the bulb. The gases given off by the filament, by its supports, by the bulb, and the residual gases left on exhausting, were therefore measured and analysed chemically, although often the quantities involved were less than a cubic millimetre. A systematic study was then made of the effects that were produced in lamps by the introduction of these (and other) gases in varying quantities into lamps. This showed clearly that only one of them, namely, water vapour, always known to be detrimental, ever produced blackening of the bulb. The action of water vapour was, therefore, studied in detail, and it was found that it attacked the filament, producing a volatile oxide of tungsten and atomic hydrogen. The oxide that thus collected on the bulb was then reduced by the atomic hydrogen. The deposit was thus changed to a black layer of metallic tungsten, while the hydrogen combined with the oxygen to form water, which again acted on the filament. The action of water vapour was thus a cyclic process by which large amounts of tungsten could be carried from the filament to the bulb by very small quantities of water.

Efforts were then made to study the relation between the amount of water vapour on the bulb and the rate of blackening by this cause. Pressures of water vapour even as low as 0.0001 mm. were found to produce very rapid blackening, and, by methods of exhaust especially adapted to the removal of water vapour, it was finally proved that the blackening of bulbs with filaments at high temperature goes on even in the absence

of water vapour. This kind of blackening was considered probably due to ordinary evaporation.

To test this theory, quantitative experiments were made to determine the rate of loss of weight of tungsten filaments in vacuo when run at various temperatures. This work conclusively showed that the cause of the blackening of ordinary well-made tungsten lamps, as well as those run at higher than their rated efficiency, is simple evaporation. On the other hand, the rapid blackening of poorly-made lamps is due largely to the presence of water vapour.

To increase the efficiency, therefore, either the rate of evaporation would have to be decreased or the evaporated material would have to be prevented from blackening the bulb. These considerations led to several different methods of attack, of which the following are particularly interesting:—(1) Introduction of gases, such as nitrogen or mercury vapour at atmospheric pressures into the lamp bulb. (2) Changing the location of the deposit by means of convection currents in gases, so that the bulb opposite the filament does not darken. Each of these methods has been tried with marked success.

The use of a gas at high pressure causes the loss of heat from the filament by convection. This makes it necessary to run the filament at a higher temperature than in a vacuum even to get the same efficiency. The question then arose: Are the advantages to be gained by the use of a gas sufficient to offset the tendency for an increase in the rate of evaporation owing to the higher operating temperature? Simultaneously, with a large part of the preceding work, several investigations on the heat losses of wires in various gases had been under way. It had been found that the heat lost by convection increases only approximately as to the 1.5th power of the temperature of the filament. The radiated energy, on the other hand, increases with about the 4.7th power of the temperature. At very high temperature the effect of convection currents therefore becomes relatively small. It had also been found that the heat loss by convection from small wires at high temperatures is very nearly as great as that from wires several times as large in diameter. In other words, the cooling effect of the gas on the filament is much more serious in the case of small filaments than in the case of large ones. For example, a straight filament 0.001 in. in diameter run in nitrogen at atmospheric pressure and at a temperature corresponding to that of a filament running at 1 watt per candle, will give an efficiency of only about 4.8 watts per candle. On the other hand, a filament ten times as large (i.e., 0.010 in.) will give at the same temperature an efficiency of 1.59 watts per candle. It is thus of great importance to use filaments of large diameter. Practically the same effect can be obtained by winding the filaments into the form of a tightly coiled helix.

From the above considerations it is clear that the larger the diameter of the helix the higher the efficiency that may be obtained. The diameter of the helix is ordinarily limited by the sagging which is apt to occur if the mandrel on which the helix is wound is too large in proportion to the size of the wire.

With helically wound filaments in nitrogen very high efficiencies can be obtained, and yet the life of the filament may be more than 1,000 hours. The blackening of the bulb is avoided; and in properly designed bulbs the tungsten that evaporates produces only a slight brownish deposit in the upper part of the bulb, where it does no harm. A number of types of nitrogen-filled lamps have been made and tested. Among these the most interesting for the present are perhaps the following:—

1. *Large units of very high efficiency.* (0.4-0.5 watt per candle with a life of 1,000 hours or more.) These take currents of at least 20-30 amperes, and (except in units over 4,000 candle-power) are therefore best run from A.C. circuits through small transformers.

2. *Smaller units of low voltage.* These take currents of ten amperes or less, at voltages, in some cases, as low as four or five volts. The efficiencies with 1,000 hours' life vary from 0.6 to 1 or even 1.25 watt per candle, according to the current used. These lamps are adapted for automobile headlights and in general, wherever a source of high intrinsic brilliancy, steadiness, and white colour is needed.

3. *Lamps to run on standard lighting circuits* (110 volts). Large units of this type (several thousand candle-power) have efficiencies of 0.5 watt per candle or better. With smaller units the efficiency is ordinarily not so high.

The temperature of the filament being several hundred degrees higher than that of ordinary tungsten lamps, causes the light to be of a very much whiter colour, so that it comes closer to daylight than any other form of artificial illuminant except the direct-current arc and the special Moore tube containing carbon dioxide. By the use of special colour screens it is possible to obtain a true daylight colour at an efficiency of about 2 watts per candle, whereas with ordinary tungsten lamps the efficiency obtained with the proper screens is only 10-12 watts per candle.

Because of the freedom from blackening of the bulb in these lamps, and because the helically-wound filaments may be so designed that the sagging compensates other changes during life, it is possible to make nitrogen-filled lamps which maintain their volt-ampere candle-power characteristics practically constant during their whole life. The ultimate failure of these lamps is due to the breakage of the filament. The candle-power is usually well above 80 per cent. even just before failure.

In an editorial note at the commencement of this article, it is stated that a Paper on the subject will shortly be read before the American Institute of Electrical Engineers by Dr. Irving Langmuir.

As was announced in our issues of August 28th and September 4th, the British Thomson-Houston Co. are actively occupied with the manufacture of the half-watt lamp, and although, as in the case of other lamp manufacturers here, no definite date has been fixed for its appearance on the market, we may hope that it will be in evidence within a comparatively short time.

Siemens Bros. Dynamo Works Lamp Department inform us that, although they have not yet started manufacture of half-watt lamps at Dalston, they will be commencing to do so shortly, and they, as other manufacturers, prefer not to state any definite date yet upon which their lamps will be actually on sale. They have given us a list of the candle-powers and voltages which they will supply; these are the same as those of the other makers mentioned. The diameters of the bulbs will be as follows: 600 c.p., about 6 ins.; 1,000 c.p., about 6½ ins.; 2,000 c.p., about 8 ins.; and 3,000 c.p., about 9½ ins.

**Model Engineering and Scientific Exhibition.**—The fourth exhibition of models, tools, and scientific apparatus, organised by the proprietors of *The Model Engineer*, will be held at the Royal Horticultural Hall, Westminster, S.W., from October 10th to 18th. Besides numerous working models a special section will be devoted to wireless telegraphy. The exhibition will be open from 12 a.m. to 10 p.m.

**The Gas Exhibition.**—The most interesting feature, from the electrical engineer's point of view, of the Gas Exhibition now being held at Shepherd's Bush is that large electric fans are used for ventilating the hall. This, we believe, is an addition to the building which was insisted upon by the London County Council, and, to judge by the hot air and fumes arising from the gas apparatus exhibited, it seems to be very necessary.

**A Lamp for Colour Matching.**—The Edison & Swan United Electric Light Co. have introduced a special metal filament lamp by means of which colour matching may be carried out with as much reliability as by daylight. A special tinted glass is used for the bulb, which intercepts such rays as are present in too strong a proportion, and produces an effect approximating to daylight. This new lamp is to be known as the Royal Ediswan daylight lamp, and in addition to its great superiority over other incandescent lamps for colour matching, it forms a capital reading-lamp, and is most restful to the eyes. All sizes are supplied.

**Mica.**—An interesting monograph entitled "Mica: its History, Production and Utilisation," by Hans Zeitler, has just been published in book form in English by D. Jaroslaw (19 Tower Hill, E.C.) at the price of 2s. 6d., but we understand the firm will be glad to present copies to responsible officials who are interested in the subject. The work gives an interesting historical account of the growth of knowledge of the features of this mineral, and discusses with thoroughness its physical and chemical properties. The geological occurrence of the different varieties is treated of, and there are interesting notes as to the method of mining in various parts of the world. Not the least interesting portion is that devoted to the applications of mica, of which its utilisation as an insulating material in electrical machinery forms an important part. An appendix contains statistical tables of production and consumption of mica. The book is well illustrated, and will be read with interest by those who are in any way connected with the industries in which mica figures.

**University and Technical College Announcements.**—A course of eight lectures on the design, construction, and testing of electric power cables will be delivered by Mr. H. Savage (W. T. Henley's Telegraph Works Co.) at the East London College (Mile End Road, E.), on Mondays, commencing October 20th, from 7 till 8 o'clock. The fee for the course is one guinea, but apprentices and engineering employes under 25 years of age, and earning less than one guinea per week, are admitted at half rate. Fuller particulars may be obtained on application to the Registrar or the Principal, Mr. J. L. S. Hatton.

The Goldsmid Entrance Scholarship to the Faculty of Engineering at University College has been awarded to H. P. Gardham, of Bancroft's School. The scholarship is of the value of £30 a year, and is tenable for three years.

A course of advanced lectures on wireless telegraphy, by Mr. J. V. Pletts, will commence in November at the City and Guilds Engineering College, South Kensington.

## EXPERIENCES WITH ELECTRIC TRACTION IN THE LOETSCHBERG AND SIMPLON TUNNELS

SOME further particulars are to hand of the troubles experienced on the new Loetschberg Railway since the opening of the tunnel. It will be remembered that single-phase locomotives are employed, working from a 15,000-volt, 15-cycle contact line.

The line was opened to a certain amount of traffic on July 15th last, but after a few days' running the trains were often several hours late, and were even at a standstill in the tunnel for long periods at a time. Writing in the *Elektrotechnische Zeitschrift* of September 25th, Dr. Breslauer states that the troubles were caused by the undue haste of the railway company in opening the line, against the wishes of their technical adviser who desired first to give the equipment a thorough test. The chief source of disturbance is said by him to have been faulty insulators which, it is supposed, were damaged during erection. The line pressure employed even in the tunnel is 15,000 volts 15-cycle single-phase, and the insulation is, in Dr. Breslauer's opinion, ample and well designed from an electrical standpoint. Further trouble has been reported from the excessive static charges on the contact line, due to differences of altitude. The height at Spiez is 1,980 ft., and the air is moist, while at the south end of the tunnel the altitude is 4,100 ft., and the air is dry. From this point the line runs down again to Brigue, where the level is 2,240 ft. These charges have been eliminated by the installation of water-jet static dischargers. According to a Swiss contemporary, the bow collectors have also given trouble. Slight subsidences of the track have taken place in the tunnel, and as the bow collectors are necessarily restricted in size on account of the shape of the tunnel section, these subsidences are said to have caused the bows to run off the contact wire. Dr. Breslauer states that the rolling stock has proved satisfactory with one or two exceptions. The locomotives were supplied partly by Brown-Boveri and partly by the Oerlikon Co., and have each two single-phase commutator motors of a capacity (for one and a half hours) of not less than 2,500 h.p., while at a speed of forty miles per hour they run at about 600 r.p.m. The gradients reach from 3 to 3.5 per cent. On two or three occasions the transformers on these locomotives have broken down in the end turns, this being attributed not to the design, but to the excess voltages mentioned above. The motor commutators have also given trouble, but this has been traced to too great a pressure on the brushes. Some mechanical troubles are reported also, notably straining of the triangular coupling rods on the driving wheels. The fact that the equipment of the repair shops at Spiez was not completed also resulted in serious delay in making good the several defects. Most of these faults have now been remedied, however, and the normal schedule is now being run with the exception of a few night trains.

In this connection, interest attaches to the practical experience gained during the seven years' electrical working of the Simplon tunnel line, which was discussed in a long article by Herr B. Kilchenmann in a recent issue of *Elektrische Kraftbetriebe u. Bahnen*. Current is supplied to the locomotives at 3,300 volts, three-phase, 16 cycles per sec. The overhead construction on the eighteen miles of line has proved satisfactory with certain exceptions. No trouble due to expansion and contraction on temperature variation has occurred, although no automatic tensioning devices are employed. Owing to the heavy deposit of soot and dust on the insulators, however, it is necessary to overhaul and clean the whole equipment twice a year to discover faulty insulators. The horizontally-arranged bell-shaped insulators have been found unsuitable for tunnel work owing to the presence of moisture, and the hard-rubber insulated bolts used for attaching the contact wire had to be replaced in some places every six or eight weeks. The moisture was found to cause surface sparking over the rubber, which burnt in the soot and dust until it broke down. An attempt to protect the rubber with a porcelain sleeve was unsuccessful. Corrugated porcelain insulated bolts substituted for these gave better results, but this feature of the equipment is not yet entirely satisfactory. Glass-insulated bolts have been tried now for some months with considerable success. The wear on the contact wire has been slight only, being generally only 0.3 to 0.4 mm. after some 80,000 passes of the collector bows. In some places where water containing tufaceous limestone in solution drops on the wire, the wear is 0.7 to 0.8 mm., and these parts correspond with the sections of greatest rail wear. No abnormal wear has occurred at the points of suspension, although the wire is suspended with out a catenary and with spans of from 90 to 115 ft. At the

south entrance of the tunnel, however, the copper wire is subject to oxidation to such a degree that some one and a quarter miles of wire had to be renewed in 1912, i.e., after six years' wear. The reduction in weight was only 7 per cent., but the oxidation had become more rapid during the last few months, and it was considered safest to change the wire. No iron or steel was employed in the overhead equipment of the tunnel, as this would not endure two years in the presence of so much soot and moisture. Experiments have shown that copper wire will stand the warm moisture only when no soot is present. The trouble would therefore be obviated if it were possible to stop running steam trains through the tunnel, but this will not happen until the electrification is extended to Domodossola. The new section of copper wire has been coated with various kinds of paint over different sections, and the effect of this will be awaited with interest. Icicles formed in winter on the contact wire by dropping water at the north end have proved troublesome. This has been partially overcome by drawing the ventilating air through a 3-km. auxiliary tunnel to warm it before it enters the main tunnel; but in the construction of the second main tunnel an attempt will be made to eliminate the dropping water. This is also necessary to reduce the corrosion of the rails. The metal paste rail bonds have not proved satisfactory. A test showed that over 60 per cent. of the traction current was returning through the earth. Copper bonding is now being substituted, the holes being bored by pneumatic tools supplied from a locomotive brake equipment. These bonds have increased the rail conductance by 50 per cent. In spite of the severe conditions the locomotive equipments have given no trouble. On account of the rapid changes of temperature and the consequent condensation effects, short-circuits were experienced in the switching apparatus, and had the pressure been much over 3,300 volts these would have been most serious. These troubles have been partially overcome by painting all live parts except contact surfaces with an insulating varnish. Oil-immersed switches would be employed if there were space on the locomotives. The motors of one locomotive were not overhauled until after some eighteen months, or about 37,000 miles running; but this is now done every nine or ten months, a complete overhaul of the locomotive taking place every three years. The switching apparatus is overhauled at times by the locomotive attendants. By giving the contact wire a double zig-zag on either side of the centre line alternately, instead of a simple zig-zag across the centre line, the life of the bows has been increased from 1,600 miles to 4,500 miles, as the wear is thus evenly distributed over the whole width. A better arrangement of the locomotive springs, with, in particular, longer springs, is recommended, as with the present construction heavy vertical oscillations are noticed directly the journals show the slightest wear. The monthly runs of the four locomotives have averaged 4,600 miles, which is good considering the severe conditions. The consumption has been 53 to 56 watt-hours per ton mile inclusive of the locomotive weight. This high figure is accounted for by the air resistance in the tunnel. When running against the ventilation current the traction resistance, excluding the effect of the gradient, amounts to 24.7 lb. per ton at 43.5 miles per hour.

**The "Northampton" Gazette.**—This publication, which is now to be issued regularly at least three times a year, contains, in the issue dated September, a report of Mr. S. M. Hill's Presidential address to the "Northampton" Past Day-Students' Association. The address deals with the aims and objects of the Association, and incidentally gives some interesting sidelights on its working. In addition to book reviews, the remainder of the journal is devoted largely to purely personal notes.

**"Job-Line" Wire.**—Judgment was given on October 3rd, by Judge Woodfall, at the Westminster County Court, in favour of Mr. A. E. Corfield, receiver for the debenture holders of the Davis Electrical Co., Ltd., in the action which he brought against Mr. G. Cohen (Premier Electric and Hardware Co.), to recover £34 for the supply of cable. The earlier proceedings were noted in *ELECTRICAL ENGINEERING*, August 14th, p. 466. The cable supplied was sold as "job-line" cable, and was used for house wiring. It proved faulty, and although Mr. Cohen did not pay for it he ordered more, and when the claim was made he entered a counter-claim for £70, because his reputation had suffered. Evidence was given by several electrical engineers, including Mr. H. J. Wright, of 15 Garlick Hill, E.C., who represented the firm who made the cable, that the term "job-line" meant that the goods were sold with all their faults, and without any guarantee. The cable was said to have been made as to 70 per cent. in England.

## CATALOGUES, PAMPHLETS, &c., RECEIVED

**"CAB-TYRE" SHEATHED CABLE.**—Callender's Cable & Construction Co., Ltd. (Hamilton House, Victoria Embankment, E.C.), which supplies "cab-tyre" sheathed cable made under the St. Helens Cable Co.'s patent, has issued a catalogue bearing the motto, "To be bent not to be broken," giving particulars of all sizes of this cable. It is made in 600 megohm, 2,500 megohm, and 600-volt grades, with single, twin, three or four conductors, and either flexible or inflexible.

**CARBON FILAMENT LAMPS.**—A list to hand from the Edison and Swan United Electric Light Co., Ltd. (Ponder's End, Middlesex), gives the company's latest prices and designs of Royal Ediswan carbon filament lamps. In addition to the standard lamps with B.C. or E.S. terminals, there are numerous fancy-shaped lamps, as well as traction and ship side-light lamps, candle lamps, radiator lamps, "tubolite" lamps, &c.

**ARC LAMP-LOWERING GEAR.**—A new issue of its price list and general specification of arc lamp-lowering gear, winches, and accessories has been made by The Arc Lamp-Lowering Gear Co. (Darlington). The sole agents for the Company in the London district are Neale & Freund, Ltd. (31 Budge Row, Cannon Street, E.C.). The construction of the many contrivances listed is clearly shown by the aid of detail drawings, while full particulars and prices are conveniently given.

**ELECTRIC FIRES.**—A new season's catalogue dealing with red-hot electric fires has been issued recently by Redglo, Ltd. (Royal Liver Building, Liverpool). Included are a number of assorted designs in which the Redglo elements are adapted for domestic use. In particular, we notice some fine designs specially suited for use as fire screens, the globular heating element in the centre enhancing their otherwise bold appearance. The consumption of each element is 600 watts, and the standard fires contain one, two, or three of these elements.

**WORKING OF STEAM BOILERS.**—The fifth edition of that useful publication entitled "Working of Steam Boilers" has just been published by Taylor, Garnett, Evans and Co., Ltd., of Manchester, at the price of 1s. 6d. paper boards, and 2s. cloth. A number of useful particulars and telling photographs of boiler deterioration, as well as constructional drawings, are given. The author is Mr. E. G. Hiller, who is the chief engineer of the National Boiler and General Insurance Co., Ltd. (Manchester).

*Readers desiring copies of catalogues or pamphlets should apply to the firms in question, referring to the notice in "Electrical Engineering."*

**ELECTRICAL AND MECHANICAL MACHINERY.**—In harmony with the excellence of the multitudinous products of Vickers, Ltd. (Vickers House, Broadway, Westminster, S.W.), is the illustrated booklet of 66 pages which the company has produced in connection with its exhibits at the Ghent Exhibition. The letterpress is in both English and French, and describes the various specialities which the company is showing. One of these is a Stirik horizontal table planer fitted with Vickers reversible drive, which is interlocked and fitted with push-button control, and another is the Vickers system of train lighting, in which a battery of accumulators in conjunction with a four-pole axle-driven dynamo is used. The fluctuations in pressure are regulated by field resistance controlled by a specially designed solenoid. In addition may be mentioned some electrically driven drills, turret laths, and other machine tools, electrical appliances, including circuit-breakers, massive control pillars, &c., while aeroplanes, motor-cars, and the necessary engineering accessories are also dealt with. A fine coloured plate of a battleship at sea and other photographs serve to remind one of the firm's energies in this direction.

**OPAL REFLECTORS.**—A folder has been issued by the Benjamin Electric, Ltd. (117 Victoria Street, S.W.), in connection with "Marbella" opal reflectors—concentrating and distributing types. These were illustrated in last week's *ELECTRICAL ENGINEERING*, p. 554.

**"LIGHTING NEWS."**—No. 2 of this B.T.H. publication has recently been produced. It is on similar lines and of the same size (4½ in. by 3½ in.) as No. 1, which we reviewed last year. The success which we predicted has been more than realised, for we understand that over 300,000 copies were disposed of during the past season by retailers, central-station departments, &c. The features of the present issue consist of short and bright articles, with illustrations and notes, calculated to induce non-users to become users of electricity, and to demonstrate to partial users how greater benefits may be obtained by a more extended use. Electrical engineers, contractors, and central-station men are invited to write at once to the British Thomson-Houston Co., Ltd. (77 Upper Thames Street, E.C.), stating the number of copies required and giving details of overprinting. All requisitions will be filled within three days of receipt, unless they arrive when the 250,000 copies already printed are disposed of.

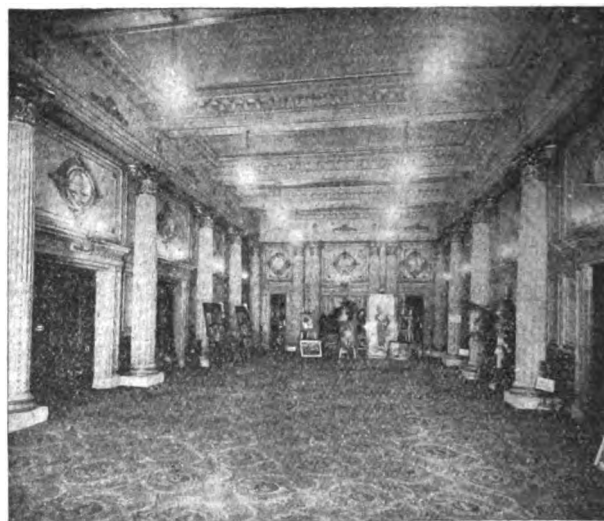
**FLAME ARC LAMPS.**—A new and complete catalogue dealing with the Crompton-Blondel flame arc lamps has been issued by Crompton & Co., Ltd (Arc Works, Chelmsford, Essex). These lamps are of the open type with vertical carbons, the larger mineralised carbon being the lower one, and the economiser is of metal specially shaped to direct the air currents and to act as a reflector. The carbons are differentially controlled through a brake wheel. The present list illustrates different types of lamp for special purposes both on A.C. and D.C. circuits. Lanterns, raising and lowering gear, auto-transformers, &c., are also dealt with, and the publication is brightened by photographs of various installations.

**MERCURY VAPOUR LAMPS.**—A leaflet from the Westinghouse, Cooper Hewitt Co., Ltd. (80 York Road, King's Cross, N.), illustrates 500 and 1,000 c.p. mercury vapour lamps for 50-65 volts and 100-130 volts respectively. In addition to the numerous industrial and commercial premises where these lamps may be used to advantage, they are advocated for hosiery and other works of a similar nature. A number of installations have been made in the Nottinghamshire and Leicestershire districts. The tubes are guaranteed for 1,000 hours, though the average life is about 4,000. The efficiency is 0.33 watt per c.p.

**FLAMING ARCS.**—A folder from the Engineering & Arc Lamps, Ltd. (Sphere Engineering Works, St. Albans, Herts), draws attention to the "Beaconette" flaming arc lamp. This is a modification of the well-known "Beacon" lamp, and is of attractive appearance and moderate price.

## THEATRE LIGHTING

THE illustration below, which has been sent us by the General Electric Co., Ltd. (67 Queen Victoria Street, E.C.), represents the vestibule of the London Opera House, illuminated by Osram drawn-wire lamps. Some idea of the lighting value of these lamps can be gained from the fact that the photograph was taken entirely by their light. Osrams are installed also in the whole of the auditorium; in fact, they form the principal illuminant throughout the



VESTIBULE OF THE LONDON OPERA HOUSE.

theatre. Leading provincial theatres, &c., are also realising the value of efficient and economical lighting, and among the latest to use Osram drawn-wire lamps are the "Theatre Royal," the "Hippodrome," and the "Palace" at Oldham.

**20,000 K.V.A. Turbo-generators.**—The first of two 20,000 K.V.A. turbo-generators has just been installed by the Allgemeine Elektrizitäts Gesellschaft in the Oberschlesische Elektrizitäts Werke power station at Chorzow, Upper Silesia, Germany. According to the *Elektrotechnische Zeitschrift* it is a 1,000 r.p.m. machine, generating at 6,000/6,500 volts, three phase. The steam consumption is not given. At 6,400 volts the current is 2,000 amperes, and this is taken through eight three-core cables direct to a group of auxiliary bus-bars. These bus-bars are connected to the main bus-bars by three automatic oil switches in parallel, as it was thought inadvisable to deal with so large a current with one oil switch. These switches have reverse-current relays, but not overload relays, and are operated simultaneously by remote control. Ammeters are connected in each switch circuit, so that any inequality in the division of the current can be detected. The generator is paralleled on one of the three switches. Any one can be inspected and repaired without taking the generator off the load, by opening the isolating switches on either side of that particular switch.



# QUESTIONS AND ANSWERS BY PRACTICAL MEN

## RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,359.

Show by examples how to design wood formers on which three-phase stator "symmetrical and asymmetrical" coils are wound.—"COIL."

(Replies must be received not later than first post, Oct. 16th.)

### ANSWERS TO No. 1,357.

In horn lightning arresters, what clearance of gap is allowed per 100 or 1,000 volts?—"SPARK."

The first award (10s.) is given to G. A. P., who writes as follows:

The gap clearance of horn lightning arresters is not expressed as so much per 100 or per 1,000 volts, as the gap is not related to the flash-over pressure according to a straight line law. Further, horn arresters should not be used on systems of less than 3,000 volts working pressure, as the gap then required (e.g., a gap to flash over at 6,000 volts) is so small that it is difficult to set accurately, and is easily bridged by dust. The

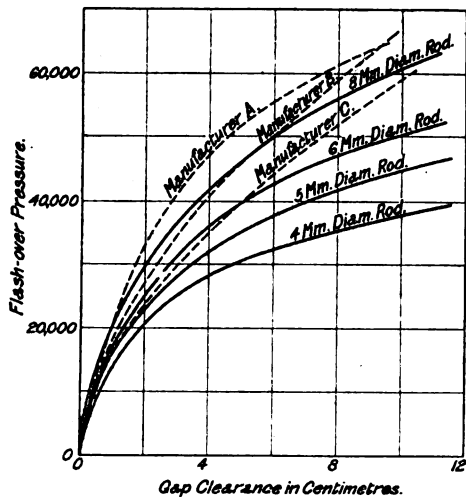


FIG. 1.—THEORETICAL AND MANUFACTURERS TEST CURVES FOR HORN ARRESTER GAP SETTINGS.

curves given in manufacturers' pamphlets showing the relation between gap and flash-over pressure are deduced from tests on particular arresters, and are quite empirical and suitable only for the arresters they refer to. The curves in text-books are generally useless, as they take no account of the diameter of the rods forming the horns, that is, the radius of curvature of the electrodes. This radius of curvature has a large influence in determining the flash-over pressure, the problem being almost the same as the determination of the critical voltage for corona effect and the insulation of extra high pressure cables. Neglecting the curvature of the rods in an axial direction, which is generally so small as not to affect the result, the flash-over pressure is expressed mathematically by

$$V = 4.605Sr \sqrt{\frac{a}{a+4r}} \log \frac{\sqrt{a^2+4ar+a}}{\sqrt{a^2+4ar-a}}$$

where  $2r$  is the diameter in centimetres of the rod forming the horn,  $a$  the gap in centimetres, and  $S$  the average breakdown pressure of air, which is about 25,000 volts per cm. at normal barometric pressure. The derivation of this formula is given by K. Grütter in the *Schweizerische Elektrotechnische Zeitschrift* of July 12th, 1913. Fig. 1 shows curves plotted for arresters of rod of 4, 5, 6, and 8 mm. in diameter, and also three test curves submitted by different manufacturers. The diameters of the rod in these cases are unfortunately not given. It would appear that the 8 mm. theoretical curve is correct for ordinary arresters, which doubtless have this radius of curvature of 4 mm. for the electrodes. It must be remembered, however, that the breakdown pressure of air varies very considerably with the state of ionisation of the atmosphere and the atmospheric pressure. Thus in hot, dry weather the gaps would break down at lower voltages owing to the ionised state of the air, while they will also break down at lower voltages when installed at high altitudes owing to the lower atmospheric pressure. These effects have, however, not yet been quantitatively investigated.

A simple horn gap is not satisfactory on a power system of any size and importance. To limit the current flowing to ground through the arc after a discharge has taken place, a resistance must be connected in series with the gap. But this resistance generally burns out if a heavy dynamic surge takes place, and so it is now usual to have two arresters in parallel, one set to discharge at, say, twice normal voltage, and with a fairly high non-inductive resistance to limit the current flow;

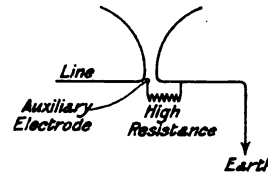


FIG. 2.

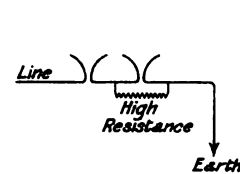


FIG. 3.

and one set for a higher pressure, but with only a very low or no resistance, to take care of the heavy surges. The former takes care of small surges and static charges. In some recent designs, the low resistance big gap arrester has an auxiliary electrode set close and connected to earth through a high resistance to deal with these small discharges (Fig. 2). In a horn arrester the arc is blown up by the heated air and the electrodynamic action until it breaks. To reduce the length of the arc and the space required above a horn gap, two arresters may be connected in series. The gap of one may be set close, and the other may be shunted by a high resistance to lead off small charges. A heavy surge will cause a flash over across both gaps in series (Fig. 3).

The second award (5s.) is given to S. F. for the following reply:—

The width of gap does not vary in direct proportion to the spark voltage. This would be true only if the points between which the spark passes were of infinite sharpness. Various formulæ have been produced by different authors, but they vary considerably presumably on account of the many varying

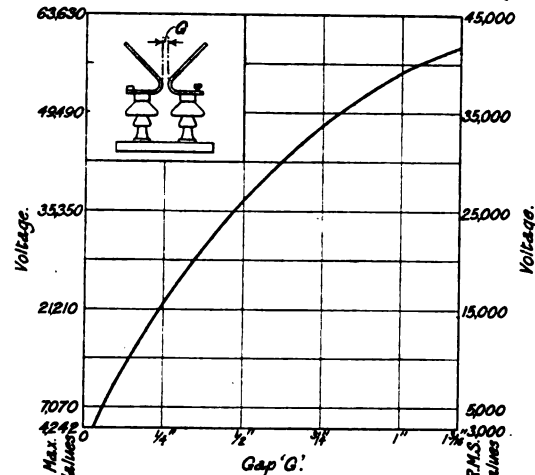


FIG. 4.

factors. Fig. 4 shows the relation between the air gap and the spark voltage from actual test. The voltage is given in R.M.S. values and maximum values assuming a sine wave. The con-

## "ELECTRICAL ENGINEERING" PATENT RECORD

*(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)*

### Specifications Published October 2nd, 1913

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

13,282/12. **Manufacture of Ductile Masses of Tungsten, &c.** P. SCHWARZKOFF, S. BURGSTALLER, and WOLFRAM-LABORATORIUM DR. ING. P. SCHWARZKOFF GES. The object of the invention is to produce a mass of tungsten, molybdenum, &c., of uniformly small crystals suitable for drawing into wires for metal filament lamps. The process consists in the reduction of the oxides of the metals by carbon after they have been consolidated by pressure in moulds. These oxides should be in the form of a fine-grain powder, each particle of which contains a lower proportion of oxygen than the lowest oxide of the particular metal. Sintering is effected at the same time as the reduction by the use of an adjustable current of hydrogen. The rate of removal of the oxygen, in order to regulate the size of the crystals produced, is effected by the addition of an adjustable quantity of an indifferent gas, so that the partial pressure of the oxygen is regulated. At the same time, the rate of flow of the reducing gas and the rate of travel of the pressed material, as well as the temperature, may be regulated. Furthermore, a metal or compound which is not decomposed at the temperature to which the finished body is to be submitted may be added to the pressed material. The action of the added metal (uranium is suggested) is to lower the vapour pressure without substantially lowering the melting-point of the main metal.

20,831/12. **Sealing and Junction Boxes.** H. H. R. GREEN. The casing is longitudinally slit or slotted so that it can be slid or sprung on the cable. The ends are clamped to the cable sheathing, and the casing is then filled with the sealing compound, and a cover with a projection to engage the slot is affixed. Eight figures.

21,971/12. **Conduit Fittings.** E. P. COTTIER and H. L. DOWNES. The elements of the fittings are divisible longitudinally, and are fitted together by removable metal bands. To ensure accurate positioning, a tongue in one member engages a recess on the adjacent member. Thus the cables may be easily inspected. Three figures.

23,402/12. **Controller Contact for Heavy Currents.** J. DAWSON. The contact piece consists of a thick disc or roller mounted on a spindle between the flanges of the finger-bar web so that a series of adjustments by a stud or set screw passing through the web into a lapped hole in the disc may be made. The web or flange is slotted for the adjusting stud. Four figures.

24,131/12. **Water Heaters.** J. NATHAN. A compact construction of a heating element for steam tables, percolators, &c., in which the current passes through the water between electrodes, is described. Four figures.

25,536/12. **Tubular Porcelain Reflectors.** F. W. SUTER. Trough-like reflectors of porcelain or other moulded material are made with end pieces containing the plugs and sockets (for making up into a continuous length) connected through the trough-like part by pins or plugs smaller than the holes through which they pass. These connectors are secured, so that only lateral expansion can take place. A recess is moulded in each end of the reflector to receive the end of the adjacent section. Thus some adjustment can be made for lamps of varying lengths. Ten figures.

1,002/13. **Series Lighting.** E. BOOTH and N. R. BOOTH. In a low-pressure incandescent lamp series lighting system each lamp is provided with a substitutional resistance designed as follows:—Normally two conductors are separated by a thin insulating material, such as paper, thinly coated with a conductor, e.g., graphite, and perforated by a sharp-pointed instrument. On failure of the lamp the rise in pressure is sufficient to fuse the conducting coating and partially destroy the insulation, so that a low resistance path is established. One figure.

3,227/13. **Synchronous Polyphase Motors.** CROMPTON & Co. and H. BURGE. Power-factor regulation is obtained in polyphase self-exciting synchronous machines by providing the armature with a main A.C. winding and with a D.C. winding and commutator. The field is compounded by a winding connected to a brush pair so placed (i.e., about 90 electrical degrees from the main brushes) as to collect the current due to the E.M.F. produced by the armature cross-flux. Two figures.

8,352/13. **Electro-deposition.** K. S. GUITERMAN. A series of electrodes are suspended in the electrolyte so that a flow is set up approximately parallel to the electrodes. This is obtained by feeder pipes, and the velocity is such that the slimes are continuously removed from the bath with a portion of the electrolyte. High current densities may be used. Three figures.

12,753/13. **Filament Supports.** WOLFRAM LAMPEN A.G. To prevent fritting or fusing together of the filaments and the supports, the latter have, as nearly as possible, as high a fusing temperature as the filaments. They are made from about 98 per cent. of oxide of tungsten and two per cent. of thorium oxide.

The mixture is reduced in hydrogen and worked in the usual way. A pliant wire results.

14,562/13. **Liquid-heaters.** E. A. RAVES. An element for heating liquids by insertion consists of a resistance wire wound on an insulated metal cylinder, and enclosed in an insulated metal casing. A construction of the leading-in wires and upper part of the element is also given. One figure.

### Specifications Published To-day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free.

Names in *italics* indicate communicators of inventions from abroad. Summaries of some of the more important of these patents will appear in our next issue.

**Distributing Systems, &c.:** B. T.-H. Co. (*G. E. Co., U.S.A.*) [Motor control systems] 21,263/12; SIEMENS-SCHUCKERT. [Fly-wheel storage for hauling and winding machinery] 11,007/13.

**Dynamos, Motors, and Transformers:** ROLFE [Turbo-generator field-magnets] 14,056/12; FRIEDR. KRUPP [D.C. dynamo connections] 1,407/13; SIEMENS-SCHUCKERT., 14,390/13.

**Electrochemistry:** HOOFNAGLE [Treatment of gases and vapours] 20,950/12; HENDERSON [Ozonisers] 1,156/13; STEYNIS [Ozonisers] 3,769/13; GES. FÜR CHEMISCHE INDUSTRIE IN BASEL [Electrolysis of aqueous solutions] 11,872/13.

**Incandescent Lamps:** SCHALLER, 1,804/13.

**Instruments and Meters:** SIEMENS & HALSKE [Photographically recording readings] 8,240/13.

**Storage Batteries:** DE SEDNEFF, 18,571/12.

**Switchgear, Fuses, and Fittings:** KRAMER [Distribution boxes] 23,750/12; BROOKS and HOLT [Switches for lighting systems on automobiles] 25,420/12; MÖLLER [Automatic circuit breaking] 27,530/12; BOUTARD [Automatic switches] 5,546/13; SIEMENS-SCHUCKERT. [Switches] 16,454/13.

**Telephony and Telegraphy:** SIEMENS & HALSKE [Circuits for automatic telephone systems] 18,498/12; [Registering circuits for automatic telephone exchanges] 9,168/13; [Inductance coils] 12,565/13; MARR [Telephone receivers] 21,664/12.

**Traction:** RISI [Railway signalling] 28,213/12; MANTHORPE and HANSEN [Cab signalling] 10,391/13.

**Miscellaneous:** PARKS [Flexible clip for lamp-shade holders] 20,805/12; GRAEMIGER [Lifting magnets] 24,541/12; FELTERICO [Light diffusing screens] 6,064/13; SCHLOSSBERG [Acid and fire-proof bodies of silicic anhydride] 6,949/13; SULLIVAN [Automatic ships' telegraph alarms] 11,972/13.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Dynamos:** SOC. INTERNATIONALE LUMIÈRE (PROCÉDÉS DUSSAUD) [Picture projector pedal-driven dynamos] 20,288/13.

**Telephony:** SIEMENS & HALSKE [Automatic and semi-automatic systems] 16,538/13; [Circuits] 19,928/13.

**Miscellaneous:** PELLI [Alarms for money safes] 10,087/13.

### Expiring and Expired Patents

The following specifications expire during the current week, after a life of fourteen years:—

20,655 of October 14th, 1899. **Stone-ware Conduits.** THE ALBION CLAY Co. and R. LAWTON. Socket and spigot joints of stone-ware conduits are provided with composition joints so that the conduits may be quickly laid in true alignment. A female mould on a base, which also supports vertical guides for a crosshead carries a movable male mould. In addition a bar or plane is provided. This can be adjusted laterally to bear on the side of the sections where the joints are formed.

20,661 of October 14th, 1899. **Nickel Steel Leading-in Wires for Glass Vessels.** LA SOCIÉTÉ ANONYME DE COMMENTRY-FOURCHAMBAULT. The combination of glasses of different compositions with nickel steels containing approximately 28 to 30 per cent., or about 42 to 46 per cent. of nickel is claimed. The expansion of the glass and nickel-steel is the same.

The following are the more important Patents that have become void through non-payment of renewal fees.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** W. AITKEN [Pole line insulator for use where the overhead line is cabled] 13,902/04.

**Dynamos, Motors and Transformers:** M. LATOUR [Repulsion-induction motor] 13,585/04.

**Electrochemistry:** D. SINCLAIR [Coloured surfaces are produced on metal by making this the anode in an alkaline lead and copper solution] 10,977/00; [Use of iron, silver, gold, nickel, &c., instead of copper] 13,487/04.

**Instruments and Meters:** G. C. FRICKER [Differential thermometer type maximum demand indicator] 13,663/02.

**Traction:** W. R. SYKES and W. R. SYKES INTERLOCKING SIGNAL Co. [Motor operated semaphore signals] 13,130/08.

ROBUST and  
RELIABLE!

SPECIFY

# IGRANIC

## SWITCHGEAR

IGRANIC ELECTRIC CO. LTD.  
LONDON

Works:  
BEDFORD

ditions of the test were as follows: Copper horns, 5/16 in. diam.; temperature, 60° F.; barometer, 30 in.; alternator giving approx. sine wave; frequency, 50 cycles. The air is such a variable factor that it is not possible to set the gap so that the spark voltage will not vary more than 10 per cent. under all conditions. The humidity of the atmosphere may affect the spark voltage to this amount. The spark voltage is increased by about 1 per cent. for a fall of 5.4° F., or for a rise of 0.3 in. in pressure. If discharges have taken place in the neighbourhood of the horns, the dielectric strength of the air is very much reduced. It is, of course, the maximum value of the voltage wave which determines the point of breakdown, so that peaky waves will have lower R.M.S. spark voltages for the same gap.

It is not wise to set the gap too fine, as trouble may arise due to surges caused by changes of current in the circuit. These voltages may reach two or three times normal, but are of short duration. To protect against direct lightning strokes, induced charges caused by lightning in the neighbourhood or static charges due to atmospheric conditions, it is satisfactory to set the gap for three or four times normal pressure. It is customary to provide a resistance in series with the horns to limit the energy current which follows the initial spark to about 2 amps. This does not affect the spark voltage, but if it is omitted, the gap should be made wider to make sure that the energy current will be interrupted.

### TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

The International Conference on Safety at Sea is to meet in London on November 12th, and among the resolutions is one by the German delegates to the effect that all passenger steamers carrying seventy-five persons, including the crew, must carry a wireless installation with a range of a 100 sea miles.

A "Report of the Proceedings of the Board of Agriculture and Fisheries in relation to the Complaints of Damage to Submarine Telegraph Cables by Trawlers" has been issued as a Government Paper. This report is in English; the same report was issued in French last month (see ELECTRICAL ENGINEERING of September 18th) as an appendix to the report of the proceedings of the recent International Conference on the same subject. It gives a description of the methods of inspection of steam trawlers, which has been found effective in reducing the damage done to cables.

The Post Office has acquired a site in Great Tower Street, E.C., for a new manual C.B. telephone exchange of 10,000 lines capacity. As the present tenants will not leave before next Lady-day, it will not be until 1916 that the exchange can be working. It will relieve the existing Avenue, London Wall, Central and City, and Bank exchanges.

The new 10,000-line Victoria exchange was opened last week, but so far only new subscribers have been connected. The transfers from the old Victoria will shortly be made. The latter was filled by the transfers from the National Telephone Co.'s Westminster exchange.

In connection with the Strowger automatic telephone exchange at Newport (ELECTRICAL ENGINEERING, June 12th, p. 345), we learn that there is to be a small "satellite" automatic exchange at Chepstow. The erection of the Lorimer automatic exchange at Hereford is now practically complete, and may be taken over by the Post Office in a few weeks' time. The equipment was described in ELECTRICAL ENGINEERING, July 24th, p. 435.

The danger of aeroplanes and airships coming into collision at night with high wireless aerials has led the Telefunken authorities to set up a warning signal on the roof of the Nauhen station. This consists of two 1,000-c.p. metal filament lamps connected with an automatic switch so that they give the Morse signal "N" continuously all night. The signal has been observed from a balloon twenty-five miles distant from Nauhen, and at an altitude of 1,300 ft.

At an extraordinary general meeting of Marconi's Wireless Telegraph Co., Ltd., last week, the scheme for raising

new capital, referred to on p. 562 of our last issue, was sanctioned. Mr. G. Marconi, Chairman of the Company, presided, and a long speech was made by Mr. Godfrey Isaacs, the Managing Director. With regard to the Goldschmidt high-frequency alternator, the patent rights for which the Marconi Co. will now take over, he pointed out that whilst there is great merit in the invention, Professor Goldschmidt did not claim to have invented a system of wireless telegraphy, but only a machine for the generation and utilisation of continuous waves. In the opinion of the Company's advisors, the Goldschmidt station at Hanover was still a very long way from being able to conduct a Transatlantic service without the assistance, experience and patents of the Marconi Co. He did not, however, wish this statement to detract in any way the great merit due to Professor Goldschmidt for his invention. There was, nevertheless, not an atom of foundation for the statements recently made in the Press that the Goldschmidt station at Hanover had succeeded in transmitting a wireless message to Tuckerton, U.S.A., at a regular rate of 100 words per minute for several hours. The directors were convinced that the step taken by the Company in purchasing the Goldschmidt patents would be a very marked advantage to the nation, as, should the Goldschmidt machine prove to be able to do all that was anticipated, the country would have the benefit of it without any extra cost.

The Falmouth-Bilbao cable of the Direct Spanish Telegraph Co. broke on the 3rd inst.—Communication is also down between Singaradja Ampenan, and telegrams for the latter place, Mataram, Selong, Praja, and Labocanhadji are sent by post from Singaradja.—The Oran-Tangier cable went on the sick list on the 6th inst.

**Western Section of the Institution of Electrical Engineers.**—A booklet has been sent out by this section, of which Mr. H. Faraday Proctor is now chairman, giving particulars of the section, extracts from the articles of association of the Institution, a list of members of the section, and the dates provisionally fixed for meetings. The session will commence on October 27th by an afternoon meeting at Bristol, when Mr. H. Faraday Proctor will give his Presidential Address. A visit to the works of W. D. & H. O. Wills will be paid in the morning, and the annual dinner will be held in the evening.

**Municipal v. Company Supply.**—We have received from the Research Department of the Fabian Society a copy of a Paper on "Public versus Private Electricity Supply," by Mr. C. Ashmore Baker. The author analyses, by means of curves, the published results of municipal- and company-owned undertakings with a view to proving the superiority of the former. He shows first of all that the capital cost per kilowatt is lower for municipal than for company stations of corresponding size, and refutes the charge that municipalities make large paper profits by selling current to themselves for public lighting at excessive rates, by showing that the average price charged by municipalities is actually higher for stations under 2,000 kw., and only very slightly lower for larger undertakings. With regard to wages paid, he declares that although their curve shows a lower wages cost per unit sold, municipalities pay on the average a higher rate than companies, but more than make up the difference by judicious management. The fact that companies pay much more for repairs and maintenance he apparently regards as evidence of economy, and he claims that the municipalities maintain their plant in quite as efficient working order. The smaller amount spent on fuel by municipalities he considers unimportant, as a larger percentage of municipal stations are situated in the coal area. The management expenses, &c., are much higher in case of companies, and Mr. Baker exultingly points out that municipalities get a board of directors for nothing. The cost of oil, water, and stores works out at about the same, but in the case of rent, rates, and taxes, no general law can be adduced. The total working costs per unit sold are shown to be much less for municipal undertakings. It is shown that the price obtained is markedly lower in the case of municipalities, but it is argued that, had they charged the same prices, they would have made 2½ times the gross, or 2½ times the net profits per £ of capital that the companies have gained. Another argument advanced against company supply is founded on statistics showing that the units sold per head of population have advanced much slower in company than in municipal undertakings.

**EVERY INSTALLATION ENGINEER**

Should join his Trade Protection Organisation,  
**THE**  
**ELECTRICAL CONTRACTORS' ASSOCIATION**  
 (Incorporated).

*Inquiries cordially invited by the Secretary,*

**L. G. TATE,**  
 20, Bucklersbury, LONDON, E.C.

For instructions on Cleaning and Polishing  
 Electrical Fittings and Electric Cookers, read

**CANNING'S HANDBOOK ON****POLISHING, ELECTRO-PLATING & LACQUERING.**

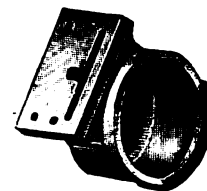
Fully Illustrated. Price 2s. 3d. post free. Abroad, 2s. 6d.

**W. CANNING & CO., BIRMINGHAM.**

LONDON: 18/20, ST. JOHN'S SQ., CLERKENWELL, E.C.

MENTION BOOK 224.

**SEE THESE  
 PIECES OF  
 INTRICATE  
 REPETITION  
 WORK.** They are



**CAST AND  
 FINISHED**

by the

**"PRANA" DIE FINISHED  
 CASTING PROCESS**

which can save time as well as money. Write  
 for a little booklet which will show you how, to

**AERATORS LIMITED,**  
 UPPER EDMONTON, LONDON, N.

**ELECTRICAL PORCELAIN**

OF

**HIGHEST QUALITY**

APPLY TO

**JAMES MACINTYRE & CO., LTD.,**  
 BURSLEM.

**MICA MICANITE FIBRE.  
 OILED FABRICS LEATHEROID**

**INSULATION**

The Micanite & Insulators Co., Ltd.  
 Walthamstow, London, E.

**BLAKE & INSULATING STAPLES**

*Write for Samples and Prices.*

**MOSES & MITCHELL,**

Ohlswell Works, 122-124, GOLDEN LANE, E.O.

**STEATITE  
 INSULATORS**  
 SUPPLIED  
 FOR ALL KINDS OF  
 ELECTRICAL WORK  
**WILLIAM SUGG & CO. LTD.**  
 WESTMINSTER.

**ELECTRIC TRACTION NOTES**

The capital reconstruction scheme of the Sunderland District Electric Tramways which involves the cutting down of the preference shares from £1 to 10s. each, and the cancellation of the arrears of dividend, and the conversion of the dividend from cumulative to non-cumulative, although meeting with considerable opposition on the part of the shareholders, has been passed.

The Greenock & Port Glasgow Tramways Co. has still fourteen years to run before its present lease of the tramways in Greenock expires, but the Council has the opportunity of acquiring the undertaking by agreement in 1914. There is a strong feeling in the town that this opportunity should be taken advantage of, but the Council has not yet dealt with the suggestion.

A proposal at the last meeting of the Glasgow Corporation that consideration should be given to the construction of tube electric railways from east to west, in order to relieve congestion, was carried.

The Croydon Corporation has passed a recommendation by the Tramways Committee that the Government shall be asked to give effect to the report of the Select Committee on motor traffic at the earliest possible moment. The Croydon Corporation has taken an active part in the question of the unfair competition of motor omnibuses with municipal tramways.

The Buenos Aires Lacroze Tramways Co. is making an issue of £500,000 5 per cent. consolidated mortgage debentures at 88.

The Birmingham Tramways Committee is negotiating for the purchase of the Birmingham Omnibus Co.'s undertaking, in order to have all street-travelling facilities under its own control.

The proposal that first-class trams shall be run in Manchester has failed so far as the Tramways Committee is concerned. It is possible, however, that the question will be raised in the Council itself.

The Auckland Electric Tramways Co. proposes to increase its capital by the issue of £100,000 ordinary shares. We refer in our "Tenders Invited" column to new plant required by this Company.

**LOCAL NOTES**

**Aberdeen: Street Lighting.**—Hitherto the whole of the street lighting, including repairs, has been under the control of the Electrical Department, but in future this work will be undertaken by the Lighting Department.

**Barking: Electricity Accounts.**—The electricity accounts for the year to March 31st show a net profit of £1,852 after meeting capital charges, and £3,193 for special expenditure. The Borough Treasurer, in reporting this result to the Council, calls attention to the desirability of adding the net profit to the reserve fund, a recommendation which was adopted by a subsequent meeting of the Council.

**Bristol: Wages in the Electrical Trade.**—The dispute between the Bristol electrical wiremen and the electrical contractors has not yet been settled, and pending a settlement the men remain out on strike.

**Dromore: Public Electric Lighting.**—An electric lighting scheme has been put into operation.

**Dublin: Coal for Electricity Department.**—An attempt to unload a cargo of coal last week for the electricity undertaking was prevented, as the result of the present labour troubles in Dublin. It is understood, however, that this coal is only a portion of the normal supplies now coming in for the winter, and that the stock in hand at Pigeon House Fort is sufficient to carry the undertaking on until January.

**Dundee: Supply to Broughty Ferry.**—It has been decided when laying a cable from Carolina Port power house to Broughty Ferry, to construct a second duct in order to avoid the opening of roads a second time later on.

**Edinburgh: Electricity Accounts.**—There was a net profit of £2,169 upon the working of the electricity undertaking last



year. The Committee has asked the Town Council to reduce the charges for private lighting by one-eighth of a penny per unit. The present rate is 2½d. per unit.

**Glasgow: The Electrical Exhibition.**—The Countess of Glasgow will open the Electrical Exhibition which is being promoted by the Corporation Electricity Department on October 23rd. The Exhibition will remain open to November 15th, and in addition to lectures on the applications of electricity to various purposes, there will be demonstrations of cooking and heating by electricity.

**Great Harwood: Electric Supply.**—The Accrington Corporation has been asked upon what terms they will take over the Council's provisional order.

**London: Poplar: Electricity Accounts.**—There was a net profit of £3,170 upon the working of the electricity undertaking for the year to March 31st. After meeting a number of items, including services and meters, wiring installations and cooking installations, the net balance carried forward is £2,691. Attention is called in the report to the fact that an agreement has been entered into between the Poplar and Stepney Councils which will obviate the necessity of further extensions until the maximum demand on the Poplar undertaking has reached 10,000 kw. Satisfactory progress has been made during the year in converting the old type arc lamps to the modern system of street lighting, viz., by high candle power incandescent lamps; in addition, seventy-two gas lamps have been converted to electric lighting.

**Marylebone: Electricity Accounts.**—The accounts of the electrical undertaking for the June quarter show the most satisfactory quarterly report for many years past. The increase in the number of units sold to private consumers is no less than 30 per cent. above that of the corresponding quarter of 1912, and thus 30 per cent. more electrical energy has been produced for an extra expenditure of only 3·14 per cent. In other words, to secure an addition to the income of £4,160, an expense of only £465 has been incurred. The net cost of the Sales and Publicity Department for the quarter was £491, and Mr. Seabrook thinks it must be left to the judgment of individual members of the Council as to what extent the improvement in the general electricity revenue is attributable to the work of this Department.

**Middleton: The Electric Power Co.**—With reference to the note on p. 519 of our issue for September 11th, the Electricity Committee has rescinded the resolution giving consent to the Lancashire Electric Power to supply the Calico Printers Association, as arrangements have been made with a neighbouring corporation for a bulk supply which will enable the Corporation to deal with the business itself.

**Port Glasgow: Electric Supply.**—The arrangements with the Greenock Corporation for a supply of electrical energy include a 42 years' concession, whilst a number of agreements have been fixed up with large power users for periods of twenty years.

**Stoke-on-Trent: Tests of the High-Tension Plant.**—At the last meeting of the Electricity Committee the Electrical Engineer reported that the tests of the Siemens motor-generators in the new power station did not comply with the guaranteed performance. During the course of the discussion with Messrs. Siemens' representatives, it was admitted by them that there had been difficulty in designing 100-cycle single-phase plant, and that the permeability of the magnetic core was lower than had been anticipated. The firm, however, offered to provide boosters for the generators, or to rewind the generators and to provide new pole pieces. The Committee have adopted the Engineer's recommendation to accept the boosters to enable the load to be dealt with during the forthcoming winter, and that subsequently the stators should be rewound and new pole pieces fitted.

**York: Street Lighting.**—In consequence of the York Gas Co. having made a reduction in their charges for street lighting, the Electricity Committee have been asked to make a reduction in their charge for street lighting by electricity.

**Death by Electric Shock.**—An inquest was held last week concerning the death of George Carpenter, an electrician at Messrs. Edward Lloyd's Paper Mills, Sittingbourne, who was killed at the works whilst engaged in fitting up some cable. It appears that whilst adjusting the cable he touched a live wire on the transformer, and received a shock from a 430 volt transformer. During the evidence it was stated that the deceased was not wearing rubber gloves as he ought to have been, and H.M. Inspector of Factories for the district, who attended the inquiry, said that the firm had provided every possible safeguard for the lives of the men.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

### Generating Stations, Sub-Stations, Mains, &c.

**Ardley.**—The Surveyor has been instructed to obtain information as to a possible electric lighting scheme.

**Australia.**—An electrically-driven pumping installation is required for Canberra. Secretary, Department of Home Affairs, Russell Street, Melbourne. Further particulars, 73 Basinghall Street, London, E.C.—Supply of insulated lead-covered cable is required by the Melbourne Electric Supply Committee. Messrs. McIlwraith, McEacharn & Co., Billiter Square Buildings, London, E.C.

**Bootle.**—Mains extensions to supply Messrs. Harland and Wolff's works are to be carried out at an estimated cost of £300.

**Burnley.**—The details of the Council's application to borrow £36,227 are as follows:—A 2,000-kw. turbo-alternator, condensing plant, &c., £7,420; two 500-kw. rotary converters and transformers, £9,040; new switchgear and alterations, £2,400; two boilers, £1,300; economisers, £700; water softener, £500; cooling tower, £600; engine-room cranes, £600; sub-stations and equipment £4,100; cables, £3,700; mains and services, £7,000; contingencies, £2,657.

**Criccieth.**—A special committee has been appointed to consider the question of electric lighting.

**Ellon.**—Messrs. T. C. Smith & Co., who have been negotiating with the Council with regard to an electric lighting undertaking, have now offered better terms, and a meeting has been arranged between the Manager of Messrs. Smith and the Council.

**London: Battersea.**—Mains extensions, &c., are to be carried out at an estimated cost of about £378.

**New Zealand.**—A 1,000-kw. generating set is to be installed by the Auckland Electric Tramways Co.

**Shanghai.**—E.H.T. pilot cable, &c. Consulting engineers, Messrs. Preece, Cardew & Snell, 8 Queen Anne's Gate, S.W. October 17th.

**South Africa.**—Extensions to the electric lighting undertaking at Pretoria are contemplated at an estimated cost of £25,000.—According to the *British and South African Gazette*, electric lighting schemes are to be undertaken at Ermelo and Kampala. Considerable extensions to the electricity undertaking at Durban are also contemplated.

### Wiring

The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.

**Blackburn.**—New fire station.

**Cardiff.**—Extension of head Post Office. H.M. Office of Works, London.

**Chorley.**—New school. Town Clerk.

**Coventry.**—New technical institute (£30,000).

**Edinburgh.**—Military quarters at cavalry barracks, Redford. Director of Army Contracts, War Office, London.

**Failsforth.**—Public Gardens.

**Grantham.**—Elementary school.

**Hinckley.**—New elementary school.

**Kettering.**—The Kettering & District hospital is to be wired for electric lighting. The specification is being prepared by the Borough Electrical Engineer.

**London.**—New infirmary at Tulse Hill for Lambeth Guardians. (£200,000).

**Mountain Ash.**—New fire station.

**Royton.**—The Town Hall, market, baths and free library are to be wired at once. The Council has just made an application for an electric lighting provisional order.

**York.**—Guardians board room and offices, Museum Street.

### Miscellaneous

**Australia.**—Automatic switchboards with accessories for suburban telephone exchanges are required by the Deputy

FOR  
STEAM JOINTS  
USE



JOHN HUDSON & CO.'S SUCCESSORS, Mansell St., London, E.

Postmaster-General, Sydney. March 18th, 1914. Further particulars, 73, Basinghall Street, E.C.

**Bradford.**—Twelve months' supply of electrical sundries for Tramways Department. Town Clerk. October 18th.

**Glasgow.**—A twelve months' supply of electric lamps and fittings for the Lunacy District Board, 266 George Street.

**Leicester.**—Tramway extensions estimated to cost £30,000 are recommended. Ten additional P.A.Y.E. cars are to be ordered.

**Newcastle-on-Tyne.**—Twelve tramcar bodies with covered tops, electrical equipment and trucks. General Manager.

**Newport (Mon.).**—A scheme for considerable extensions of the tramways to the suburban districts is under consideration.

**New Zealand.**—Two sets of high-lift electrically-driven turbo pumps. Town Clerk, Hastings, New Zealand. December 18th. Further particulars, 73 Basinghall Street, E.C.

The Dunedin Council requires a two years' supply of meters, maximum demand indicators and cable.

### TENDERS RECEIVED AND ACCEPTED

**Blackpool.**—An order for a 1,000-kw. turbo-generator and condensing plant has been placed with Messrs. Richardsons, Westgarth & Co.

**Cardiff.**—The following tenders have been accepted:—Turbo-generator for the Roath power station, Fraser & Chalmers, £6,345; 1,000-kw. rotary-converter for the Hayes sub-station, the British Westinghouse Co., £1,955.

**Clonakilty.**—The tender of the local electric light and power company for fifty 50-c.p. lamps for street lighting purposes at an annual cost of £100 for a period of 15 years has been accepted.

**London: Hackney.**—An offer by Messrs. Cox-Walkers, Ltd., to instal a Taylor-Scotson pressure regulator at £200 is recommended for acceptance. The makers are willing to give a twelvemonths' guarantee, and remove it at the end of that period if it is not satisfactory to the engineer.

**Manchester.**—Orders have been placed with W. T. Glover & Co., Johnson & Phillips, and the Western Electric Co. for L.T. paper-insulated cable.

**Salford.**—The British Westinghouse Co. has received an order for additions to the E.H.T. switchboard at £275.

**Wimbledon.**—A tender at £9,900 for a new turbo-alternator with accessories has been accepted, subject to the Local Government Board's sanction to the necessary loan.

### APPOINTMENTS AND PERSONAL NOTES

Mr. G. Cardwell, Manager of the Devenport & District Tramways Co., has been presented with a silver tea and coffee urn by the employees on the occasion of his marriage.

We are pleased to hear that Mr. G. F. Naylor, Chief Electrical Engineer to the Nelson Corporation, is now improving from a serious attack of pneumonia.

The following increases of salaries are recommended in the Brighton Electricity Department:—F. C. N. Bergh, Assistant Mains Superintendent, from £2 17s. 6d. per week to £165 per annum; H. Chipp, foreman-jointer, from £2 5s. to £2 7s. 6d. per week; W. Charman, testing inspector, from £2 5s. to £2 7s. 6d. per week; H. Heasman, foreman motor adjuster, from £1 19s. to £2 2s. per week; G. Packham, foreman wireman at Southwick, from £2 2s. 6d. to £2 5s. per week.

Mr. J. Bemrose, Chief Assistant Electrical Engineer at Tunbridge Wells, has been appointed Chief Electrical Engineer to the Leek U.D.C. in succession to Mr. R. M. Carr, who has gone to Macclesfield.

The recommendation to increase the salary of Mr. H. D. Munro, the Exeter City Electrical Engineer, referred to in our last issue, has been deferred until next January by a vote of the Council.

Mr. A. Clough, late Resident Electrical Engineer, and more recently Consulting Electrical Engineer to the Liverpool Corporation, from which position he has now resigned, has been presented with an illuminated address and two divan chairs by the staff.

Mr. R. M. Carr, who recently resigned the position of Electrical Engineer to the Leek U.D.C., has secured a similar position with the Macclesfield Corporation.

Mr. Alfred Hands informs us that he has accepted engage-

ments to lecture on lightning protection at a number of places in London and the Provinces.

Mr. W. Wyld, late Borough Electrical Engineer, Birkenhead, was entertained by a number of friends to dinner on Friday last to celebrate his appointment as Borough Electrical Engineer at Hampstead. Mr. H. E. Blain was in the chair, and Mr. E. P. Barfield acted as Hon. Secretary in making the arrangements.

### MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. G. Smith & Son, of 5 Philpot Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night, was £77 5s. to £77 15s. (Last week, £77 to £77 10s.)

**Change of Address.**—Bi-metals, Ltd., have removed from 80A Southwark Street, S.E., to 57 Lant Street, Southwark, S.E.

**Small Metal Filament Lamps.**—The British Thomson-Houston Co., Ltd. (Mazda House, 77 Upper Thames Street, E.C.), advise us that they have now introduced a 10-watt Mazda drawn wire lamp for 100–130 volt circuits, giving 8 c.p., which should prove very useful in small rooms where 8 c.p. carbon lamps are sometimes still retained.

**Agency.**—H. W. Butler & Co. inform us that they have been appointed sole agents in this country for the Ateliers de Constructions Electrique du Nord et de l'Est, of Jeumont, France, manufacturers of electric plant and cables.

### COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &c.

**Dick, Kerr & Co.**—The trading profit for the year ended June 30th amounted to £30,100, compared with £3,300 in the previous year, and after deducting debenture interest there was a net profit of £18,600, compared with a loss in the previous year of £8,600. No dividend, however, is recommended on the ordinary shares.

**Callender's Cable & Construction Co.**—An interim dividend at the rate of 10 per cent. per annum, less tax, has been declared on the ordinary shares.

**Drake & Gorham.**—There was a net profit of £10,268 for the year ended June 30th, and after paying a 5 per cent. dividend, and writing off the balance of underwriting commission, the sum of £1,716 is carried forward. The report states that the steady increase in the turnover has been maintained, and that encouraging reports continue to be received concerning the efficiency of the firm's lighting system, the details of which are constantly being perfected.

**Edison Accumulators.**—A prospectus is being circulated privately, in which £50,000 participating preference shares are offered at par.

**Hove Electric Lighting Co.**—A dividend at the rate of 8 per cent. has been declared for the six months to June 30th.

**Consolidated Diesel Engine Manufacturers.**—The first annual meeting was held on Wednesday last week, when, as we mentioned in our last issue, the mysterious disappearance of Dr. Diesel was announced. Among those present was Mr. Georges Carels, of Carels Frères, Ghent, and it was stated that the site of the Ipswich works occupies twenty-three acres, the Company having the option of twenty-three acres adjoining. This option has been exercised. The total amount of money spent on the works, including land, to date is £140,000, but in spite of various difficulties, including strikes, a fair number of orders have been booked. At present, however, there was no question of dividends being paid by the English Company, as the works were not yet finished. Some dissatisfaction was expressed by the shareholders at the meeting that no accounts had been prepared, and eventually the meeting was adjourned to a date not later than December 31st.

**Cleveland & Durham Electric Power.**—An issue of £130,000 5 per cent. first mortgage debentures is being offered at £97 10s.



# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 355 [Vol. IX., No. 42]  
*All rights reserved.*

THURSDAY, OCTOBER 16, 1913.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES AND TECHNICAL COLLEGE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

*Other Advertisement Rates on Application.*

#### Latest Time for Receiving

Letters for Insertion, Tuesday first post.

Small Advertisements and Official Announcements, Wednesday first post.

Displayed Advertisements, Tuesday first post.

Corrections in Standing Advertisements, Monday first post.

All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 208-206, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Oircelng, Fleet, London."

Telephone No.: 5509 Holborn.

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

AN application made by Evershed & Vignoles to restrain R. W. Paul from using the name "Omega" for his testing set was decided yesterday in favour of Mr. Paul. The patent action by the Marconi Co. against the Helsby Wireless Telegraph Co. is expected to come on for hearing early in the Michaelmas Law Sittings. (Page 578.)

A good collection of wireless apparatus is shown at the "Model Engineer" Exhibition, now being held at the Horticultural Hall. (Page 578.)

THE hydroelectric power-station which has been established by the Chester Corporation on the site of the old Dee Mills, will be formally inaugurated on Saturday. The equipment consists of four vertical shaft, low fall turbines, driving continuous-current dynamos, and in view of the variation in the height of the tail water in the tidal river, the sets are designed so as to be capable of giving their voltage over a considerable range of variation of head and speed. (Page 579.)

AT the "Ideal Home" Exhibition there may be seen some new designs of radiators, ovens, and vacuum cleaners. The lighting effects are very good. (Page 581.)

THE specifications published by the Patent Office last Thursday include one for time-limit circuit-breakers by E. O. Möller, of the British Westinghouse Co., one

for a heat control switch of the diaphragm type by H. C. E. Boutard, and one by Siemens-Schuckert covering a method of damping out the flux pulsations in interpoles. (Page 582.)

THE electrical driving of planing machines is dealt with in our Questions and Answers columns. (Page 583.)

NEW Engineering Laboratories have been opened at University College, Dundee. (Page 584.)

ILLUSTRATIONS are given of recent examples of residence lighting and electric signs. (Pages 584 and 585.)

A DESCRIPTION is given in our Electric Traction Notes of the new split phase system of electric traction which is being experimented with in America. (Page 585.)

SOME particulars are given under "Telephony and Telegraphy," of two submarine telegraph cables recently laid by the Italian Government. (Page 585.)

OPPOSITION is being offered at Halifax by the members of the Gas Committee to a proposal to reduce the charge for electricity.—The proposal to sell the Redditch electricity undertaking has again been brought forward.—Rearrangements of tariffs are being made at Derby and Edinburgh.—The Scarborough Corporation proposes to purchase the local electric supply company.—Special reports from outside engineers are to be obtained upon the Stirling electricity and tramway undertakings. (Page 587.)

It is proposed to duplicate the gas plant in the Accrington electricity works.—Local Government Board inquiries have been held at Wolverhampton (£22,000); Walsall (£4,840); and Loughborough (£14,000).—Extensions are contemplated at Nottingham (£35,000); Stretford (£7,000); and electric lighting schemes are under consideration at Waterford (£27,338), and other places.—Batteries are required at Manchester and Sale, and miscellaneous electrical apparatus by the Victorian Railway Commissioners and the Great Northern Railway Co. of Ireland. (Page 587.)

A NEW issue of capital is being made by the Newcastle-on-Tyne Electric Supply Co. (Page 588.)

**The British Electrical and Allied Manufacturers' Association.**—The annual dinner of this association is fixed for January 14th, 1914. Lord Ampthill is to preside.

**Fire at an Electrical Manufacturers' Works.**—About ten o'clock on Thursday night, a serious fire occurred in a saw mill at the premises of L. Bill & Co., Ltd., electrical accessories manufacturers, Queen's Road, Aston, Birmingham. The origin of the fire is unknown.

**The late Dr. Diesel.**—The body of Dr. Diesel has been found in the Scheldt. According to *The Times* Munich correspondent, a meeting of the creditors of Dr. Diesel has been held when it was stated that there is a deficit in his estate of £25,000 on account of ordinary debts, and £50,000 on mortgages. The creditors have decided to avoid bankruptcy proceedings and to liquidate the assets gradually, for which purpose a committee of five has been formed.

## ARRANGEMENTS FOR THE WEEK

FRIDAY, OCTOBER 17TH.

*Electro-Harmonic Society.*

8 p.m. Smoking Concert at Holborn Restaurant.

SATURDAY, OCTOBER 18TH.

*Birmingham and District Electric Club.*

7 p.m. Lecture on "Electric Cooking," by W. E. Milns.

MONDAY, OCTOBER 20TH.

*Institution of Electrical Engineers: Newcastle Section.*

7.30 p.m. Inaugural Address by Chairman at Armstrong College, Newcastle.

WEDNESDAY, OCTOBER 22ND.

*The 25 Club.*

7.15 for 7.30 p.m. Dinner at Connaught Rooms, Great Queen Street, Kingsway, W.C.

THURSDAY, OCTOBER 23RD.

*Institution of Electrical Engineers: Newcastle Section.*

7 p.m. Meeting of Tees-Side Members at the Literary and Philosophical Society, Middlesbrough, when Chairman's Address will be repeated.

*Institution of Civil Engineers.*

9 p.m. "James Forrest" lecture by Alexander Grant, on "Progress of Marine Construction."

## PENDING ELECTRICAL LAWSUITS

**D**URING the Michaelmas Law Sittings, which began on Monday last, a number of cases of considerable electrical interest will probably come on for hearing. Of greatest interest, perhaps, is the action brought by the Marconi Co., Ltd., against the Helsby Wireless Telegraph Co., Ltd., to restrain alleged infringement of the famous Marconi patent No. 7,777 of 1900. The trial of this action has long been expected, but it was only a few months ago that the Marconi Co. obtained permission to interrogate the Helsby Co. as to any differences recently made in the system employed by them (*ELECTRICAL ENGINEERING*, July 17th, p. 425). The case will be heard by Mr. Justice Eve in a few weeks' time.

A case to be tried some time hence by Mr. Justice Neville will turn on two patent specifications. The action is brought by the Anglo-Swedish Electric Welding Co. against the British Arc Welding Co. Mr. Justice Neville will also be required to determine the construction to be placed on a detail in an agreement between Mr. Lemmens, who is on the board of Everett, Edgecumbe & Co., Ltd., and the Company.

In the Divisional Courts two actions are down for consideration. In one of these the question of a reduced assessment of the L.C.C. tramways in Islington will be discussed, the County Council's claim being based upon the lower profits due to motor-bus competition. In the other action, some outstanding question regarding the purchase of the London United Tramway Co.'s undertaking in London by the London County Council has to be disposed of.

There are also several minor actions in which electrical interests are involved, but the cases are not of an electrical engineering nature.

**The "Omega" is not the "Megger."**—In an application before Mr. Justice Neville yesterday by Evershed & Vignoles, Ltd., against R. W. Paul, for an injunction to restrain the sale of portable testing sets under the name "Omega," it was admitted that the name had been used to some extent for a number of years as a trade mark on electrical measuring instruments. The application was, as a result, dismissed with costs, with some reservations. The action was brought on the ground of infringement of trade mark, and that the use of the word "Omega" in connection with the testing sets was a "colourable imitation calculated to deceive." Mr. E. B. Vignoles stated in the course of his evidence that the sale of "Meggers" was from 1,200 to 1,500 a year, and still increasing. In cross-examination it was shown that the term Omega was used for some measuring instruments at least as far back as 1903, and a voltmeter sold by Isenthal & Co. bearing the sign  $\Omega$  was produced. A question as to whether this line of evidence was disclosed in the pleadings was raised, and Mr. Justice Neville offered to allow time for the pleadings to be amended. After consultation, however, Mr. A. J. Walter, K.C., who appeared for Evershed & Vignoles, asked for the action to be dismissed without costs. Mr. H. A. Colefax, K.C., who appeared for Mr. R. W. Paul, however, asked for costs, and these were allowed with the exception of the costs of witnesses intended to be called to speak to the general use of the term Omega in the electrical trade.

## THE "MODEL ENGINEER" EXHIBITION

**A**T the Model Engineer and Scientific Exhibition, now being held at the Horticultural Hall, there is a good display of wireless telegraph apparatus with different degrees of finish and reliability. Some examples of well-finished apparatus may be seen at the stand of the Static Scientific Co. (237-239 Katherine Road, East Ham). In particular may be mentioned a patented adjustable condenser, in which the moving plates are completely encased in a moulded di-electric. There are also high-pressure condensers made for a wide range, flat pattern oscillation transformers, crystal and electrolytic detectors, and the other accessories incidental to wireless work. The Company manufactures receiving and transmitting sets for different purposes, while time-signal receiving sets, motor-generators, switchboards, &c., are supplied. Here also one can see the Gibson patent insulated terminal, which was illustrated and described in *ELECTRICAL ENGINEERING*, September 25th, p. 546.

A large range of wireless apparatus to meet almost every experimenter's requirements is shown by A. W. Gamage & Co., Ltd. In addition to its stand in the body of the hall, this Company has erected an aerial in connection with receiving apparatus in the wireless telegraph section. This section is in a separate room up the stairs, where also may be found the exhibits of the British School of Telegraphy, Ltd. Some actual transmitting and receiving apparatus for land and submarine lines, as well as wireless, is shown working, and the methods adopted by the Company for training operators may be learned. Allied to this company also is the British Telegraph Instrument Co., Ltd., which has a large stand on the ground floor, where much apparatus for use by the Marconi Co. and different Governments may be seen. Of particular interest perhaps is a set designed for meteorological purposes, by which a station can be rapidly picked up, and then, by substituting a crystal detector, rapidly and accurately tuned. A crystal detector with a large crystal eccentrically mounted is also shown. This is of robust construction, and can be readily adjusted so that maximum sensitiveness can be obtained. Among the other exhibits is a "Horphone," and some electrical clocks, bell controllers, and an automatic time-ball, shown by the Synchronome Co., Ltd. Some other firms are exhibiting model apparatus and electrical novelties, while some amateur work is on view. Small lathes and tools are also well represented.

**Lightning Arresters.** In the August and September issues of the *General Electric Review* Mr. E. E. Freighton discusses the features of American and European practice with lightning arresters, with the object of showing that the aluminium arrester meets every case. He finds that simple horn gaps are often used in Europe, as they give a large discharge rate, but that they give poor protection on account of the large gap setting. In addition a short circuit of the power is produced at every simultaneous operation of two or more gaps, synchronous apparatus is caused to drop out of step, and a complete interruption of power on the circuit to which they are connected results. In American practice the aluminium arrester is largely used. This gives a discharge rate high enough to take direct lightning strokes, but not so high as the horn arrester, and without the drawbacks of the latter, and, as the gap length is less, greater protection is afforded. The author considers that delta connected horn gaps with large settings without series resistance are unnecessary. Y-connected horn gaps with moderate settings and with enough series resistance to limit the dynamic current to a range of 3 to 12 amperes, is the most recommended practice; but on high pressures too much power is taken from the circuit. At and above 2,300 volts the multi-gap arrester is cheaper, and takes less energy from the circuit. Although the resistance horn gap arrester for medium pressures is largely used, because no other suitable inexpensive arrester is available, a new type of high protective value, it is said, will be put on the market shortly. This, it appears, will be of the aluminium type. The current-limiting action of the aluminium films enables small discharges to pass through a small gap setting and resistance, and performs the same gap functions in one-half cycle, whereas the horn gap takes 50-120 times as long to extinguish the arc. The practice of using multiple horn gaps connected between a number of series choke coils in the line has been discontinued in America, as the aluminium arrester can be set very close to the line pressure. These also make water jet arresters obsolete. The use of electrostatic condensers for shunting high frequency currents with a frequency less than 25 per cent. above normal are not now used in America, where "high-frequency absorbers" have taken their place. In a recent issue of the *Electrical World* (New York), concrete resistors, for use with horn-gap arresters on 11,000- and 22,000-volt lines in Georgia, are described. Two bronze-mesh electrodes are cast into a solid concrete block, 4 ft. long and 1 ft. square. The block is fixed upright on the ground, and the lower electrode earthed, while the upper one is connected to one limb of a double horn-gap arrester. The apparatus to be protected is connected to the other horn and through a fuse to the middle of the gap.



## THE CHESTER HYDRO-ELECTRIC POWER SCHEME

THERE are not many municipal electric supply schemes employing water power in England, and the power station which has been installed by the Chester Corporation on the site of the old Dee Mills, is unique on account of the special arrangements which have had to be made to deal with the variation in the available head of water entailed by the rise and fall of the tide in the estuary. The station will be formally inaugurated on Saturday, when the Mayor of Chester, Councillor H. P. Dutton, will entertain a number of visitors to lunch at the Town Hall.

It is unnecessary to record here in detail the whole history of the "Dee Mills," and the uses to which the available water

and to pull down the mills to the level of the Dee Bridge and Skinner's Lane, and it was then thought that the usefulness of the water at the weir for power purposes had come to an end. Mr. S. E. Britton, City Electrical Engineer, however, brought forward a scheme to convert the water power, which had been usefully employed for nine centuries, into electrical energy. The Electricity Committee, after obtaining a favourable report from Mr. A. C. Hurtzig, consented to the scheme, and after

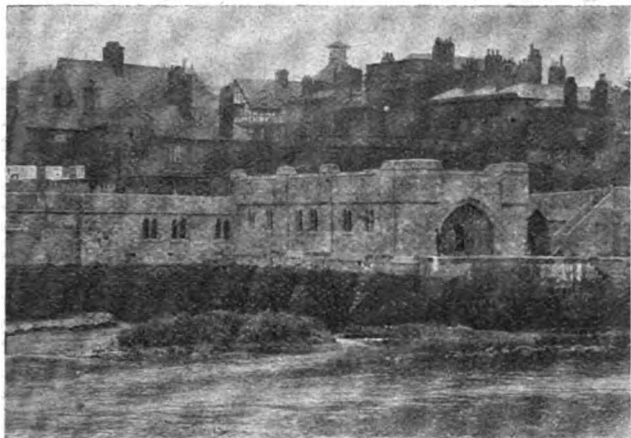


FIG. 1.—VIEW OF POWER HOUSE FROM EAST SIDE OF OLD DEE BRIDGE.

power at the site now occupied by the electric power station were put in the past, but it is interesting to note that the original and still existing stone dam was constructed by one Hugh Lupus, Earl of Chester, somewhere about the year 1100, partly for working flour mills by water power, and partly for the purposes of a salmon fishery. In subsequent times (from 1600 to 1857) the water power was used for pumping the town water supply as well as for flour mills, which latter industry was continued

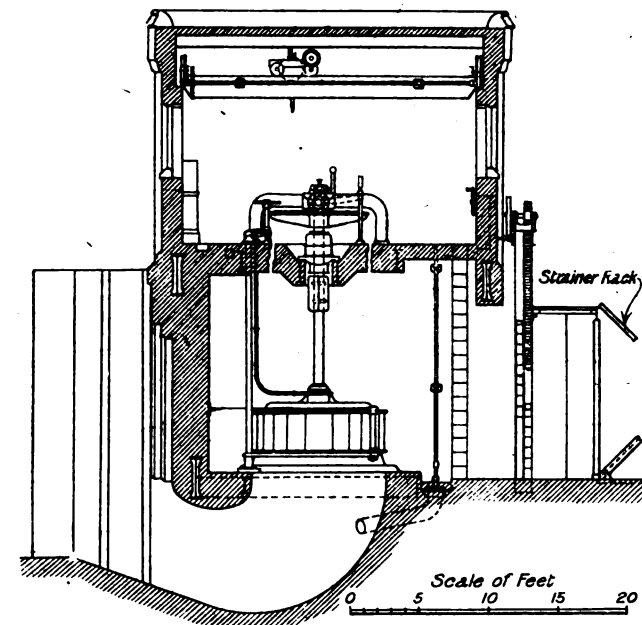


FIG. 3.—SECTIONAL ELEVATION, SHOWING LARGE TURBINE, SLUICE GATES, AND STRAINER RACK.

some considerable opposition the scheme was carried through and adopted by the Council. In view of this opposition, which was mainly based on the effect of the works on the interest of other users of the river, it should be pointed out that the Electricity Committee undertook that in the working of the installation, the water from the river above the weir should not be lowered by more than six inches below the mean height of the weir.

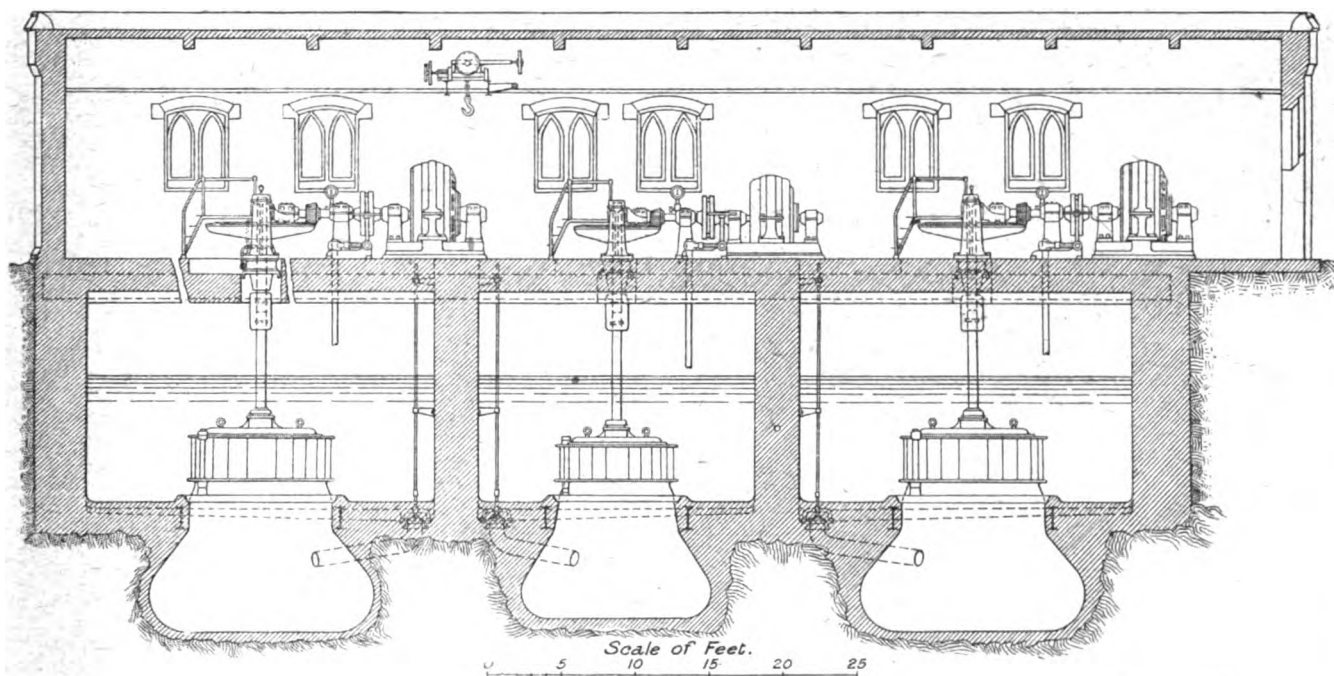


FIG. 2.—SECTIONAL ELEVATION OF POWER HOUSE, SHOWING TURBINES AND DYNAMOS.

down to 1908, when, after the last of a series of disastrous fires, the mills were finally abandoned for this purpose. The Corporation had acquired the property in 1895, and established a sewage pumping plant, which, however, was discarded in January, 1910. It was then proposed to sell the machinery

There were no mean engineering difficulties to be overcome in the reconstruction of the retaining walls, and the restoration of the bridge, which were made the more difficult by the flooded condition of the river and

abnormal high tides. Owing to the river being tidal it was necessary to adopt specially designed turbines and dynamos, capable of working efficiently over a wide range of speed, but the result has been an overall efficiency at all times, higher than usually obtained with constant speed plant. It is calculated that the average flow varies from 30,000 cu. ft. per min. in December,

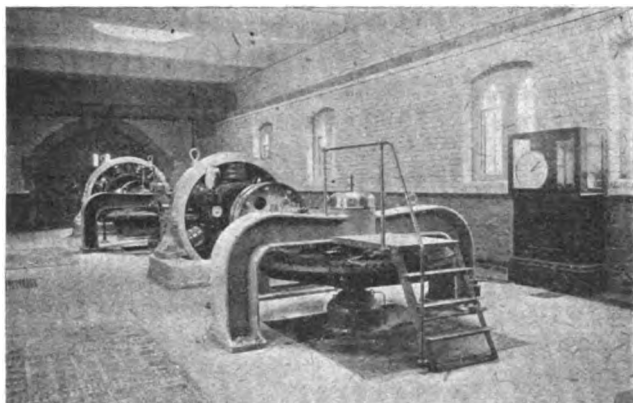


FIG. 4.—VIEW OF INTERIOR OF POWER HOUSE, SHOWING SMALLER GENERATOR IN FOREGROUND.

down to 20,000 in the summer months, with a minimum dry weather flow of 10,000 cu. ft. per min. The average head with neap tides varies from 4.5 ft. in the winter to 8.75 ft. in the summer, but at spring tides the weir is entirely submerged for an hour or two at the turn of the tide, and the turbines are drowned. The weir is placed diagonally across the river at the east side of the old Dee bridge. The water passes to the power-house and enters the turbine pits through a strainer rack and sluice gates, and passes out directly into the lower river. A view of the exterior of the power-house is given in Fig. 1. The general arrangement of the turbines, with their vertical shafts driving the dynamos through bevel gearing, is shown in Figs. 2 and 3.

The power house is 89 ft. long by 24 ft. 6 in. wide, and measured from the bottom of the head-race 36 ft. high. It is mainly constructed of steel and concrete; the exterior is faced with sandstone rock, and the interior with glazed brick. The foundation is on sandstone rock. The under-water work forming the head-race, the three turbine pits, and the tail-race are of concrete and steel. On the external face of the

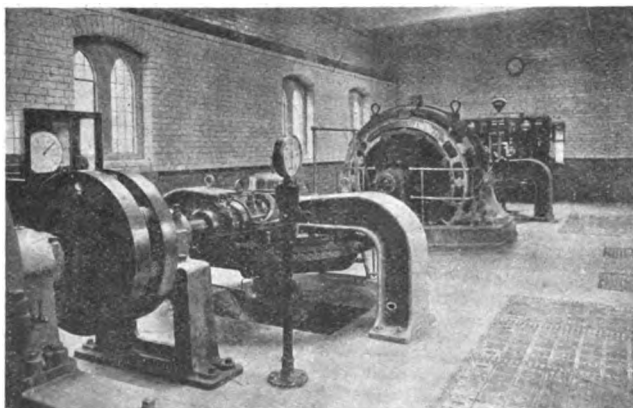


FIG. 5.—VIEW SHOWING FLEXIBLE COUPLING AND GEARING, WITH ONE OF THE LARGER GENERATORS AND THE SWITCH-BOARD IN THE BACKGROUND.

down-stream side of the turbine pits are placed three cut waters and Gothic arches, harmonising with the adjoining bridge. The external of the above-water part of the building, including the dynamo and switch-room and stores, is in sandstone, and contains twelve pairs of Gothic windows, and the interior is lined with glazed brick. The building is covered with a flat reinforced concrete roof covered with asphalt. There are three circular glass domes in the roof. The retaining wall between the bridge and the power house and 121 ft. of river

wall have been rebuilt, and that part of the old bridge which stands in the head-race and formed part of the old mills has been restored.

There are three vertical-shaft Francis type turbines which were supplied by J. Gordon & Co., designed for working under a head of water varying from 1 to 9 ft., two of which are designed for dealing with 30,000 c.f.m. under an actual working head of 9 ft., and capable of developing 415 B.H.P. at a speed of 50 r.p.m.; the other is designed for dealing with 22,000 c.f.m. under similar conditions, and capable of developing 305 B.H.P. at 55 r.p.m.

The turbine runners are constructed with buckets of forged steel plate cast into a centre boss and surrounding ring of iron, and are keyed to the shafts. The guide casing is of cast-iron, and the guide blades are of cast-iron bushed with gunmetal, and mounted on steel spindles. Each vane is fitted with a link which connects on to a regulating ring, which is operated by two vertical regulating shafts connected by levers and connecting rods to another shaft extending above the floor level and there connected to the hand regulating gear. Each turbine is provided with a set of hand operating gate gear mounted on the generator floor. The revolving weight is supported by a collar suspension bearing, fitted at the upper end of the vertical shaft on the generator floor, and supported by a heavy cast-iron bridgetree. The thrust rings of the suspension bearing are submerged in oil.

The power is transmitted from the vertical to the horizontal shaft by a pair of Citroen machine-cut helical bevel gears, the gears for both the large and small turbines are of cast steel, and the pinions of forged steel, having a ratio in speed of 1 to 5 in each case. These gears are clearly shown with their covers removed in Figs. 4 and 5, together with the flexible

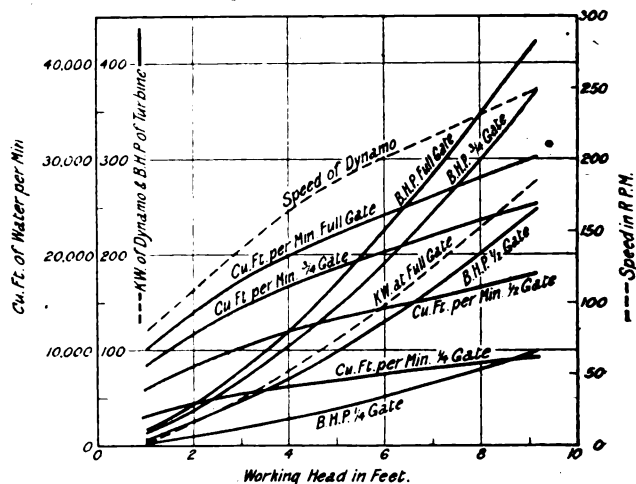


FIG. 6.—CURVES OF OUTPUTS, &C., OF LARGER SET, AT VARIOUS HEADS.

couplings through which the dynamos are driven. Each turbine is provided with recording head and speed gauges.

One complete strainer rack of flat wrought-iron bars is provided across the full width of the head race. There are three complete sets of sluice gates, each set consisting of two pitch-pine gates of the double lifting type; the gates are 11 ft. 6 in. high from the bottom of the head race channel to the top when closed; the lower gates are provided with channel section lifting bars with cast steel racks, and the upper gates are provided with lifting angle plates, which enable the lower gates to lift and carry upwards the upper leaf of the gates. Each sluice gate is provided with a double set of head gear, the worm wheels of which engage on to a shaft fitted with two worms and a bevel wheel, so arranged that each sluice gate under full head pressure is operated inside the power house by one man. The contractors for the building, strainer rack, sluice gates, turbines, gears, horizontal shafts, flexibles, couplings, and travelling crane were J. Gordon & Co. (81 Knightrider Street, E.C.).

The generators are of the shunt-wound interpolar type, manufactured by the Lancashire Dynamo & Motor Co. (Tramford Park, Manchester). Each is mounted on a bed with two pedestal bearings, and coupled to its turbine by means of a flexible coupling. The two large generators each have an output of 225 kw. 440–500 volts, at a speed varying between 143 and 285 r.p.m., while the output of the smaller generator is 185 kw. 440–500 r.p.m. at any speed between 167 and 300 r.p.m. Although the normal maximum speed of either machine is approximately 300 r.p.m., the armatures are banded with steel wire so that they may be safely run at 500 r.p.m. without fear of damage. The higher speed is given when the load is instantaneously thrown off the turbine, as, for instance, in the event of the generator circuit-breaker operating. Special attention has been paid to the insulation

throughout the machines, so that it may withstand the action of the damp atmosphere. In order to obtain specially cool field coils, these are wound in sections with air-spaces between them. A special pattern of box-type brush gear is employed. The curves in Fig. 5 show the way in which the output and speed of the large machine varies with the head of water at different gate openings. The speeds to which the machines would rise on sudden removal of the load are about 70 per cent. in excess of the values given.

The generators are controlled from a switchboard manufactured by Crompton & Co. (Arc Works, Chelmsford), and erected at one end of the power house. It consists of three enamelled slate panels, on which is mounted the usual apparatus for the control of direct-current generating plant. The current generated is conveyed by three lead-sheathed and steel-armoured cables laid direct in the ground to a sub-station at the Cross. As much of the current as is required to meet the demand of that area is distributed from the sub-station; the balance is sent to the steam generating works at New Crane Street, where it passes through a reversible booster, and is either sent out to other areas of supply or stored in a battery in readiness for the next peak load. This booster set was also supplied by the Lancashire Dynamo & Motor Co. It is of the three-wire type, and consists of a motor mounted between two boosters on one cast-iron bed. All machines are of the open type shunt-wound interpolar. The motor is suitable for running from 420-475 volts, and each booster is capable of developing 40 volts continuously with 700 amps. at a speed of 750 r.p.m. The boosters are of the hand reversible type, each field being governed by a reversing potentiometer shunt regulator and excited from 210-237 volts.

The arrangement of the plant provides flexibility and economical running under the varying conditions of flow and head, as one will deal with the dry weather flow, two with the average flow, and three at the times of wet weather flow and low heads. It is estimated that the installation will yield about 1,250,000 units per annum at a cost, including capital charges, of rather less than 0.3d. per unit.

In conclusion we wish to express our thanks to Mr. S. E. Britton, City Electrical Engineer, for putting at our disposal particulars of the plant, together with the drawings and photographs from which our illustrations have been prepared.

## THE "IDEAL HOME" EXHIBITION

NOW that the "Ideal Home" Exhibition is open, we can say that it is very much as we thought it would be, and the applications of electricity shown are proving to be great attractions for the multitude. This is, of course, highly desirable. However, after all the publicity which has been given to "La Maison Electrique," promoted by the Electricity Supply Publicity Committee, the reality is a little disappointing. In the first place, its position in the hall renders it so inconspicuous as to be difficult to find, and the space occupied is none too large. Again, the exhibit has not the appearance of a "house," but looks rather like a collection of stands, which are viewed as well from the outside as inside. A considerable amount of representative heating, cooking, lighting, and other domestic and office apparatus, however, has been brought together, but it is too cramped up to be effective. The wonderful dining-table is not at all impressive, and there is nothing to convince the spectator that it is not worked by hand; and as a finale to the visitor's tour through the stand leaves him confused as to which are the real benefits that electricity can afford in his home.

A few stands away, however, is the exhibit of Rashleigh Phipps & Co., where there is a room fitted with different types of lighting by metal filament lamps—cornice, indirect from suspended bowls, semi-indirect, &c. The control is from a number of switches, on which is marked the power taken by the lamps controlled by each, so that the results from the different systems under the same conditions may be visually compared. There also one may see handsome designs of Prometheus, Belling, and G.E.C. radiators, and, as we mentioned last week, there are irons, lamps, and cooking apparatus on view. The new G.E.C. grill and oven, with polished case and air-space between the outer and inner walls, are being used for cooking operations, while electric ironing and sewing are also carried out. Small ozonisers, table fountains, electric clocks, and other novelties, as well as the more utilitarian apparatus, are also displayed.

Adjoining this stand is that of the Dowsing Radiant Heat

Co.; Ltd. Here, in addition to the apparatus mentioned in ELECTRICAL ENGINEERING last week, is a new radiator with a single 750-watt red-hot element of the most recent quartz-protected type. This is sold at 36s., and should prove very useful for knee-hole desks and other restricted spaces. An air-lagged oven is now on view. This has been experimented with for a considerable time, and a similar one is used for cooking the daily lunch for the staff at the Company's show-rooms at 105 Great Portland Street, W. It is provided with two quartz-protected elements of 750-watts capacity. These are set at an angle of about 45° in the top of the oven, so that the cooking is largely done by direct radiation. Each element is controlled by a separate switch. A two-heat hot plate, maximum loading 900 watts, is provided on the top, and three normal-sized saucepans can be kept boiling. The oven easily takes a 6-lb. joint and other small viands.

A good general display is also being made by Edmundsons' Electricity Corporation. Automatic petrol-electric sets for country house lighting are shown; one is in operation on the stand, and miscellaneous fittings, some heating and cooking apparatus, vacuum cleaners, &c., may be seen. Other firms also are exhibiting vacuum cleaners of varying size and usefulness. On the stand of the British Vacuum Cleaner Co., Ltd., in particular, there are representative machines of every class. The most recent design of electric cleaner introduced by this Company weighs only 11 lb., and measures 14 in. by 7½ in. by 9½ in. A considerable amount of descriptive matter of the various machines is being distributed.

Another interesting stand to the electrical engineer is that of the Linolite Co. Here there are samples of the Woodhouse steel casing for encasing and protecting small wires. It is very unobtrusive, and takes less space than wooden casing, and may prove more convenient than screwed conduit, as well as being less unsightly for surface wiring. It is made of thin rectangular section galvanised steel in 3-ft. lengths. The under part is nailed or screwed to the wall, and the wires laid in place and the cover sprung into position. Joint clips, angles, tees, &c., are all quickly fitted in a similar manner, so that an electrically continuous circuit is provided. For getting over obstructions, such as cornice rails, a bendable casing has been introduced. This is also simple, and is an ingenious idea. It can be obtained in 5-in., 8-in., and 12-in. lengths. The outside dimensions of the standard casing are ¾ in. by 7⅞ in., and 1½ in. by ⅝ in. Some examples of the "Tubolite" system of lighting by tubular metal filament lamps in narrow polished aluminium or white enamelled reflectors are also on view. The reflectors are specially designed for different purposes, and can be made up into any length. The metal filament lamps have an average life of 1,000 hours at 1.45 watts per c.p., and are the same size as the old carbon filament lamps.

On the stand of the Altheat Co., Ltd., may be seen a new lamp radiator with humidifier with louvre front, treated with a special varnish so as to have a reddish appearance when the radiator is switched on. At the bottom there is a tank of water into which wicks depend from a funnel-shaped chamber, so that a current of heated air is circulated from the top of the radiator after being moistened by passing over the wicks. The design shown is very effective. In conclusion, it may be remarked that the numerous beautiful lighting effects obtained on almost every stand must be seen to be appreciated.

**The Development of Electrical Engineering.**—Dr. Edward Hopkinson's inaugural address to the Manchester Association of Engineers, delivered last Saturday, contained an interesting *résumé* of the history of the development of the dynamo. He mentioned the old machines shown at the Paris Exhibition of 1881, and dwelt upon the importance of the work of Dr. John Hopkinson from 1879 onward, which elucidated the conditions upon which the efficiency of the dynamo is based. He showed how the requirements of the earlier dynamos led to the development of the high-speed engine, and how, as the machines increased in size the multipolar design was evolved, and later the increasing commutation difficulties were met by the introduction of the auxiliary commutating pole. The question of speed came up in a new form on the introduction of the steam turbine, which called for higher speeds, introducing new problems, which were soon met with alternating current machinery, but had not yet been completely solved in the case of continuous currents. Turning to the development of the traction motor, he spoke of the gear and chain drives in the early tramways, the original direct-driven locomotives of the City and South London Railway, and the subsequent return to gear driving. He then spoke on the use of variable speed motors for general purposes, and in his concluding remarks referred to the accurate methods of measurement available in electrical engineering.

# "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

## Specifications Published October 9th, 1913

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

**Names in italics indicate communicators of inventions from abroad.**  
 14,056/12. **Turbo-generator Field Magnets.** A. ROLFE. The interpolar space is filled by the windings. These consist of wedge-shaped bars arranged in an arch and fitted into a dove-tailed groove. The use of insulation other than that due to the natural oxide is not contemplated. Eleven figures.

18,571/12. **Storage Battery Electrodes.** C. DE SEDNEFF. Prism shaped electrodes are pierced with series of holes at varying angles, so that a mass of intercommunicating cells results. The active material in the cells also embraces metallic ribs. Ten figures.

20,733/12. **Storing and Utilising the Kinetic Energy of Railway Vehicles.** O. WULFERDING. An auxiliary car carries an axle-driven dynamo, storage battery, driving motors, and an automatic two-way switch worked by a centrifugal governor, so that above a predetermined speed the battery is charged, and below that speed the motors fed by the battery assist the main driving power on the train. Manual control is provided as well as the automatic control, so that, if necessary, the effects may be reversed. Three figures.

27,530/12. **Time Limit Circuit Breakers.** E. O. MÖLLER (British Westinghouse Co.). A series trip coil in the main circuit and a retaining coil in parallel with a shunt in the main circuit are provided. The retaining coil is controlled by a hot-wire relay in parallel with the main current shunt. In a modification, the two coils and relays are included in the secondary circuit of a series transformer. Two figures.

1,156/13. **Electrodes for Ozonisers.** J. C. A. HENDERSON. To increase the yield of ozone and the efficiency of the ozoniser, the electrodes are made of aluminium sheets, cut so that they may be expanded like the expanded metal in general use. It is said that the dielectric becomes more durable. Two figures.

1,804/13. **Incandescent Lamps.** O. SCHALLER. The lamp is made in two parts connected by an air-tight joint. The design is covered by specification No. 16,195/11, but it has been found that detrimental gases are given off from the packing (indiarubber, impregnated paper, &c.) there suggested. It is now proposed to make the leading-in conductors have a common perpendicular axis or converging perpendicular axis. As packing, lead under heat and pressure is suggested. Seven figures.

3,769/13. **Ozonisers.** J. STEYNIS. The apparatus comprises the combination of an air drier, ozone generator, refrigerator (compressor and condenser), and pipes for conveying a cooling medium from the refrigerator through the drier and generator. A by-pass from the drier to the compressor is also provided. A high concentration and efficiency are realised. One figure.

5,546/13. **Automatic Diaphragm Switches.** H. C. E. BOUTARD. A switch is actuated by the expansion of gas in a chamber, due to heat, through the medium of a diaphragm. To compensate for atmospheric variations, a chamber of similar construction is differentially connected with the heated chamber, so that all movements of the diaphragm due to the atmosphere are counteracted. One figure.

9,695/13. **Sea Water Temperature Annunciator.** A. McNAB. The indicator is placed in the hull of a vessel, and subjected to a continuous flow of sea water. The indicator itself consists of a thermometer containing conducting and non-conducting liquids, while a series of insulated conducting studs is provided, so that a test lever, whose position is determined by the height of the liquid columns (in turn controlled by the temperature of the water), closes circuit through the conducting liquid and an incomplete alarm circuit, part of which is formed by the insulated studs in the thermometer. Four figures.

12,565/13. **Pupin Coils.** SIEMENS & HALSKE. To avoid cross-talk and other effects on physical phantom circuit combinations. Pupin coils are made with the different coils divided into concentric sections. There is a different number of winding sections belonging to the separate coils in every plane of the winding, and an approximately uniform field distribution in every plane of the winding. Fourteen figures.

14,390/13. **Interpole Dynamos.** SIEMENS-SCHUCKERT. To reduce flux pulsations in the interpoles, windings are closed through a condenser with or without resistance and reactance, either directly or through a transformer. Alternatively a special winding may be used. Three figures.

16,454/13. **Series-Parallel Switches.** SIEMENS-SCHUCKERT. Switches for connecting two circuits in series or parallel are described. The fixed contacts of the series position co-operating with the movable arms are permanently cross-connected to the opposite movable arms. Thus there are two parallel paths when the reverser is placed in the series position. One figure.

## Specifications Published To-day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free.

Summaries of some of the more important of these patents will appear in our next issue.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** GRABHAM [Resistance composition] 27,500/12; B.T.-H. Co. (G.E. Co., U.S.A.) [Rubber-like material] 9,985/13.

**Dynamos, Motors, and Transformers:** SIEMENS DYNAMO WORKS and KIEFFER [Cooling] 21,822/12.

**Electrometallurgy and Electrochemistry:** HIGGINS [Electrolytic decomposition] 22,280/12; MORGAN CRUCIBLE Co. and SPIERS [Furnace crucibles] 24,626/12.

**Heating and Cooking:** MARKS (Landers, Frary & Clark, U.S.A.) 22,258/12; RUTHENBURG [Heaters for liquids] 47/13; RAVES [Heaters for liquids] 7,469/13.

**Incandescent Lamps:** B.T.-H. Co. (G. E. Co., U.S.A.) 23,086/12.

**Instruments and Meters:** WALL and FERRANTI Co. [Two-rate mechanism] 22,339/12.

**Storage Batteries:** FULLER, 22,053/12.

**Switchgear, Fuses, and Fittings:** DORAN [Switch] 20,270/12; GRIGSBY [Cord grips] 3,014/13.

**Telephony and Telegraphy:** AUTOMATIC TELEPHONE MANUFACTURING Co. (Automatic Elec. Co., U.S.A.) [Telephone systems] 19,249/12, 19,250/12, and 19,253/12; MCBERTY [Telephone exchange] 25,174/12; GRAHAM [Loud-speaking telephones] 25,911/12; GOTTSCHALK [Telephone transmitters] 26,964/12; RICHARDSON and McCULLUM [Working tyers, railway block telegraph instruments, &c.] 29,328/12; BETULANDER [Impulse transmitters for automatic telephones] 4,792/13; [Selectors] 6,465/13.

**Traction:** HANDCOCK, DYKES and DUDDELL [Railway signalling] 25,333/12; HEINZE [Magnetic wheels] 10,894/13.

**Miscellaneous:** CHESSIN [Determining a ship's position] 21,610/12; B.T.-H. Co. (G.E. Co., U.S.A.) [Coating and impregnating moulded materials] 22,449/12; GALLOWAY [Batteries] 2,402/13; BRITISH ERICSSON MFG. Co. and ROGERS [Enunciators] 5,626/13; SCHNEIDTZIK [Medical electricity apparatus] 13,145/13; MALONE [Temperature alarm] 17,112/13.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Dynamos, Motors, and Transformers:** BOUCHEROT [D.C. transformers] 19,588/13.

**Electrometallurgy and Electrochemistry:** KRUPP A.-G. [Electrodes] 17,925/13.

**Ignition:** KETTERING [Engine starting] 3,655/13.

**Instruments and Meters:** PAUL BRANN & Co. [Recording galvanometers] 20,796/13; STEPHENSON [Voltmeter] 21,143/13.

**Telegraphy:** OTTO [Synchronisation by waves] 20,798/13.

## Amendments to Specifications under Section 8

14,685/11. **Multiple Carbon Arc Lamps.** SIEMENS DYNAMO WORKS (Siemens-Schuckert.). The Specification deals with arc lamps in which a number of electrodes in parallel are used.

10,996/12. **Self-Starters for Internal Combustion Engines.** B. BROOKS and W. HOLT.

## Expired Patents

The following are the more important Patents that have become void through non-payment of renewal fees.

**Arc Lamps:** B.T.-H. Co. (G. E. Co., U.S.A.) [Flame electrodes] 14,196/04; SIEMENS DYNAMO WORKS and C. R. RIBER [Search light feeds] 13,580/08.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** F. KUHLO [Armoured cables] 13,489/08.

**Dynamos, Motors, and Transformers:** ELEKTRICITÄTS A.-G. VORM LAHMEYER [Protecting end coils from high pressures during switching] 11,168/04; J. C. LINCOLN [Adjustable speed shunt motor with movable conical armature] 13,427/06.

**Electrochemistry and Electrometallurgy:** A. LEVY [Removing metallic coatings by electrolysis] 13,666/08.

**Ignition:** H. DE LA VALETTE [Construction of magneto and distributor for varying the times of ignition] 13,252/05.

**Incandescent Lamps:** F. HARRISON [Spring supports for metal filaments] 26,294/07; P. G. TRIQUET [Supports for metal filaments] 13,449/08.

**Storage Batteries:** W. PETO (P. Gouin, France) [Traction battery plates with perforated ebonite shields] 12,954/01.

**Switchgear, Fuses, and Fittings:** R. F. VENNEN. R. C. GRIESBACH, and D. K. MORRIS [Remote control switch] 13,327/08; SIEMENS DYNAMO WORKS (Siemens-Schuckert) [Non-interchangeable cartridge fuses] 13,450/08.

**Miscellaneous:** K. HEINTZ [Bunsen cells] 13,671/08.



## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,360.

I have recently come into possession of a dynamo rated at 19 amps. 110 volts 1,400 r.p.m., but find that I cannot get more than 60 volts at this speed, 88 at 1,580 r.p.m., or 92 at 1,620 r.p.m. The armature is ring-wound, and the connections, &c., appear to be in good order. There is no sparking, but the armature and the bearings at the commutator end get rather hot. Is it advisable to run the machine at a still higher speed to obtain 100 volts, or would it be preferable to use lamps of lower voltage, if no method can be suggested to make the machine give the correct voltage at the right speed; and in this case what ampere capacity should be expected from the machine? It should be mentioned that the armature was recently re-wound, and it is possible that some error may have been made. What would be a fair cost for re-winding correctly if this is so?—"SMALLMAN."

(Replies must be received not later than first post, Oct. 23rd.)

### ANSWERS TO No. 1,358.

It is required to drive an existing planing machine with a 20ft. travel and vertical and horizontal feeds of 10in. with provision for three tools by individual motor drive. The machine is at present driven by belting on to a 24in. pulley running at 300 r.p.m., and there are stepped pulleys on the counter-shaft so that a 50 per cent. variation in the speed of the cutting stroke can be obtained in several stages. The usual automatic belt-shifting arrangement is provided to obtain a quick return, but the pulleys for this purpose could easily be removed if it is decided to obtain all the variation of speed by control of the motor. Give a specification which would enable an electrical firm to quote alternatively for a constant or variable-speed 500-volt continuous-current motor with complete control equipment.

The first award (10s.) is made to "W. H." for the following reply:—

Assuming the planer to be for average duty, about 40 h.p. would be required to drive same. First taking the constant speed motor, it would probably be cheapest to belt drive on the existing 24 in. pulley running at 300 r.p.m.

The specification should read as follows:—Contractors to supply a compound wound commutating pole motor capable of developing 40 h.p. continuously and overloads of 25 per cent. for one hour and 50 per cent. momentarily. Speed of motor about 500 r.p.m., and shaft to be fitted with pulley about 14½ in. diameter, to give a belt speed of 1,880 ft./min. Supply voltage, 500 D.C. Temperature rise of motor not to exceed 40° C. after six hours' full load. A high potential test of 2,000 volts to be applied for one minute between all windings and frame of machine. The motor is to be provided with covers to protect the moving parts from flying chips of metal. The following control gear is also to be supplied:—One starting rheostat fitted with no-volt and overload release, and capable of starting the above motor with full load current at infrequent intervals.

Alternatively, contractors are to quote on an electrical equipment suitable for varying the cutting speed by 50 per cent., and giving a high speed return stroke. For this purpose a motor with a speed variation of at least 3/1 and reversible is to be supplied, the horse power and voltage being as before,

but the motor, which is to be suitable for gear driving, is to have a speed variation of 300/900 r.p.m., and is to be reversible without shifting the brush position. The motor will require to be continuously rated at 40 h.p., and must be capable of withstanding the following overloads: 25 per cent. for one hour, and 100 per cent. momentarily at any speed over the whole range. Insulation tests as before. The motor must be capable of accelerating quickly and reversing quickly without sparking. The following control gear will also be required:—A set of contactor gear, suitable for starting up the above motor; for reversing same and for speeding up the motor by shunt field regulation. A field rheostat is to be supplied to give the required speed variation from 300 to 900 r.p.m., and also the necessary resistances for starting purposes. A suitable device is to be provided, which will be operated mechanically from the bed of the planer at each end of the stroke, and which will automatically operate the contactors, giving reversal of motor at each end of stroke and the necessary speeding up on the return stroke. It must be possible to set the speed of the motor during the cutting stroke at any point between 300 and 450 r.p.m., and a suitable mechanically operated switch must be provided, such that in case of a failure of supply of current, the planer bed will be prevented from overrunning by a braking effect, preferably produced by short circuiting the armature before the field has died away. In order to prevent rushes of current when speeding up, a relay must be provided to short-circuit a part of the field resistance if the current exceeds a predetermined value, and as soon as the current falls below this value to automatically reinsert the resistance. In order to work economically, it is desirable that the energy given up by the planer bed during retardation should be returned to the line in the form of current, either by strengthening the field automatically and thus generating current, or some other suitable means. It is also necessary that the contactors should open the circuit for reversing only when the current is at a low value. The necessary current limiting devices in the form of circuit breakers with overload and no-volt releases are to be fitted on the contactor panel.

The second award (5s.) is given to "Alph.," who writes as follows:—

There is little doubt that a more satisfactory result would be obtained by installing a variable speed reversible motor direct connected to the driving shaft of the planer and entirely eliminating the belting, &c., than by driving the planer by a constant speed motor and retaining the mechanical speed-changing and reversing devices. Although the purely electrical control is higher in first cost, it is much more efficient, eliminating the losses in the belting and also the wear and tear of the belts themselves; with a belt drive the unavoidable slipping of the belts at reversal and on heavy cuts not only involves very heavy friction losses and wear and tear, but also reduces the speed of operation, and thus decreases the output of the planer as compared with that obtainable with a direct-connected motor. This loss of output is a serious item, the time of operation with a direct-connected motor being reduced in some cases to 60 per cent., or even less, of the time taken by a belt-driven machine to perform the same work. Without full particulars of the class of work done on the planer, it is difficult to assign a rating for the motor, but from the particulars given it would seem that a 35-h.p. motor would be satisfactory for direct connection. The motor would not be working at full load continuously, and a one-hour rating would probably meet the case. The question does not state whether the 300 r.p.m. specified for the driving shaft corresponds to the maximum or the minimum cutting speed required, but we will assume it is the latter. A return speed of four times the minimum cutting speed (i.e., 1,200 r.p.m. on the driving shaft) will probably be about right, and will also be suitable for the motor, since a speed variation of about 4:1 is the maximum that can be obtained by shunt field control of a D.C. machine with certainty of good operation. The motor for direct connection will therefore require to be a variable speed reversible machine rated at 35 h.p., 300/1,200 r.p.m., 500 volts, with a temperature rise not exceeding 40° C. as measured by thermometer on the hottest part of the machine after running on full load for one hour. The motor should be fitted with commutating poles, and should operate without visible sparking at any load from no load to 50 per cent. overload, and all speeds from 300 to 1,200 r.p.m., in either direction; it should also withstand 100 per cent. overload for one minute without injury. It should be of the ventilated type and fitted with hooded covers arranged so as to prevent the possibility of metal chips, &c., falling into the motor, unless the arrangement of the planer is such that the motor is mounted high up out of the way of such chips. The machine will require a small amount of compound winding to give stability on the higher

speeds, but should have a shunt characteristic. The control gear will consist of two field rheostats (one for the cutting and one for the return stroke), starting and braking resistances, contactors for making the required connections, a master switch operated by dogs carried by the planer table, and a main switch and fuses. The field rheostats will be set by hand to give the required speeds. They should be marked "Cutting" and "Return" and provided with a scale calibrated to show directly the speed of the table in feet per minute. The contactors should be provided with the necessary mechanical and electrical interlocks to prevent the possibility of short circuits and to ensure that they cut out the resistance sections in the right order. They should also be provided with some form of current limit control to protect the motor from being overloaded by too rapid acceleration. With a properly designed contactor system a separate starting rheostat will be unnecessary, it being sufficient to close the main switch, when the contactors will automatically cut out the resistance in steps, and bring the motor up to speed, after which the operation will of course be automatic, reversing, acceleration, and braking being effected by the contactors, controlled by the master switch on the planer. If the table and work are heavy and the speed high (as is probably the case in this instance), it is advantageous to arrange the electrical braking with a resistance in series with the motor armature on the first step, this resistance being cut out in two or more steps, thus avoiding the heavy current rush which would take place if one braking point only (necessarily of comparatively low resistance) were provided. So long as the control equipment complies with the above requirements, it will be found more satisfactory, as well as cheaper, to leave the actual details to the makers, choosing, of course, a reputable firm who have had experience in similar work. The specification should state the range of speeds required in each direction, and also the approximate weight of the table with the heaviest work it is likely to handle, since this will materially affect the design and cost of the braking resistance, and possibly of the motor also. If a constant speed non-reversing motor is decided on, a rather higher rating should be specified to allow for the loss in the belting, &c. Probably a 45-h.p. motor on a one-hour rating would not be too large. The machine will, however, be somewhat cheaper than the 35-h.p. variable speed motor specified above, since it will be arranged for belt drive instead of direct connection, and is therefore not limited to a low speed. The actual speed may safely be left to the manufacturer, the purchaser specifying the size and speed of the driven pulley. The temperature rise should not exceed 40° C. after a full load run for one hour. The necessity for hooded covers will depend, as in the previous case, on the location chosen for the machine. The motor should operate sparklessly up to 50 per cent. overload, and without injurious sparking up to 100 per cent. overload, and should be compound wound in order to withstand the sudden overloads to which it will be subjected. The control gear will consist merely of the ordinary starting panel with switch, fuses, and starting rheostat. In addition to the necessary tests to determine that the apparatus will comply with the requirements specified above, the whole equipment, whether variable speed or constant speed, should have a flash test of 1,500 volts A.C. for one minute applied at the makers' works while the motors, &c., are hot after the heat run. The apparatus will also, of course, need to be fitted with the necessary protecting covers, &c., to comply with the Factory Regulations. Finally, it should be mentioned that the h.p. ratings specified above are only approximate, and should be checked by reference to the makers of the planer.

## NEW ENGINEERING LABORATORIES AT DUNDEE

THE new engineering laboratories which have just been completed at University College, Dundee (University of St. Andrews), were formally opened on Tuesday by Sir Alexander Kennedy. The cost of the new block with its equipment has been defrayed by a grant of £10,000 made by the Carnegie Trust for the development of the Scottish universities, and is from designs by Sir R. Anderson & Paul, architects in conjunction with Dr. A. H. Gibson, professor of engineering at the College. The department comprises a main building of two storeys, containing lecture-rooms, drawing offices, library, private rooms, and hydraulic laboratory, with a tower in which the ventilating machinery and a large storage tank is placed, and a wing containing a heat-engine laboratory and boiler-house, a strength of materials laboratory, a cement testing room, and a workshop. There is no fresh accommodation for electrical engineering, as the well-equipped Peters' electrical laboratory was only completed as recently as 1910. The heat-engine equipment comprises steam, gas, and petrol engines arranged for experimental work, and provision is made for the installation of a Diesel engine and a steam turbine in the near future. Steam is supplied by a Babcock & Wilcox boiler, with superheater, economiser, electrically-driven forced draught fan and feed-pump, and other auxiliary equipment. A 50-ton Buckton testing machine is

the principal item in the strength of materials laboratory. The hydraulic apparatus, which includes a Pelton wheel, a turbine, several pumps, and a 45-ft. flume, is very complete, and the workshop is provided with an equipment of machine tools. One, two, or three years' courses are arranged, and the degree of B.Sc. can be taken in civil, mechanical, or electrical engineering. A number of scholarships, exhibitions, &c., in engineering are open to competition.

## INDIRECT LIGHTING

THE illustration which is reproduced here has been sent us by the British Thomson-Houston Co. (Mazda House, 77 Upper Thames Street, E.C.), and represents an application of their well-known "eye-rest" system of indirect lighting in a large private house. In addition to



INDIRECT LIGHTING IN A DINING-ROOM.

the absence of glare, this system of lighting, owing to the even distribution, lends itself particularly well to showing up architecture and mural decorations, and renders separate lighting of pictures unnecessary. The bright illumination of the ceiling also gives an effect of height and space not obtainable otherwise.

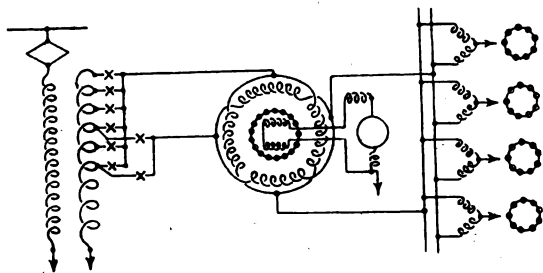
**Awards at the Ghent Exhibition.**—A list of the awards accorded to British exhibitors has been published by the Board of Trade. The following are the awards in Group V. (Electricity):—**CLASS 23.—MECHANICAL PRODUCTION AND UTILISATION OF ELECTRICITY.**—*Grand Prix:* Electric & Ordnance Accessories Co., Ferranti, Ltd., Vickers, Ltd. *Gold Medal:* R. A. Lister & Co. *Silver Medal:* A. Sauvée & Co. **CLASS 24.—ELECTROCHEMISTRY.**—*Grand Prix:* Siemens Bros. & Co. **CLASS 26.—TELEGRAPHY AND TELEPHONY.**—*Grand Prix:* General Post Office, Siemens Bros. and Co., Western Electric Co. *Diplomas of Honour:* Gell Telegraphic Appliances Syndicate, H. W. Sullivan. *Gold Medals:* British Insulated and Helsby Cables, Burt, Bolton and Haywood, Lamson Pneumatic Tube Co., Peel-Connor Telephone Works. *Silver Medal:* Gent & Co., Oliver Typewriter Co. **CLASS 27.—MISCELLANEOUS APPLICATIONS OF ELECTRICITY.**—*Grand Prix:* Siemens Bros. & Co. *Gold Medals:* Gent & Co., Sient Electric Clock Co.

**New Publication.**—Messrs. Cassell & Co. announce that they are to-day publishing the second volume of Dr. Mullineux Walmsley's "Electricity in the Service of Man." This deals with the "Technology of Electricity," and is divided in two main sections on the Generation, Transmission, and Utilisation of electric power and the practical applications of small electric currents.

**The Faraday House Journal.**—In addition to numerous items of news as to the doings of Faradians, the current issue of this Journal contains special articles on the Amsler planimeter and on high-tension transmission. Biographical notices appear of Mr. G. Scott Ram (H.M. Electrical Inspector of Factories) and Mr. B. Sankey, who has just left the Whitehaven electricity undertaking for Port Elizabeth.

**SPECIFY**For EXCEEDINGLY  
ARDUOUS  
CONDITIONS!**'IGRANIC'****SWITCHGEAR**IGRANIC ELECTRIC CO. LTD.  
LONDONWorks:  
BEDFORD**ELECTRIC TRACTION NOTES**

In the October issue of the *General Electric Review* (New York), Mr. E. F. W. Alexanderson gives some information on the split-phase locomotive. This is the name given to locomotives in which polyphase driving motors are fed from a single-phase contact line, as is being done by the American General Electric Co. on the Norfolk & Western Railway, which serves the hilly Pocahontas district of W. Virginia (*ELECTRICAL ENGINEERING*, September 11th, p. 517). Mr. Alexanderson thinks that the polyphase induction motor is the most adaptable to all the different types of locomotive that are being considered as having points of advantage. An experimental split-phase locomotive has successfully been through some severe tests, and a six-axle locomotive, with six motors, is now being constructed. Each motor is designed to give 300 h.p. continuously, and a tractive effort of 45,000 lbs. at 15 m.p.h. and 30,000 lbs. at 22 m.p.h. A diagram of the connections of a split-phase locomotive, using the rotary phase-splitting device, is given. The phase converter is a machine like a standard two-phase induction motor, with the addition of an exciting winding on the rotor. The phase converter may be likened to a series transformer connected in one phase of a two-phase induction motor and supplying energy to the second phase. The secondary current is, however, substantially  $90^\circ$  out of phase with the



primary current. This is effected by the addition of the synchronous excitation whereby the magnetising current can be changed from positive to negative, and eventually made zero. The action of the motor will be the same as from a direct two-phase supply, except that the impedance of the phase converter must be reckoned connected in series with the motor. The impedance drop in the converter can be compensated, and the full output obtained from the motors by leading the current from the second phase through a section of the main transformer, whereby the action of the transformer on the circuit of the second phase becomes a source of supply of wattless current, because the transformer pressure applied to the circuit is  $90^\circ$  in advance of the current flowing in this circuit. By adjusting the amount of wattless current thus supplied, the combined characteristics of motor and converter are the same as the characteristics of a simple induction motor. Pressure control only is necessary so that the maximum torque of the motors is not limited by the minimum line pressures, but by the k.v.a. available corresponding to the maximum tractive effort that can be utilised.

Before proceeding further with Mr. Balfour's scheme for taking over the Stirling tramways and converting them to electric traction, the Council has decided to call in Mr. Peter Fisher, General Manager of the Dundee Corporation Tramways, to advise.

The Newport (Mon.) Corporation has been advised to promote a Bill in Parliament for trolley omnibus powers.

**Fencing Electrical Machinery.**—The Eccles Industrial Manufacturing Co. was on Monday fined £10 and costs for not properly fencing an electric motor. The prosecution by the Inspector of Factories followed on an accident which happened to an employee, and in spite of which the firm refused to take the necessary precautions.

**TELEPHONY AND TELEGRAPHY  
(INCLUDING WIRELESS)**

It is not necessary in this column to enlarge upon the details of the mid-Atlantic tragedy which has been in the minds of all this week, but we must take the opportunity of rejoicing that wireless telegraphy has again been successful in saving many lives, on a greater scale than ever before, not only in enabling nearly a dozen ships to concentrate in a few hours near the ill-fated *Volturro*, but in providing means of communication to facilitate a concerted plan of action.

The two new cables laid for the Italian Government between Syracuse, and Tripoli and Benghazi respectively were described by Mr. Jona in a recent issue of the *Atti della Associazione Elettrotecnica*. The cable in each case consists of 7/0.82 mm. stranded copper, insulated with three layers of gutta-percha to a diameter of 7.1 mm., giving a copper weight of 130 lb. per naut, gutta-percha 143 lb. per naut. Brass teredo-proof tape is used to protect the core of the deep-sea cable, as well as on the shore end and intermediate, as previous experience on the Naples-Palermo cable had shown that damage from the teredo had actually occurred at depths as great as 3,500 metres. The shore ends are armoured with ten galvanised steel wires of 9.6 mm. diameter, the intermediate cables with ten wires 6.5 mm. diameter, and with 10.5 mm. respectively, and the deep-sea cable with 15/2.5 mm. The Tripoli cable has a length of 281½ nauts. The Benghazi cable is 415½ nauts long, 78 per cent. of which is accounted for by the undulations of the sea bottom. It lies mostly at a depth of nearly two miles, the maximum depths being 4,400 metres, or over 2.6 miles. The cables were made by the firm of Pirelli & Co. The English cableship *Cambria* was employed in laying the Benghazi cable, and the *Citta di Milano* for the Tripoli cable.

A Brussels telegram states that wireless messages have passed between the station at Laeken, near Brussels, and Boma, in the Congo.

An interesting use of the telegraph lines in America was made on Friday last, when the blowing up of the Gamboa Dyke on the Panama Canal was controlled by President Wilson from Washington. A circuit of 4,000 miles over the land lines and cables of the Western Union and Central South American Telegraph Companies was made use of. The signal sent from Washington was retranslated at Galveston (1,556 miles), whence it passed over 793 miles of cable to Coatzacoalcas, 180 miles of the land lines of the Tehuantepec Railway, 766 miles of the Pacific cable to San Juan del Sur, and the remainder by cable to Panama, where suitable relays switched on the current to ignite the explosives. The removal of this dam is, of course, not the actual opening of the Canal, but it renders a considerable portion available to light draught vessels, although the Culebra Cut is still completely blocked, owing to fresh landslides.

The Bissao-Bolama cable failed on the 8th inst., and was put into working order again on the 10th. The line beyond Boraz Joon, Persia, has been restored, and telegrams can again be sent to Ahvaz, Mohammareh, Behbahan, and Shushter.

**The Mazda House News.**—The British Thomson-Houston Co. have just sent us a copy of the first issue of their new house journal, which they are distributing to the trade "to give information on Mazda House matters, and to stimulate electric lighting business." It should succeed admirably in both these respects, and thereby be of great use to contractors. Many sides of the illumination problem are treated by the aid of excellent illustrations, and an effective colour scheme, in conjunction with high-class printing, render the whole publication most attractive. Those who are desirous of availing themselves regularly of the information afforded by this journal are invited to send their names and addresses to the Publicity Dept., Mazda House, 77 Upper Thames Street, E.C.

# THE LONDON ELECTRIC WIRE COMPANY

Telegrams: "ELECTRIC LONDON." **AND SMITHS LTD.** Telephone No. 3195 London Wall.

Offices and Warehouse: **PLAYHOUSE YARD, GOLDEN LANE, LONDON, E.C.** Works: { **CHURCH ROAD WORKS, LEYTON, E.**  
**ANACONDA WORKS, SALFORD.**  
**MANUFACTURERS OF EVERY DESCRIPTION OF CABLES AND WIRES FOR ELECTRICAL PURPOSES.**

**DYNAMO WIRES** Strips and Compressed Strands. **INSTRUMENT WIRES**, Silk and Cotton Covered.  
**EUREKA, PLATINOID** and other High Resistance Wires. **ENAMEL** Insulated Wires.

**FLEXIBLES. INSULATING VARNISH. BRUSHES. FUSE WIRES. JOINTING MATERIAL.**

**HIGH CONDUCTIVITY COPPER WIRE.**  
**SPECIAL TROLLEY WIRE.**

**SILICIUM BRONZE & PHOSPHOR BRONZE WIRE.**  
**ALUMINIUM WIRE.**

**MICA** **BRITISH MICA CO., LD.**  
 Contractors to  
 H.M. Government.  
 Lebanon Road Works,  
 Wandsworth, S.W.  
 Tel.—405 P.O. Putney.  
 Teleg.—"Micamini." London  
**MICANITE**  
 Plate Tubes,  
 Rings, &c., in

**PLATES**  
**MICANITE**  
**SEGMENTS**  
**RINGS**  
 THE MICANITE & INSULATORS CO. LD.  
 OFFICES AND WORKS—  
 WALTHAMSTOW, LONDON, E.

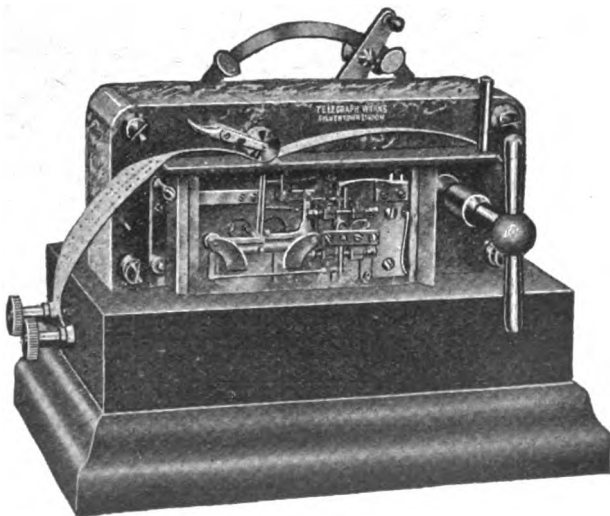
**CRYSELCO**  
**ELECTRIC**  
**LAMPS.**  
**KEMPSTON WORKS, BEDFORD.**  
 Telegrams: "Cryselco" Bedford.  
 Telephone: 177 Bedford.

**GLASS TUBES**  
**AND RODS**  
**FOR ELECTRICAL PURPOSES**  
**GUILBERT-MARTIN**  
**9, Edmund Place, LONDON, E.C.**

**ELECTRICAL PORCELAIN**  
 OF  
**HIGHEST QUALITY**  
 APPLY TO  
**JAMES MACINTYRE & CO., LTD.,**  
**BURSLEM.**

**F. WIGGINS & SONS,**  
**FOR** **MICA** **INSULATION**  
**102, 103 & 104, MINORIES, LONDON.**

## SILVERTOWN INSTRUMENTS



### WHEATSTONE Automatic Apparatus

**Transmitters & Receivers**  
**Working up to 400 words**  
**per minute**

**PRICES ON APPLICATION**

**The India Rubber, Gutta Percha and Telegraph Works Co., Ltd.**

**Head Offices:**  
**106, Cannon Street, London, E.C.**

**Works:**  
**Silvertown, London, E.**

*When corresponding with Advertisers, please mention "Electrical Engineering."*



## LOCAL NOTES

**Accrington: Gas Plant.**—During the course of the Electricity Committee's visit to view the Corporation's new gas plant, described in our issue of August 8th, p. 488, Alderman Higham, the Chairman, mentioned that the plant is now fully loaded, and that it will soon be necessary to take steps to increase it. As a matter of fact, the Electrical Engineer has been instructed to prepare plans and an estimate for a duplication of the present installation.

**Bangor: Electricity Tariffs.**—The Council has decided to increase the charge for electricity for lighting purposes by  $\frac{1}{4}$ d. per unit. The Committee's justification for this is that consumers are at present obtaining a reduction of 20 per cent. in their lighting bills by the greater efficiency of metal filament lamps.

**Derby: Charge for Heating and Cooking.**—The Corporation has adopted a recommendation of the Electricity Committee that consumers using electricity for cooking and heating as well as lighting be offered an alternative tariff on the rateable value system, the basis being 10 per cent. on the rateable value of the house, plus  $\frac{1}{4}$ d. per unit.

**Dublin: Electric Lighting Charges.**—The Electric Lighting Committee has been asked to report as to when it is intended to take off the extra charge of 10 per cent. which was imposed upon consumers three years ago. In agreeing that the matter should be reported upon, the Lord Mayor reminded the Council that since that time the cost of coal had increased from 10s. 6d. to 14s. per ton.

**Edinburgh: Electricity Tariff.**—The recommendation of the Electricity Committee to reduce the charge for private consumers from 2 $\frac{1}{4}$ d. to 2 $\frac{3}{4}$ d. per unit, together with certain other reductions in the discounts, has been adopted by the Corporation.

**Halifax: Electricity Tariffs.**—There was considerable opposition at the last meeting of the Corporation to the proposal of the Electricity Committee to modify the charges for electrical energy. The proposal was that for accounts up to 1,200 units per quarter 4d. per unit should be charged, with 2d. per unit for consumption in excess of that; whilst in the case of shop premises where electricity is the chief illuminant for lighting the interior, all current for exterior lighting in connection with advertising signs should be supplied at 2d. per unit, with a discount of 5 per cent. for prompt payment. The opposition in the debate came from the feeling which existed in Halifax between the Electricity and Gas Committees, the suggestion being that in the general interests of the town there should not be competition for customers in the matter of price between the two departments. Eventually the recommendation was passed by 25 votes to 24. The chief antagonism seemed to be with regard to the advantages offered for the use of current for outside window purposes, and, in spite of the fact that an amendment referring back the whole minutes was defeated, an amendment referring back that portion relating to outside shop purposes was subsequently passed, so that apparently the whole matter will have to come under the consideration of the Committee once more.

**Leeds: Purchase of Roundhay Electricity Co.**—There is considerable difference of opinion among the members of the Corporation as to a proposal by the Finance and Electricity Committees to take over the Roundhay & District Electric Lighting Co.'s undertaking at a cost of £12,390. Already the matter has been referred back once, and when it came before the last meeting of the Corporation there was a tie in the voting. In order to facilitate the other business of the meeting, the Chairman of the Electricity Committee took the recommendation back once more for further consideration.

**Liverpool: The Lister Drive Power Station.**—The reconstruction of Lister Drive No. 1 power station is making satisfactory progress, and it is anticipated that the water-tube boilers will be under steam next month. There are also on order two 6,000-kw. turbo-alternator sets for this power station.

**Redditch: Electricity Undertaking.**—At the last meeting of the Council, Mr. J. Blackford proposed that the Council should call a meeting of ratepayers to consider the advisability of selling the electricity undertaking, or of taking such other steps that might be thought best. It was pointed out that at present the undertaking involved a call upon the rates of some £3,000 a year, and objection was taken to the proposal to spend a further £10,000 upon the undertaking. Reference was also made to what was alleged to be the unsuitable site

of the works, and the suggestion was made that the undertaking, even as a municipal concern, could be made to pay if the works were removed to a more suitable site. Against this recommendation an amendment was moved by a labour member of the Council to the effect that an application should be made to the Local Government Board for a loan of £8,000 for extensions, and that the scale of charges be revised. Eventually further consideration of the matter was postponed until the Advisory Committee and the new Works Manager had reported to the Council.

**Scarborough: Proposed Purchase of Electric Lighting Co.**—Mr. J. W. Hame, City Electrical Engineer, York, has been retained by the Corporation to advise in connection with the proposed purchase of the Scarborough Electric Supply Co.'s undertaking.

**Stirling: Proposed Sale of Electricity Undertaking.**—Before going further into Mr. Balfour's offer to acquire the electricity and tramway undertakings, the Council has decided to request Mr. J. A. Robertson, the Borough Electrical Engineer at Greenock, to report with regard to the electric lighting undertaking, and Mr. Peter Fisher, General Manager of the Dundee tramways, to report with regard to the tramway undertaking. The Borough Electrical Engineer and the Borough Surveyor are also to be requested to furnish reports.

**Worthing: Street Lighting.**—In consequence of the satisfactory position of the electrical undertaking, the charge for street lighting is to be reduced by £300 per annum.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

## Generating Stations, Sub-Stations, Mains, &amp;c.

**Accrington.**—A duplication of the present gas plant at the electricity works is contemplated.

**Bulgaria.**—Tenders are invited for the supply and erection of an electric station at the Penik State Coal Mine. Further particulars at 73 Basinghall Street, E.C.

**Crowle.**—The Council has been approached by two firms of consulting engineers with regard to an electric lighting scheme.

**India.**—Steam turbo-alternators for East India Railway Co. Secretary, Nicholas Lane, E.C. October 29th.

**London: Poplar.**—The Finance Committee of the L.C.C. recommends sanction to loans of £17,626 and £9,333 for extensions at the electricity works.

**Shoreditch.**—The Finance Committee of the L.C.C. recommends sanction to a loan of £6,706 for mains.

**Woolwich.**—The Finance Committee of the L.C.C. recommends sanction to a loan of £4,280 for mains, services, and meters.

**Loughborough.**—A L.G.B. inquiry was held last week concerning a loan of £14,000 for plant extensions. It is proposed to instal A.C. plant in conjunction with a Ljungstrom turbine. In connection with this latter, the Inspector deprecated spending money upon what he termed a new and untried thing, and said that standard machines were more reliable. At the same time he admitted that he did not know sufficient about the Ljungstrom turbine to criticise it one way or the other, but he thought that an undertaking like that at Loughborough should not indulge in anything approaching an experiment.

**Manchester.**—Storage battery, battery booster, and switch-board. Chief Electrical Engineer. October 29th. (See advertisement on another page.)

**Nottingham.**—Extensions are contemplated at an estimated cost of £35,000.

**Sal.**—Storage battery and battery charging booster. Borough Electrical Engineer. October 23rd.

**Stretford.**—Sanction has been received to the borrowing of £5,000 for cables and services, and £2,000 for meters.

**Walsall.**—A L.G.B. inquiry was held last week concerning

## THE RECORD ELECTRICAL Co., Ltd.

LONDON OFFICE:  
CAXTON HOUSE,  
WESTMINSTER, S.W.  
Telephone:  
3007 Victoria.

ON SALE  
INSTRUMENTS.

RECORD'S PATENT.

Telegrams & Cablegrams:  
"Infusion,"  
London.

WORKS:  
BROADHEATH,  
MANCHESTER.

Telephone:  
104 Altrincham.

Telegrams & Cablegrams:  
"Infusion,"  
Altrincham.

Write for Prices & Particulars.

a loan of £4,840 for new plant at the electricity works. During the course of the inquiry, Mr. A. S. Barnard mentioned that the output for the present year to date is 12 per cent. in advance of what it was this time last year.

**Warrenpoint.**—It is stated that a firm of consulting engineers is advising the Council with regard to electric lighting.

**Waterford.**—Mr. E. M. Lacey's report upon the proposed electric lighting installation is now before the Committee, and he recommends a scheme at a cost of £27,338, of which the power station will absorb £16,200 and the distribution system £11,138. In addition, the street lighting scheme, in which 80-c.p. lamps on an average are to be employed, is estimated to cost £1,200.

**Wolverhampton.**—A L.G.B. inquiry was held last week concerning a loan of £22,000 for extensions at the electricity works.

### Wiring

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Cardiff.**—Five shops and billiard hall. Architect, T. Thomas, Wenalt, Treharris.

**Clydebank.**—Block of buildings for Clydebank Co-operative Society.

**Dumfries.**—Electric lighting, telephones, and electric clock installation at new county buildings. Consulting Engineer, W. Arnot, 163 Hope Street, Glasgow.

**Falmouth.**—Secondary school. Education Department, County Hall, Truro.

**Finchley.**—New swimming baths.

**Fleetwood.**—New secondary school.

**Grantham.**—Elementary school. Secretary, Education Committee, Guildhall.

**London.**—Cinematograph hall in Wells Street, Camberwell.

**Southwark.**—New coroner's court.

**Manchester.**—Carnegie library at Didsbury. Town Clerk, October 22nd.

**Middlesbrough.**—Extensions to high school buildings.

**Motherwell.**—County hospital. District Clerk, Hamilton, October 23rd.

**Newport (Mon.).**—Cinematograph theatre, Cross Keys. Architects, Wilmott & Smith, 29 St. Mary Street, Cardiff.

**Salford.**—Cinematograph theatre, Gardiner Street, Pendleton.

**Torquay.**—New theatre (£20,000).

**Worksop.**—The electric lighting of the workhouse has been decided upon.

### Miscellaneous

**Australia.**—The Victorian Railway Commissioners require a 60-h.p. electric motor and accessories. Further particulars, 73 Basinghall Street, E.C.

**Dublin.**—The Great Northern Railway Co. of Ireland requires a twelve months' supply of electrical fittings and material, cables, and arc lamp carbons. Secretary, November 1st.

**London.**—The Port of London Authority requires a twelve months' supply of electrical sundries. 106 Fenchurch Street, E.C. November 5th. (See advertisement on another page.)

A twelve months' supply of opal lamp shades, &c., for H.M. Office of Works. (See advertisement on another page.)

**Spain.**—Electric crane for Valencia Harbour. Further particulars, 73 Basinghall Street, E.C.

### TENDERS RECEIVED AND ACCEPTED

**London: L.C.C.**—The following tenders have been received for high-tension switchgear at the Greenwich power house:—Bertram Thomas, £10,823; the British Westinghouse Co., £17,915; the B.T.H. Co., £20,112 10s.; Siemens Bros. Dynamo Works, £20,673 13s.; Ferranti, £22,304; Johnson & Phillips, £22,886; and A. Reyrolle & Co., £24,351. The tender of the British Westinghouse Co. has been accepted.

The tender of the British Westinghouse Co. at £5,943 has been accepted for reactance coils and steel valve chests in connection with protective devices for the Greenwich generating plant.

**Hammersmith.**—Seventeen tenders have been received for a twelve months' supply of high- and low-tension cable. The

sizes of cable required are:—High tension, 0.25, 0.1, and 0.05 square inch; low tension, 0.3, 0.2, 0.15, 0.1, 0.08, 0.05, and 0.025 square inch, and  $\frac{1}{2}$  twin. The tender of the Western Electric Co. has been accepted at £825 6s. for one drum of each size for immediate delivery. The basis price of future supplies has been taken at £21 per ton for lead, and £75 per ton for copper. The lowest price tendered for the first drum of each size was £649 14s., and the highest price £1,039.

Sixteen tenders have been received for high-tension switch-panels for distributing sub-stations, and the lowest, that of Switchgear & Cowans, Ltd., at £9 11s. 8d. per panel, has been accepted. The highest tender was £52.

The tender of the General Electric Co. at £324 10s. has been accepted for a 125-h.p. A.C. motor.

### APPOINTMENTS AND PERSONAL NOTES

Mr. W. W. Lackie, Chief Electrical Engineer to the Glasgow Corporation, and Bailie Smith, Convener of the Electricity Committee, have just returned to Glasgow after an extended tour of inspection of electric power undertakings in the United States and Canada.

Mr. E. J. Nalley has been appointed Vice-President and General Manager of Marconi's Wireless Telegraph Co. of America.

Mr. Robert Onions, the General Manager of Richard Hornsby & Sons (Stockport), has now become Works Manager to Mirreles, Bickerton & Day (Hazel Grove, Stockport). At a meeting of Messrs. Hornsby's employees, Mr. Onions was presented with a silver rose-bowl and a set of vases.

Mr. C. E. Hunter, Director of the Edison & Swan U.E.L. Co., Ltd., has been appointed to the Board of the Altrincham Electric Supply, Ltd.

We regret to read in a local paper that Mr. J. A. Cawthra, who was for some years Borough Electrical Engineer at South Shields, has been killed in a motor-car accident in South Africa. Mr. Cawthra left South Shields two years ago to take up an important position with the Victoria Falls Power Co.

Mr. R. E. Meade, Borough Electrical Engineer at Stafford, has resigned.

The salary of Mr. G. H. Watson, Assistant Electrical Engineer to the Hereford Corporation, has been increased from £117 to £130 per annum.

An Assistant Sales Manager is required by the Sunderland Electricity Department. (See advertisement on another page.)

### MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Theatre Lighting.**—We are requested to state that the contractors for the supply of Osram lamps in the installation at the London Opera House, illustrated on p. 570 of ELECTRICAL ENGINEERING of October 9th, were the British Economical Lamp Co. (9 Old Bailey, E.C.).

**Electrical Supplies.**—The Electrical Supplies Co. announce that they have commenced business at 41 Cheapside as wholesale dealers in electrical apparatus, and will be glad to receive catalogues with best discounts from manufacturers.

### COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &c.

**Newcastle-on-Tyne Electric Supply Co.**—An issue of £400,000 five per cent. second mortgage stock is being issued at 95. This issue is required to repay outstanding mortgages and other extensions of the works.

**Dick, Kerr & Co.**—The accounts given in our last issue were adopted at the meeting on Thursday. Mr. C. T. Cayley, who presided, congratulated the shareholders on the improved results compared with last year, and also upon the fact that the works are at present extremely busy in all departments.

# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 356 [Vol. IX., No. 43]  
*All rights reserved.*

THURSDAY, OCTOBER 23, 1913.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES and TECHNICAL COLLEGE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

*Other Advertisement Rates on Application.*

#### Latest Time for Receiving

Letters for Insertion, Tuesday first post.

Small Advertisements and Official Announcements, Wednesday first post.

Displayed Advertisements, Tuesday first post.

Corrections in Standing Advertisements, Monday first post.

All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 208-206, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Circling, Fleet, London."

Telephone No.: 5509 Holborn.

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

AN announcement is made regarding a well-known firm of switchgear manufacturers. (Page 590.)

A SERIOUS disturbance occurred on the Metropolitan Electric Supply Co.'s system on Monday. (Page 590.)

THE *Tynemount*, which is the first ship on a large scale to be equipped with Mr. H. A. Mavor's system of electric propulsion, is now complete. The vessel is driven by two 300 h.p. Diesel engines, which are coupled to alternators supplying current to one large slow-speed induction motor driving the propeller. Special arrangements are made for varying the speed. (Page 591.)

SOME details are given of the electrical installation at the new building of the Institution of Electrical Engineers. (Page 592.)

A QUESTION on the relative merits of different house wiring systems is given in our Questions and Answers columns. (Page 593.)

AN illustration shows the temporary lighting during the refronting of Buckingham Palace. (Page 593.)

A NEW system of connecting emergency push-buttons for stopping motors has been introduced. (Page 593.)

SHORT articles illustrate a new electric grinder and an electric sign. (Page 594.)

THE Sterling Telephone and Electric Co. has moved its showrooms into commodious premises in Tottenham Court Road. (Page 594.)

THE large scheme of tube railways for Sydney has

been rejected. No arrangement can be come to by the Brighton and Hove Corporations with regard to the trolley 'bus scheme. The Newport tramways manager complains at having to bear so large a proportion of road-repairing charges, inasmuch as the tramcars only use the rails. (Page 595.)

THE liquidation of the National Telephone Co.'s assets is almost completed. Wireless communication is to be established between Nauen and the German African colonies. (Page 595.)

Two patents relating to Aron meters expire during the current week. Opposition has been entered to the grant of several patents. The specifications published on Thursday last include one by W. Morrison for varying the torque obtainable from a petrol-electric drive for vehicles. Among the others may be mentioned two for liquid immersion heaters by E. A. Raves and M. Ruthenburg respectively. (Page 596.)

A START will shortly be made with the Birmingham Corporation 100,000-kw. new power station.—A bye-law providing for the licensing of wiremen has been passed in Wellington (N.Z.).—Manchester Corporation propose to take over the supply of electricity in Trafford Park.—The South-Eastern Power Co. has offered a bulk supply to the Dover Corporation. (Page 597.)

EXTENSIONS of plant and mains are contemplated in a large number of towns, including Bedford, Fleetwood, Hindley, Norwich, Rathmines, Rawtenstall, Rhyl, Warrington, and Watford. A considerable number of new electric lighting schemes are also projected. (Page 597.)

MESSRS. DRAKE & GORHAM have taken up the supply of electrically propelled vehicles. Some further particulars of the Wireless Electric Light Co. are given. (Page 598.)

**Junction-Box Fire.**—Some excitement was caused on Sunday night, about 7 o'clock, at the corner of Norfolk Street, Strand, near the Temple Station, by a junction-box explosion and fire in the pavement, followed by a second slight explosion in a similar box near by. The fire, however, was soon got under, and no one was injured. The cables in question, which are those of the Charing Cross, West End & City Electric Light Co., are insulated with impregnated paper, lead-covered, and laid "solid" in bitumen. The failure causing the trouble originated not far from the box where the first explosion occurred, at a point where the cable passes close to a Post Office box, and appears to have been due to mechanical damage to the lead covering, caused possibly when work was being done on the adjoining Post Office box. This allowed water to enter the cable, destroying the insulation.

**Electric Light Switching.**—A. P. Lundberg & Sons (477 to 487 Liverpool Road, Islington) have brought out a new edition of their pamphlet, entitled "The Teaching of Electric Light Switching," and the collection of opinions of the first edition of the booklet printed on the cover testify to its utility. There has been some slight rearrangement of the matter, and the outline lectures are now grouped into three grades or courses. Particulars are also included of the firm's free examination scheme, and a description is added of the sectionalised system of circuits for demonstration purposes which they recently introduced.

## FERRANTI SWITCHGEAR A New Policy

WE are informed that Ferranti, Ltd. (Central House, Kingsway, W.C.), after careful and lengthy consideration, have decided no longer to undertake switchboard contracts, the reason being briefly that they find their capacity entirely required for the growing manufacture of standard catalogue lines, including meters, power and instrument transformers, switchboard instruments, oil switches, knife switches, circuit breakers, motor starters, and heating and cooking apparatus. Their large experience in the manufacture of switchboards and switchboard details should ensure for them a very considerable clientèle amongst switchboard manufacturers for such details as they themselves do not manufacture, in view of the fact that they will no longer be competitors for such contracts. Their withdrawal from this field, in which they were particularly prominent, must necessarily benefit those remaining in the field, and there is every reason for them to hope for special consideration from those with whom they have until recently been in active competition when orders or contracts for detail gear are being placed. It should be mentioned that the whole of the staff of the switchboard department are remaining in their employ. There is little doubt that a good many manufacturers are prejudicing their chance of success by expending too much energy upon the manufacture of small sections of their requirements, of which they could be easily and profitably relieved by anyone specialising and manufacturing in large quantities. It is not unlikely that an appreciation of this consideration may lead to an extension of this movement.

**New Ediswan Showrooms.**—We are informed that the Edison & Swan United Electric Light Co. (Ponders End, Middlesex) have taken a lease of the imposing building at present occupied by the London Shoe Co. at 123-125 Queen Victoria Street. They will enter into possession shortly, when arrangements will be made for a special entrance from Upper Thames Street for the counter trade, and other alterations will be carried out which will make the large hall one of the finest electrical showrooms in London. In the meantime, the business will, as usual, be carried on at Queen Street and College Hill, where a very large stock of Royal Ediswan lamps, electrical fittings, and accessories is carried.

## ARRANGEMENTS FOR THE WEEK

FRIDAY, OCTOBER 24TH.

*Physical Society.*

5 p.m. At Imperial College of Science, South Kensington. Included in the agenda is "An Electrostatic Oscillograph," by H. Ho and S. Koto.

SATURDAY, OCTOBER 25TH.

*Association of Mining Electrical Engineers.*

5.30 p.m. Warwick and S. Staffs Branch. At Imperial Hotel, Temple Street, Birmingham. "Installation and Manipulation of Coal Cutters," by J. McCann.

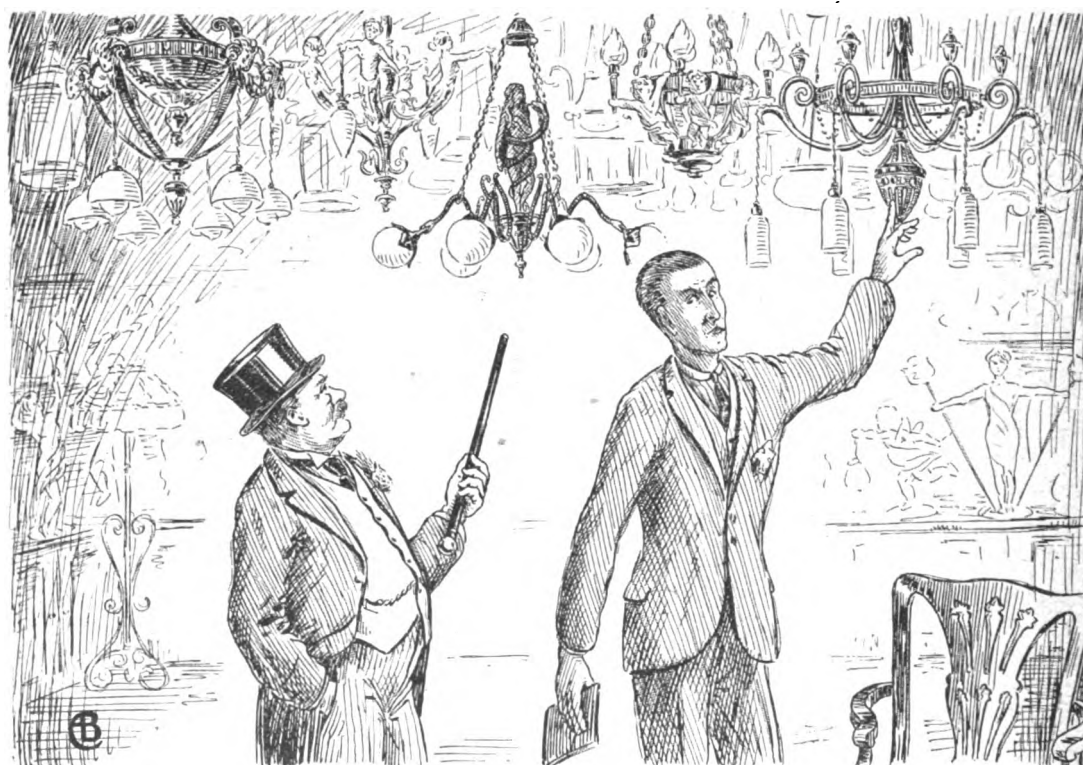
MONDAY, OCTOBER 27TH.

*Institution of Electrical Engineers: Western Section.*

3.30 p.m. At Merchant Venturers' Technical College. Chairman's Address, by H. Faraday Proctor.

**Breakdown on the Metropolitan Electric Supply Co.'s System.**—An unfortunate breakdown, which necessitated a shut-down for nearly an hour, occurred at the Willesden station of the Metropolitan Electric Supply Co. at about six o'clock on Monday. A large step-up transformer burnt out, and the primary burnt through to the secondary. Although the generators themselves did not suffer, the leads on the low-tension side and also the synchronising gear were badly affected, and it took some time to clear and to get current restored to the trunk mains to London. On the low-tension mains connected to battery sub-stations supply was maintained, but the volts fell from about 200 to 150. On the premises connected to these mains it was interesting to see the different effect of this reduced pressure on the carbon and metal filament lamps; the latter gave a light which was still quite useful, but the carbon lamps glowed only at a red heat. It is the first breakdown that the Company have had for many years, and they are greatly to be sympathised with that it should have occurred at peak time and have been so extended.

**Imperial College of Science and Technology.**—Among the scholarships which have been awarded by the Governing Body and the Delegacy for the Session 1913-14 are entrance scholarships of the value of £40 per annum each, tenable at the City and Guilds (Engineering) College, in the Department of Electrical Engineering, to R. F. H. Nalder, R. H. Barfield, and G. S. Oddie.



SALESMAN:—We have some very nice patterns in the Adams style, sir.

CUSTOMER:—No, I think I should prefer something more in the Eve's style, with apples and serpents and things.



## THE ELECTRICALLY DRIVEN SHIP "TYNEMOUNT"

WE have on several previous occasions referred to the building of the *Tynemount*, which is one of the first applications on a large scale of the electric propulsion of ships, and details of the system employed have been described by its designer, Mr. H. A. Mavor, in Papers read before the British Association and elsewhere. (See *ELECTRICAL ENGINEERING*, Sept. 12th, 1912, p. 505). The vessel is now complete, and we are able to give a few more details of her equipment, with illustrations of the actual apparatus employed.

It will be remembered that the *Tynemount* has been built for service on the canals and great lakes of North America. She is a cargo boat 250 ft. long by 42 ft. 6 in. beam and 19 ft. moulded depth. The general appearance is shown in Fig. 1. Although the main propulsion is by Diesel engines

levers of the starting gear and for cutting off the blast for stopping the engines are placed close alongside the electrical controllers, so that the whole control is carried out from one point. The position of the engines and certain auxiliaries can be seen in Fig. 2.

Each engine drives a three-phase alternator of special design made by Mavor & Coulson. The alternators have an out-

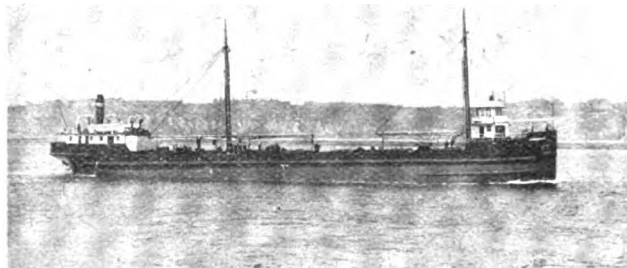


FIG. 1.—THE MOTOR SHIP "TYNEMOUNT."

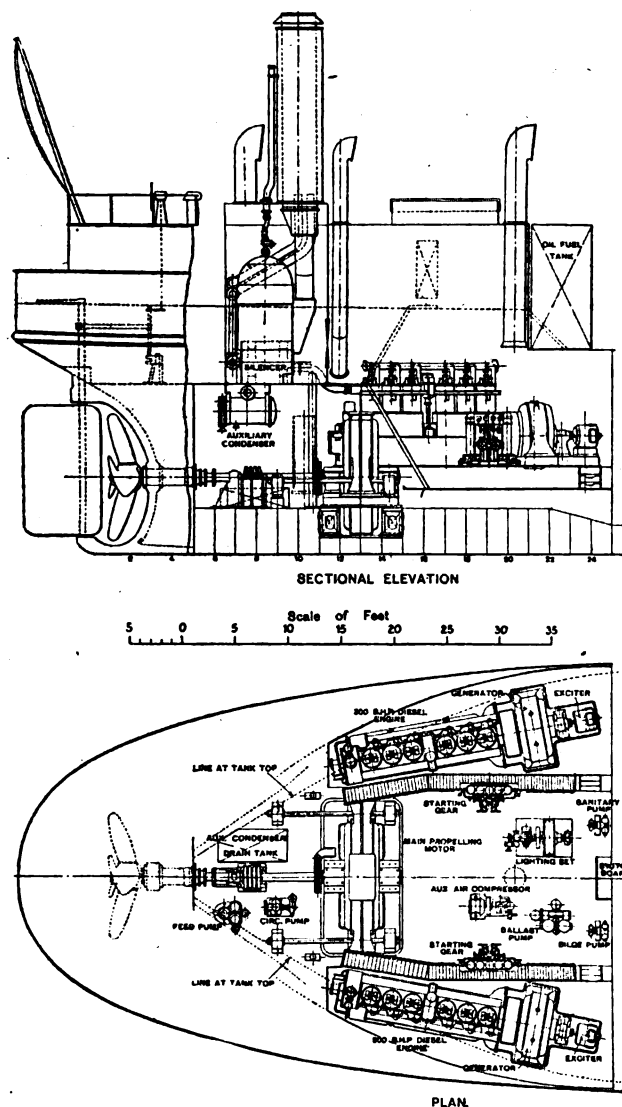


FIG. 2.—GENERAL ARRANGEMENT OF PROPELLING MACHINERY.

with electric transmission of power to the propeller, a certain amount of auxiliary machinery is steam-driven from two oil-fired donkey boilers. The main engines are two in number, and are of the six-cylinder enclosed four-stroke marine Diesel vertical type, manufactured by Mirrlees, Bickerton & Day, Ltd. (Stockport). They are each capable of developing 300 B.H.P. at 400 r.p.m., and have cylinders 12 in. diameter by 18½ in. stroke. The engines are started by compressed air in the way usual with land engines, and each has its own three-stage compressor mounted on an extension of its shaft. Owing to the electrical transmission, they do not require to be stopped or reversed for manœuvring, so that extra large compressors and stores of compressed air do not have to be carried as in the case with the complicated reversible equipments of most Diesel-engined boats. The

put each of 270 amperes per phase at 500 volts at 400 r.p.m., and they are provided respectively with six and eight poles, so that they supply current at frequencies of 20 and 26.6 cycles per second. An exciter is direct coupled to each alternator. The current from these two generating sets is led to the 500-h.p. induction motor which drives the propeller. The position of this motor is shown in Fig. 2, while its appearance in the engine-room is seen in Fig. 3. This motor was also made by Mavor & Coulson, and is of special construction. The rotor is of the squirrel-cage type, but the stator is provided with two different and entirely separate windings, one giving 30 and the other 40 poles. When these two windings are supplied with current at 20 and 26.6 cycles respectively, they give the same synchronous speed of 80 r.p.m. The motor will then absorb the full power of both engines and drive the propeller, to which it is direct-coupled at about 78 r.p.m. This propeller speed corresponds to the fastest speed of the vessel. In order to obtain a slower speed, the connections are altered so that the 20-cycle alternator supplies the 40-pole winding, and the synchronous speed of the motor is now reduced to 60 r.p.m. In this case the engine of the 26.6-cycle alternator can be shut down, but as the speed of the ship has been reduced to about three-quarters of full speed, half the total horse-power is

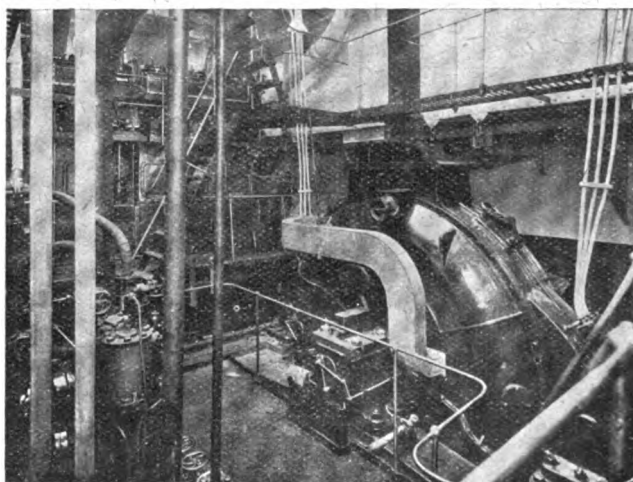


FIG. 3.—INTERIOR OF ENGINE ROOM LOOKING AFT.

ample. It will be seen that the two alternators, when they are both at work, are connected to entirely different circuits, and are never run in parallel, so that no synchronising gear is required, and indeed synchronising operations would not be at all suitable for shipboard conditions. The reversal of the motor is performed by interchanging the connections of two of the phases. A diagram of connections is given in Fig. 4.

The switchgear by means of which the necessary changes

of connections are made is very simple, and consists of main controller of the tramway type, with five positions for full ahead, half ahead, stop, half astern, full astern, and a second controller which introduces resistances into the exciter circuits. These controllers are shown in Fig. 5. The contacts in both cases work under oil, but it is inadvisable that the contacts of the main controller should be required to break the large main current flowing to the motor. The two switches are therefore interlocked, so that it is impossible to work the main switch except when all the resistance has been introduced into the exciter circuits.

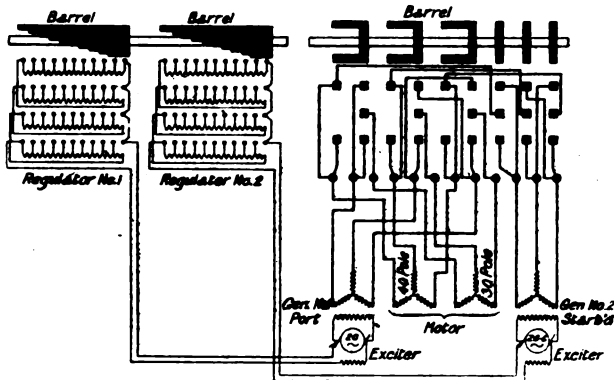


FIG. 4.—DIAGRAM OF CONNECTIONS.

Thus the whole handling of the ship is carried out by two levers which are so interlocked as to be foolproof. In the present instance these switches are in the engine-room, but it is evident that by lengthening the connecting cables they could be placed on the navigating bridge. The number of electrical instruments has been kept down to a minimum. There are only provided one ammeter and one voltmeter to each alternator, and an ammeter and voltmeter for each exciter.

The system of electrical drive permits the speed of the ship to be altered without variation of the engine speed. It also provides a convenient "gear ratio" to enable the engines and the propeller respectively to be run at their most efficient speeds, and also permits of rapid reversal of

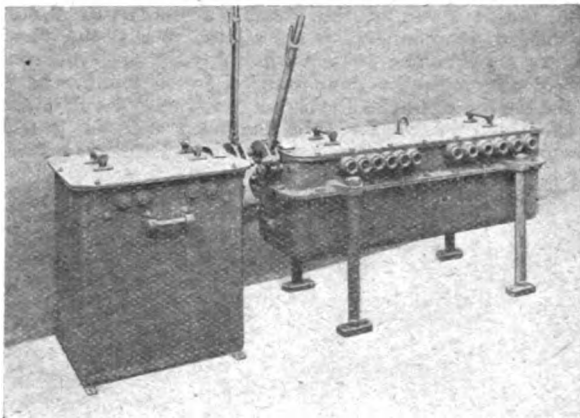


FIG. 5.—CONTROLLERS.

the propeller while the engines continue to run in their normal direction. In many cases the system allows of a reduction in the machinery space, thus increasing the cargo capacity of the vessel. It also lends itself readily to distant control, and in any case where it may be found advisable the switchgear can be put on to the bridge and the control of the propelling motor put into the hands of the navigating officer. The *Tynemount* was built by Swan, Hunter & Wigham Richardson, Ltd., Wallsend, to the order of the Electric Marine Propulsion Co., a company which has been formed to develop the system associated with the name of Mr. Henry A. Mavor, to whom our thanks are due for having put at our disposal the material from which this article and its illustrations have been prepared.

**Obituary.**—Those of our readers who knew Mr. O. F. Mould, the genial manager of the Western Electric Co.'s publicity department, will regret to hear that he died last Thursday after an unsuccessful operation for appendicitis on the previous Monday.

## ELECTRICAL INSTALLATION AT THE NEW BUILDING OF THE INSTITUTION OF CIVIL ENGINEERS

THE handsome new building in Great George Street which is the new home of the Institution of Civil Engineers, and was inaugurated at the dinner of the Institution last night, is considerably larger than the quarters on the other side of the street which the Institution was forced to vacate owing to the expansion of the new Government offices. It is not our purpose here, however, to describe its undoubted architectural beauty, nor the spaciousness of its accommodation, but rather to call attention to a few points of interest in the electrical installation.

The supply for lighting and power is taken from the mains of the Westminster Electric Supply Corporation, and a three-wire service at  $2 \times 200$  volts (continuous) is brought in in the lower basement through the meters and oil-immersed main fuses provided by that company. The Institution's main switches are of the iron-clad type mounted on a skeleton iron frame, and from these separate leads are taken in iron pipes to each of the main distribution boards in the upper basement. The whole of the gear in the lower basement is to be enclosed in an expanded metal cage to prevent unauthorised access. The main distribution boards are in a special room immediately above. There is one 400-volt board for the lift and other power circuits, which are ten in number, and well away from this and well apart from each other are the two 200-volt boards on the two sides of the three-wire system. Each of these contains nine lighting circuits and five circuits for the power plugs about the building which are provided for vacuum cleaners. All these boards are of slate on iron frames, and the double-pole linked switches and porcelain fuses are of the "Kartret" type. This pattern of switch and fuse is also used throughout on the local distribution boards on the various floors, but the switches are here single pole. Particular care is taken in the numbering and labelling of the circuits and sub-circuits. All the wiring is in solid drawn screwed conduit let into the walls during construction, and all wires were drawn in.

The lighting of the smaller rooms, which is, of course, entirely by metal filament lamps, does not present any very special features. Semi-indirect lighting is employed to some extent in the entrance hall and passages, and some handsome cut-glass bowl fittings have been provided. The most striking room is the great hall, 100 ft. long by 45 ft. wide and of the same height, with a fine scheme of decoration in marble. This is at present lighted by temporary fittings, consisting of two large electroliers carrying in all 120 40-watt lamps, each with its own "Superlux" shades. The lecture-room opens into the great hall, and as regards its dimensions (66 ft.  $\times$  40 ft.), panelling, and fixtures, is practically a replica of the old lecture-room which was familiar to many of our readers. The arrangement of the seats, however, is slightly different. The system of lighting adopted is similar to that which provoked so much discussion at the lecture-room of the Institution of Electrical Engineers—that is to say, that main illumination is by lamps concealed in the cornice so that the light is reflected by the white ceiling. This indirect illumination is supplemented by four 5-ampere Cooper-Hewitt mercury vapour lamps, arranged two in series on the 200-volt circuit, which give light through the glass dome in the middle of the ceiling. The cornice lamps are of the tubular type mounted horizontally. There are 186 20-watt lamps in all, equally spaced round the room. The trough in which they are mounted is specially shaped and painted white. No mirror reflectors are used. The cornice concealing the lamps is at a height of 20 ft. above the floor. Two special experimental circuits are brought to the lecture-table direct from the main intake, one from the Westminster Co.'s continuous-current system, and the other from the alternating mains of the London Electric Supply Corporation. A special lantern chamber is provided at the side of the room.

Electric fans are used extensively in connection with the ventilation scheme. The great hall and the lecture theatre are ventilated on the plenum system, but exhaust fans are also provided. All these larger fans are driven by 8-h.p. continuous-current motors. The other rooms are mostly provided with smaller exhaust fans only, and the air in their case enters through steam-heated radiators on the "Nuvacuumette" system, in connection with which an electrically-driven vacuum pump is used.

There are in all five electric lifts. Three of these are 13-cwt. automatic push-button passenger lifts, with a maximum speed of 150 ft. per min., one is a 80-cwt.

car switch control goods lift with a maximum speed of 110 ft. per min., and the remaining two are service lifts down from the kitchen on the top floor to carry 1 cwt. each. The lift-motors all run off the 400-volt circuit. The type of lift adopted is provided with V-sheave drive and not drum-drive, and it is interesting to note that during their tests they were driven hard against the top and bottom stops, with all the safety gear put out of action, without any damage being done. This was rendered possible largely by the slipping of the ropes in the sheave grooves. Very complete interlocking of the gates and control is provided, and a dashpot arrangement on the main controller renders it impossible to start the lift again until a definite interval has elapsed after its last stoppage, so that the car cannot be fetched away by pressing a button on another floor before there has been time to open the gate.

In conclusion, we must express our thanks to Mr. E. W. Monkhouse, under whose direction the electrical installation was carried out, for kind assistance in affording us information.

## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,361.

If a 60-light 3-storey house were to be wired on the "tree" system, but utilising screwed barrel, modern connection boxes with porcelain interiors, and also specially designed continuity iron fuse boxes, why would it still be incorrect practice? (Replies must be received not later than first post October 30th.)

### ANSWERS TO No. 1,359.

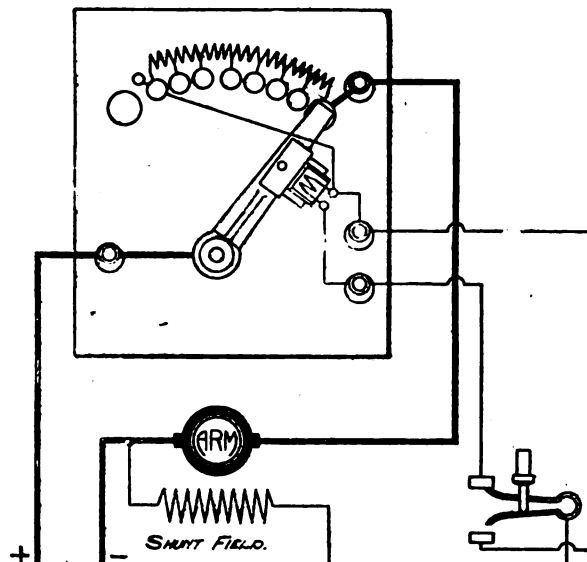
No reply worthy of an award has been received.

## AN EMERGENCY PUSH BUTTON SYSTEM

IN any system of push-buttons for stopping motors in case of emergency, reliability is the first consideration, and the ordinary method of making the push-button short-circuit the coil of the no-volt release is apt to fail when the resistance of the leads to the distant push-button is considerable. The arrangement of the push-button to break the circuit of the no-voltage coil is also objectionable in cases where this coil is in series with the motor field coils. To meet these objections, the Igran Electric Co. (147 Queen Victoria Street, E.C.) have introduced a new patented distant stop push-button system which breaks the no-volt circuit without interrupting the field circuit. The push-button is provided with two sets of contacts. If both of these were in contact at once, there would be two paths for the field current of the motor—one through the no-volt magnet coil, and the other quite independent of the no-volt magnet coil. Normally, however, these two sets of contacts are not both in contact, but only that set which passes the field current through the no-volt magnet coil, so that in this position the no-volt magnet is excited and holds up the starting lever. But when the stopping button is pressed, it first presses the other set of contacts together (thereby making the field circuit independent of the no-volt magnet circuit), and then, while holding these usually open contacts closed, it opens the normally closed contacts, thus breaking the no-volt magnet circuit and positively letting the starter handle go. The

arrangement of connections for an ordinary shunt motor is shown in the figure, and a simple modification can be made for compound motors. The apparatus is particularly valuable in enabling the Home Office regulation for factories to be complied with, which requires that:—

"In every place in which machines are being driven by any electric motor there shall be means at hand for either switching off the motor or stopping the machines if necessary, to prevent danger."



### LINES.

### EMERGENCY STOP PUSH-BUTTON SYSTEM ARRANGED FOR SHUNT MOTOR.

The Electrical Inspector of Factories, in his memorandum on the effect of these regulations, says:—

"The former (namely, compliance with the above rule) can be effected by extending the motor circuit to the machines, and there providing an additional stopping switch, but it will usually be less costly to provide an auxiliary switch with push-buttons near the machines, arranged to operate the circuit-breaker, which may be near the motor, thus avoiding having to extend the motor circuit."

## TEMPORARY LIGHTING AND LIFTS AT BUCKINGHAM PALACE

AN elaborate scheme of lighting of the scaffolding during the reconstruction of the front of Buckingham Palace,



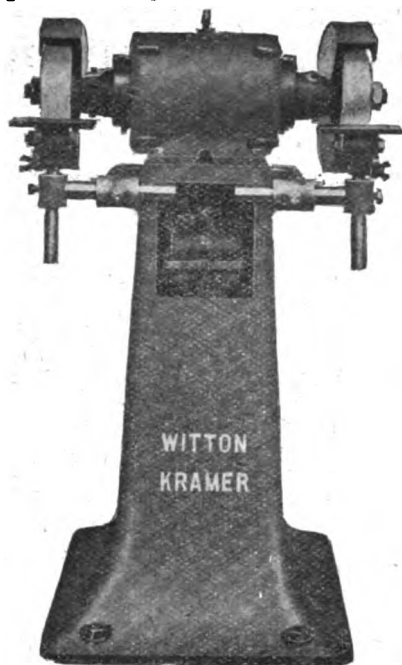
NIGHT VIEW OF SCAFFOLDING AT BUCKINGHAM PALACE.

which is now practically completed, was arranged to enable the work to proceed by night as well as day. The photograph reproduced here, which was sent us by the Edison & Swan United Electric Light Co. (Ponders End, Middlesex), shows the effect obtained, and is excellent testimony to the illuminating power of the Royal Ediswan drawn wire lamps, which were exclusively used. It will readily be seen also that the rough nature of the work, and the fact that as the work proceeded the positions of the lamps were being continually changed, were good tests of the strength of the filaments.

Electric power was also made use of in the two 80-cwt. electric lifts which were temporarily installed by R. Waygood & Co., Ltd., to facilitate the conveyance of workmen and material to the different stages of the scaffolding.

### A PEDESTAL GRINDER

FOR grinding castings, sharpening tools, and a host of other similar purposes, the self-contained electric pedestal grinder is of great utility. A tool of this description, which



PEDESTAL ELECTRIC GRINDER.

is now being manufactured in quantities by the Witton - Kramer Electric Tool & Hoist Co. (for whom the General Electric Co., Ltd., 67 Queen Victoria Street, E.C., are the sole selling agents), is shown in the accompanying illustration. This particular machine is driven by a 2-h.p. totally-enclosed three-phase motor, with bearings of extra length and spindle of large diameter extended at either side to carry grinding wheels. The spindle is solid, and is not an ordinary motor spindle with extension pieces driven in. These sets are made with either three-phase or continuous current motors, and are controlled by small iron-clad switches conveniently accommodated inside the pedestal, and operated through casting. The wheels are effectively protected by means of sheet-steel guards. Tool-rests are provided, which are adjustable in several directions. The machines are designed on substantial lines to enable them to withstand rough treatment.

### ELECTRIC SIGNS

IT is often said that we are behind other countries in the use of electric signs. This is certainly not due to any want of appreciation of the value of advertising, but many be attributed rather to the fact that electrical contractors and others responsible for the actual selling of these appliances have not sufficiently realised the magnitude of



SHOP WINDOW SIGN, 6 FT. LONG, FINISHED IN OXYDISSED SILVER.

the unexploited field that there is for their activities in this direction, especially in the provinces. A shop window must be lighted, and the electrical contractor should induce his shopkeeping clients to use a window sign which can be designed not only to light the window well, but also with the same light to draw attention to their name or to the

special claims of their wares. The window sign, which may often be conveniently controlled by a time switch, often leads to the adoption of electrically illuminated outside signs, of which so many attractive forms are available to suit any class of business. An attractive window sign which has been supplied to a number of depôts of a boot and shoe business by Simplex Conduits, Ltd. (116 Charing Cross Road, W.C.), is illustrated here. This firm make a speciality of this class of work, and assure us of their willingness to give contractors every assistance in their power by suggesting suitable types of signs and by producing special designs.

### STERLING TELEPHONES

WE recently had the pleasure of a view of the fine new offices, show-rooms, and stores of the Sterling Telephone & Electric Co., Ltd., at 210-212 Tottenham Court Road, London, W. The building itself, which is about four times as large as the old offices in Upper Thames Street, has been entirely renovated, redecorated, and fitted with the latest labour-saving devices suitable for the purpose in hand. Entrance is obtained through double doors to the counter, drawing office, &c., while to the left is the show-room, and to the right the main staircase leading to the managing director's and secretary's offices, waiting-rooms, export department, &c., on the first floor; while above this there are three floors devoted to stores and a workshop for small urgent repairs. In the basement is a test-room where all instruments are re-tested to see that they have not been put out of adjustment since leaving the works at Dagenham. The whole building is well lighted on the semi-indirect system, with special local lighting where required. Complete systems of goods lifts and pneumatic tubes have been installed, while a 20-line secret automatic system of intercommunication telephones is being erected. It is only necessary for the person originating the call to move the index to the number designating the person required and to press a button, when, if the line is free, connection is made and locked against interference until released by the called person. It is interesting to note that the leads are black enamelled and covered with paraffined cotton. Thus a high insulation is obtained. The Company, we understand, will shortly be introducing these enamelled wires into its many productions. Another item of particular interest is the bell-signalling system. The bells are of the balance-wheel type, in which when once started single strokes are given at short intervals until released by a push button from the calling end. To effect this, the bells are fitted with a wheel and projecting pin, so that when the armature circuit is opened on the first stroke the wheel is given a blow, which rotates it until it completes the circuit again, when the cycle is repeated.

In the show-room we saw a number of these bells and a quantity of robust gas- and water-tight telephones, switches, &c., suitable for use in mines and other similar industrial positions. In addition, there is a complete range of the well-known "Sterling" shot-firers, which comply with the latest Home Office requirements for firing from two to eighty shots. For general use the Company has a telephone wall-set, in which the microphone is fitted on a parallel arm so that it is always truly vertical. Of great interest also are the Ferro-case telephone sets, which are very compact and the component parts easily detachable. They are neat and very suitable for export requirements. The pressure of space permits us but to mention that there are numerous other specialities on view. All are of solid construction, and the parts easily replaceable. Included are examples of Government telephones, large orders for which the Company holds for this country and abroad, while any requirements for domestic houses, colonial service, railways, &c., can be quickly met.

**Electric Cooking.**—The opening meeting of the Birmingham & District Electric Club was held on Saturday last at the Birmingham Electric Supply Department's Show Room. Mr. W. E. Milns, of the Birmingham Corporation, gave a lecture on "Electric Cooking," with various demonstrations. A large number of ladies attended. The lecturer commenced by dealing with the ideal oven, and showed how the electric oven was the nearest approach to this ideal. Various types of ovens were compared, and hints given on their selection. Actual figures of costs were put forward to show that on the score of expense electric cooking compared favourably with any other form. A year's cooking for a family, including the electric heating of two rooms, electric kettles, irons, &c., worked out at no more than £10. Advice as to the economical use of ovens was given, and it was shown that on an intelligently selected menu, one or two courses could be cooked after current was actually switched off.



SPECIFY

IGRANIC ELECTRIC CO., Ltd.

IGRANIC

SWITCHGEAR

LONDON and BEDFORD.

## CATALOGUES, PAMPHLETS, &amp;c., RECEIVED

**HEATING AND COOKING APPARATUS.**—A small folder from the Dowsing Radiant Heat Company (105 Great Portland Street, W.) describes the new small hot bar radiator and new small oven, of which particulars were given on page 581 of last week's *ELECTRICAL ENGINEERING* in connection with the Ideal Home Exhibition.

**TEMPERATURE INDICATORS.**—A supplementary sheet to catalogue No. 502 has been issued by Siemens Bros. & Co., Ltd. (Woolwich), in which some high resistance temperature indicators with pivoted coil and compensating resistance are described. The instruments have a resistance of about 16 or 17 ohms per millivolt. A 10 ohm regulating resistance with index is provided.

**DOMESTIC HEATING AND COOKING.**—A pamphlet just issued by the Sun Electrical Co., Ltd. (118-120 Charing Cross Road, W.C.), mentions a new cheap 4 and 6 lb. iron with fire-proof connector and spring support for the flexible. Another innovation is a self-contained kettle. The elements project right into the water, and besides giving a high efficiency, it is claimed that "furring" is prevented. A cooking outfit, consisting of hot plate, aluminium kettle, saucepan, and frying-pan, priced at one guinea, is also listed, as is a substantial boiling plate and some radiators and convectors.

*Readers desiring copies of catalogues or pamphlets should apply to the firms in question, referring to the notice in "Electrical Engineering."*

**ADVERTISEMENT WRITING.**—Mr. Ernest Ingram Hill (26 Stanton Road, Wimbledon, S.W.), who was the winner of the first prize in the "Printers' Ink" advertisement competition in 1911, has sent us an illustrated leaflet on this subject, copies of which he offers to send anyone on application.

**SYNCHRONISATION OF CLOCKS.**—We have received from Greenwich Time, Ltd. (106 Albany Street, N.W.) details of a scheme for supplying synchronised clocks, giving a complete time service. The clocks are automatically wound by means of dry batteries. They are set to a slightly gaining rate, and synchronised every four hours. In large installations only the master clock is synchronised from Greenwich, and this in turn controls a series of secondary clocks.

**CANDLE FITTINGS.**—A special form of candle fitting, provided with an expanding adapter arrangement which ensures the candle always standing upright, is described in a leaflet from the Candolite Co. (65 and 67 Knightbridge Street, E.C.).

**"DAY LIGHT" REFLECTORS FOR MERCURY VAPOUR LAMPS.**—A revised sheet has just been published by the Westinghouse Cooper Hewitt Co., Ltd. (80 York Road, King's Cross, N.), in which reflectors giving a daylight effect for use with mercury vapour lamps are described. These reflectors make use of the phenomenon of fluorescence, and the light is described as being of an agreeable white colour, with a slight rosy tint.

**INDIRECT AND SEMI-INDIRECT LIGHTING.**—A folder is being sent out to business houses, factories, &c., by Electrical Installations, Ltd. (27 Martin's Lane, Cannon Street, E.C.), in which the company points out the need for good lighting, and urges the adoption of the indirect or semi-indirect systems.

## ELECTRIC TRACTION NOTES

According to the *African World*, preliminary investigations have been made as to the cost of railway electrification on the Wynberg and Sea Point lines, Cape Colony, and on the Springs-Randfontein line.

The £4,800,000 tube railway scheme recently passed by the New South Wales Legislative Assembly has been rejected by the House of Assembly.

It is stated that a complete deadlock has arisen in connection with the trolley omnibus schemes of the Brighton and Hove Corporations.

In view of the success of the provisional service of trailer cars on the L.C.C. system, the Board of Trade is to be asked to sanction their use throughout.

The conversion to electric traction of the rack railway from Wilderswyl, near Interlaken, is now practically complete, and preliminary trials have been run with the four new locomotives prior to the official tests. The full service will be opened for the next season in May next.

The Aberdare tramway and trolley omnibus system, which has cost £50,000, was inaugurated last week. The total length is about  $7\frac{1}{2}$  street miles.

The Newport Tramways Manager, Mr. N. J. Young, has raised a question as to whether the Works and General Purposes Committee should not bear a larger proportion of the cost of the road repairs than at present. He bases his suggestion upon the fact that the tramcars only use the rails, and that as there is an interval of five or six minutes between cars on every route, it is clear that the ordinary vehicular traffic is practically the sole cause of the wear on the roads.

TELEPHONY AND TELEGRAPHY  
(INCLUDING WIRELESS)

It is stated that the liquidator of the National Telephone Co. has practically liquidated all the assets of the Company, and intends to make a further payment of 7 per cent. on the deferred stock, making a total of 104 per cent. received by the preferred shareholders. The possibility is also mentioned of a final distribution of 1 or  $1\frac{1}{2}$  per cent.

According to the *Times* Berlin correspondent, the Chairman of the Post Office authorities has decided to open wireless communication between Nauen and the German-African colonies next year. By that time there will be at the Nauen station five towers each 120 metres high, in addition to one 250 metres high.

The proposal of Marconi's Wireless Telegraph Co. to create 500,000 new ordinary shares of £1 each has been sanctioned by the statutory extraordinary general meeting.

The Falmouth-Bilbao cable was restored on the 14th inst., and the Singardja-Amperan lines were put in order on the 16th. The Chio-Tenedos cable failed on the 17th. The *via* Moulmein route to Siam was down on the 18th between Raheng, Bangkok, and Myitta Kanburi. Telegrams are being sent *via* Madras-Saigon. The Tenedos-Lemnos cable broke on the 19th inst., and telegrams for the former place are being posted. Code language is again admitted for telegrams to Turkey. During the interruption of the Eastern Co.'s cables, telegrams for Salonika and other Greek offices in the annexed territories are sent *via* Larissa-Salonika, with delay and at senders' risk. The Western Telegraph Co. do not often figure in these notices, but on the 20th their Pernambuco-Ceara and Ceara-Maratham cables ceased operating, and telegrams for the Ceara district are being forwarded by the Brazilian land-lines.

**Osram Week.**—Encouraged by the great success of their previous special autumn advertising campaigns, and in response to the requests from the trade all over the country, the General Electric Co., Ltd., are again conducting an "Osram Week," and a large portfolio is being circulated to explain the details of the scheme. The Company have removed from their offer of this year the condition associated with previous Osram Week campaigns which called upon contractors to place an order for a specified number of lamps. Many entirely new and extremely effective advertisement designs have been prepared—some of the best and most ingenious we have seen—and will appear on an unprecedented scale in almost every class of paper interesting lamp-users. The names of contractors who participate in the scheme will appear in these advertisements, and material will also be supplied free of charge to them for window displays, as well as advertising literature over-printed with their names and addresses.

## "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

### Specifications Published October 16th, 1913

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

**Names in italics indicate communicators of inventions from abroad.**  
 21,612/12. **Petrol-Electric Vehicles.** W. MORRISON. A magnetic clutch has a rotating armature and rotating field magnet. One is connected to the prime mover and the other to the load. The field windings and a storage battery are connected in parallel across the armature. The field resistance and battery pressure are simultaneously adjusted to give the desired torque by a combination of different series and parallel connections, while the whole field and battery still take the maximum armature pressure. Seven figures.

21,641/12. **Lamp Indicator.** J. MARTIN. To indicate when an invisible lamp has gone out an alarm circuit is completed through two insulated metal strips with different expansions, e.g., steel and brass, mounted above the lamp. Eight figures.

22,053/12. **Storage Battery Electrodes.** G. FULLER, L. FULLER, and G. J. A. FULLER. The active material is compressed in moulds so that the finished "solid" plates have the true section of either a rectangular or cylindrical cell, and can be fitted together with separators to form a solid accumulator. Ten figures.

23,086/12. **Filament Shaping Machine.** B.T.-H. Co. (*G.E. Co., U.S.A.*). A machine for shaping squirted or wire-drawn filaments for special purposes, such as automobile and miniature lamps, is described. Seven figures.

25,333/12. **Railway Signalling.** H. W. HANDCOCK, A. H. DYKES, and W. DUDELL. An alternating current is used for track circuit signalling, and operates the signals through an electro-magnet and condenser turned so as not to be affected by strong currents of different frequency.

26,964/12. **Solid Back Telephone Transmitter.** F. GOTTSCHALK. The construction allows of spanning means, clamping springs, and exterior nuts for clamping the diaphragm to the resistance cell being dispensed with. The stem of the back electrode is enclosed by a chamber with openings only for the insertion of the resistance cell and the locking screw. A metallic diaphragm under initial stress and self-adjusting is used. Ten figures.

47/13. **Liquid Immersion Heater.** M. RUTENBURG. A resistance wire is wound inside and outside a hollow cylinder of silica having a series of holes or notches at each end to engage the wires. Two figures.

2,402/13. **Storage Batteries.** C. GALLOWAY, JNR. A vent consists of a number of passages open to the gas space at one end and directly to the atmosphere at the other. The ends of each passage are arranged closely adjacent to the inner surface of the cell at points remote from each other. Seven figures.

7,469/13. **Liquid Immersion Heater.** E. A. RAVES. A flanged electrode is fitted within a perforated metal bulb, which is inserted in the liquid to be heated. The bulb is connected as the second electrode. Two figures.

### Specifications Published To-day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free.

Summaries of some of the more important of these patents will appear in our next issue.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** YOUNG [Supply systems] 22,852/12; BROWN, BOVERI ET CIE. [Regulation] 27,069/12; SIEMENS-SCHUCKERT. [Remote control of synchronous motion] 687/13; A.E.G. [Motor regulation] 7,896/13; JULIUS-PINTSCH A.-G. [Railway-car lighting] 15,082/13.

**Dynamos, Motors, and Transformers:** PRICE [Dynamos for vehicle lighting] 19,345/12; HOLMES [Brush holders] 22,985/12; THOMAS [Motors] 26,396/12; ETHELLE, CONGDON & MUIR, and MUIR [Electric braking of motors] 27,482/12; MASCH. OERLIKON [Apparatus for winding] 14,633/13.

**Electrometallurgy and Electrochemistry:** LEE and BRAME [Holding articles which are to be electroplated] 26,765/12; FARBWERKE VORM MEISTER, LUCIUS and BRÜNING [Obtaining nitrogen and nitrogen oxides simultaneously] 3,662/13.

**Ignition:** SCHAAER [Rotary distributors for multi-cylinder engines] 22,438/12; THORESEN and OLSEN [Magneto driving] 24,691/12; "MAFAM" MOTOR APPARATE GES. [Magneto] 1,093/13; ROYER [Electrically-heated igniters for internal-combustion engines] 7,302/13; REIFFERN (*Julius-Pintsch A.G.*) [Railway vehicle gas lamp control] 15,080/13.

**Switchgear, Fuses, and Fittings:** BERRY and MARKHAM [Switches] 22,118/12; GREEN [Control of electrically-driven mechanisms] 22,646/12; RECORD [Terminals] 763/13; HIRST and STRACHAN [Interlocking switchgear with box lids] 2,636/13; HOVLAND [Relays] 10,472/13; CHIGER [Timing gear for switch operation] 10,559/13.

**Telephony and Telegraphy:** ELLERO [Transmission of pictures] 24,758/12; HILL [Selective signalling] 2,612/13; SIEMENS & HALSKE [Supervisory circuits] 7,531/13; THOMPSON (*Ges für Drahtlose Telegraphie*) [Receivers for wireless] 8,821/13; BAUDISCH [Reels for laying field telephones] 17,563/13.

**Traction:** BERGMAN [Automatic equalisation of tramway and railway loads] 14,846/12.

**Miscellaneous:** SEVERY and SINCLAIR [Vibratory musical instruments] 19,868/12; HILL [Alarms for engines and machines] 22,412/12; HANSON, LANGSTON and E.P.S. Co. [Miners' safety lamps] 22,738/12; LOWE [Primary cell electrolyte] 27,634/12; FARKAS [Advertising] 29,892/12; ACHENBACH [Primary cells with gelatinous electrolytes] 832/13; LEAVITT [Gyroscopic steering of torpedoes] 6,163/13 and 7,160/13.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Dynamos, Motors, and Transformers:** HARTMANN [Packing joints of metal vapour A.C. rectifiers] 20,300/13.

**Electrochemistry:** SOC. ANON. L'OXYHYDRIQUES FRANÇAISE [Electrolysis of water] 18,818/13.

**Telephony and Telegraphy:** BALSILLIE [Transmitter for wireless] 15,673/13; [Receiver for wireless] 15,674/13; ARNTZENIUS [Switching system for order wire uni-directional telephone service between two exchanges] 21,735/13; SIEMENS & HALSKE [Semi-automatic telephone systems] 21,766/13.

**Miscellaneous:** RABBIDGE [Absorbents for dry batteries] 19,783/13; OTTO [Remote control of marine or aerial torpedoes for manœuvring] 21,212/13.

### Application for Amendment of Specification

19,763/12. **High-Frequency Currents for Wireless.** W. DUBILLIER. It is desired to correct a clerical error in Fig. 6 of the drawings accompanying this specification, which was abstracted in ELECTRICAL ENGINEERING, August 21st, p. 481.

### Opposition Entered to Grant of Patents

19,963/12. **Ignition Magneto Pole Shoes.** O. BÄRTSCH. The specification describes designs of pole shoes for giving a strong spark for advanced or retarded positions.

1,420/13 and 1,439/13. **Electrolysis.** H. M. DU BOIS. The process described is for the production of caustic soda by the electrolysis of sodium chloride. The electrolyte flows from anode to cathode through a gas-proof seal, and then across the electrolytic field within a space between the cathode and a porous diaphragm.

2,610/13. **Private Telephone System.** E. A. GRAHAM and W. J. RICKETS. Either one of a pair of stations can call the other. The call is reproduced at the calling station.

### Expiring and Expired Patents

The following Patents expire during the current week, after

the of fourteen years:—

21,354 and 21,355 of October 25th, 1899. **Meters.** H. ARON and THE ARON ELECTRICITY METER. The first specification gives a construction for an automatic electric winding mechanism for clock trains, &c. The construction given is an improvement on that first described in specification No. 24,876 for 1894. The second specification describes a method of metering for three-phase installations with four conductors, in which only three conductors are utilised, together with the pressures from them to the fourth conductor. From the sum of these readings, the action of the current in the third conductor combined with the sum of these same pressures is deducted. In a clockwork meter a third coil is arranged between two pendulums, and simultaneously affects them, in addition to the individual currents acting on them. In a motor meter, two separate magnet coils act on two armatures, so that one is influenced by one current, the other by the second current, and both by the third current.

The following are the more important Patents that have become void through non-payment of renewal fees.

**Distributing Systems, &c.:** B. G. LAMME [Running commutator motors off three-phase supply] 12,418/05; B.T.-H. Co. (*A.E.G.*) [Haulage, rolling-mill, and similar systems] 14,161/08.

**Dynamos, Motors, and Transformers:** UNION ELEKTRICITÄTS GES. [A.C. commutator motor brushes of equal potential are separately supplied] 13,283/04.

**Electrochemistry:** C. MASON [Oxidisable metals are given a metallic coating before the final electro-deposit] 13,715/08.

**Incandescent Lamps:** H. KUZEL [Mounting squirted metal filaments] 15,017/07; B.T.-H. Co. (*G.E. Co., U.S.A.*) [Tungsten filaments are made by replacing the carbon of carbon filaments by tungsten in a vacuum furnace and sintering] 15,367/07.

**Instruments and Meters:** E. WESTON [Moving coil portable and pocket volt and ampere meters] 14,547/02.

**Telephony:** B.T.-H. Co. (*G.E. Co., U.S.A.*) [Homopolar is used as generator or converter for power supply] 14,789/06.

# Space will Not Allow

READING  
—  
TABLE  
—  
STUDY  
—  
PIANO  
—  
DESK  
LAMP

This is only  
**ONE LAMP,**  
but can be  
adapted to the  
above uses  
and more.

PRICE  
**£1 4s.**

Including  
Flex. Plug, and  
Lamp Adaptor.

us to explain here the numerous advantages and uses of the D.G. Adjustable Reading Lamp. We have therefore compiled a small folder giving illustrations and diagrams of the Lamp, detailing the cleverly constructed Revolving Shade, and the benefits to the eyes derived from its use, the scientifically designed Reflector, etc.

Write or 'phone for a supply of this literature with your name and address overprinted free of charge.

**DRAKE  
AND  
GORHAM  
LIMITED**

**LONDON:** 1, Felix Street, S.E.

(4338, *Hop.*)

**MANCHESTER:** 47, Spring Gardens.

(3700, *City.*)

**GLASGOW:** 50, Wellington Street.

(2198, *Argyle.*)

**LIVERPOOL:** 37, School Lane.

(754, *Royal.*)

## PHOENIX ASSURANCE COMPANY, LIMITED.

ESTABLISHED 1782.

Head Offices: 19 & 70, LOMBARD STREET, LONDON, E.C.

TOTAL FUNDS EXCEED

£15,000,000

CLAIMS PAID EXCEED

£90,000,000

CHAIRMAN: RT. HON. LORD GEORGE HAMILTON, P.C., G.C.S.I.

### FIRE - LIFE - ACCIDENT - MARINE

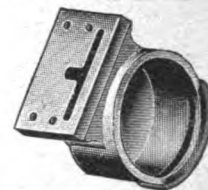
Loss of Profits following Fire, Workmen's Compensation,  
Fidelity Guarantee, Burglary, Trustee and Executor, &c.

#### ELECTRIC LIGHTING.

The Company has always encouraged the development of Electricity, and the well-known "Phoenix Fire Office" Rules for Electrical Installations are in use throughout the world. Copies will be supplied free on application to Head Offices.

General Manager: SIR GERALD H. RYAN.

SEE THESE  
PIECES OF  
**INTRICATE**  
REPETITION  
**WORK.** They are



**CAST AND  
FINISHED**

by the

**"PRANA" DIE FINISHED  
CASTING PROCESS**

which can save time as well as money. Write  
for a little booklet which will show you how, to

**AERATORS LIMITED,**  
UPPER EDMONTON, LONDON, N.



### ELECTRICAL PORCELAIN

OF

HIGHEST QUALITY

APPLY TO

**JAMES MACINTYRE & CO., LTD.,**  
BURSLEM.

The Micanite & Insulators Co., Ltd

WALTHAMSTOW,  
London, E.

FOR **FIBRE**  
SHEETS, RODS  
AND  
TUBES.

## BLAKE & INSULATING STAPLES

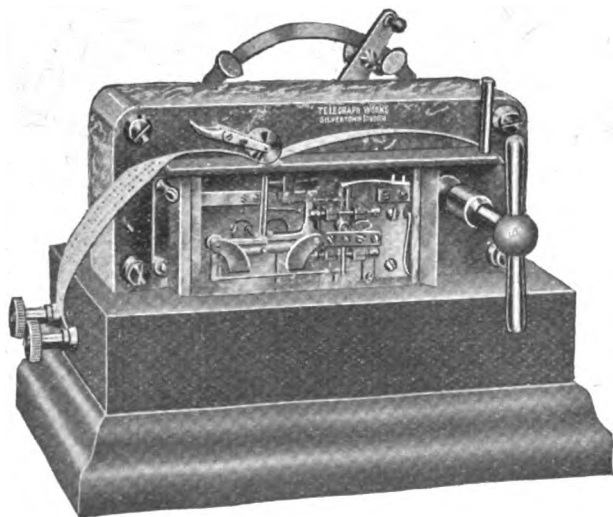
Write for Samples and Prices.

**MOSSES & MITCHELL,**

Chiswell Works, 122-124, GOLDEN LANE, E.C.

**STEATITE  
INSULATORS**  
SUPPLIED  
FOR ALL KINDS OF  
ELECTRICAL WORK  
**WILLIAM SUGG & CO. LTD.**  
WESTMINSTER.

# SILVERTOWN INSTRUMENTS



**WHEATSTONE**  
**Automatic Apparatus**

**Transmitters & Receivers**  
**Working up to 400 words**  
**per minute**

PRICES ON APPLICATION

**The India Rubber, Gutta Percha and Telegraph Works Co., Ltd.**

Head Offices:

106, Cannon Street, London, E.C.

Works:

Silvertown, London, E.

When corresponding with Advertisers, please mention "Electrical Engineering."



## LOCAL NOTES

**Action: Electricity Undertaking.**—A statement prepared by the Borough Treasurer says that last year the number of units sold under the agreement with the Metropolitan Electric Supply Co. was 1,306,941, compared with 760,696 in 1910-11, the final year of working by the Council. The position of the undertaking was regarded as satisfactory, but one of the two opponents of the sale to the Company took the opportunity of reminding the Council that they had done a foolish action in parting with the undertaking.

**Ayr: Electricity Accounts.**—The net profit on the electricity undertaking last year was £241, against £755 in the previous year. The gross revenue, however, was £316 in advance of the previous twelve months, and satisfactory increases in all departments were reported.

**Birmingham: New Power Station.**—A start will shortly be made with the foundations of the new 100,000-kw. power station at Saltley, to which reference has already been made in these columns.

**Carnarvon: Electricity Undertaking.**—The National Electric Construction Co., which is running the local electricity works under lease from the Corporation, has found it necessary to increase the price of current for lighting purposes from 5d. to 6d. per unit. To this the Corporation has taken some exception, as when the works were first started the Company stated that there was very little likelihood of the price being increased beyond 5d. In reply, the Company state that they have up to date lost £7,000 on the working of the undertaking, and that the step they have taken is as much in the interests of the Corporation as of the Company, as under the terms of the lease the Company has to meet the capital charges on the money borrowed by the Corporation.

**Dover: Bulk Supply.**—The South-Eastern Electric Power Co., which is developing works at Tilmanstone, has offered to supply the Corporation in bulk. The Borough Electrical Engineer estimates that an expenditure of £4,500 will be necessary on converting plant for dealing with the Company's 11,000-volt supply. Consideration of the matter has been adjourned pending further information from the Company.

**Hebburn: The Trouble with Electric Cables.**—It is anticipated that the Board of Trade inquiry with regard to the trouble experienced some time ago in Hebburn from the electric cables will be held in London. Experiments are being carried out upon samples of bitumen used in the districts for the purposes of this inquiry.

**Manchester: Electric Supply.**—It is probable that in an omnibus Bill to be promoted by the Corporation next session, powers will be asked to purchase the Trafford Power & Light Supply (1902), Ltd., which will, of course, give the Corporation powers to supply in Trafford Park.

**Newport (N.B.): Purchase of Electricity Works.**—There is a suggestion that the Town Council should purchase the electricity undertaking belonging to the adjoining township of Wormit.

**New Zealand: Licensing Wiremen.**—The Wellington Council has adopted a bye-law providing that no person shall undertake electrical work in the city unless licensed as a master wireman or journeyman wireman.

**Pontypridd: Cooking.**—Messrs. Gillespie & Beales, of Amberley House, Norfolk Street, Strand, the sole wholesale selling agents for "Tricity" cookers, have recently organised a successful demonstration of electric cooking with the "Tricity" cooker. The lectures and demonstrations were given by Mr. F. S. Grogan, of the British Electric Transformer Co., Ltd., who interested large audiences twice a day during the past week. The interest and enthusiasm shown augurs well for the future of electric cooking in this area, and the rapid development of a big cooking load on the Urban District Council's mains is likely to occur. In an appreciative paragraph, the *Glamorgan Free Press* refers to "the perfect results which are unflinchingly attained without labour, worry, or care"; and adds that Mr. Grogan "scatters the bogey of expense to the four winds, and proves that the thrifty housewife can gain all the unquestioned advantages of electric cooking, ironing, &c., and actually show a saving in hard cash on the year's expenses."

**Swinton: Street Lighting.**—It is proposed to extend incandescent lighting to all the tram routes, two 50-c.p. lamps being fitted to each span wire. The estimated cost is put at £192 per annum, compared with £269 for the present gas lamps.

**West Ham: Electrical Bulletin.**—The October issue of the West Ham Corporation electrical service bi-annual bulletin

contains an interesting article on electric vehicles, and descriptions of the electrically-driven machinery in a pianoforte factory, a laundry, and a cycle and motor-car repairing works.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

## Generating Stations, Sub-Stations, Mains, &amp;c.

**Bedford.**—A 1,000-kw. mixed-pressure turbo-alternator with exciter and condensing plant, also water-tube boiler with mechanical stoker and coal-handling plant, is required. Chairman, Electricity Committee, November 12th. (See advertisement on another page.)

**Bitterne.**—An electric lighting proposal by the Southampton Corporation is to be further considered.

**Burnham.**—Dr. J. A. Purves, who is promoting a local company for the supply of electricity, communicated to the Council a short time ago that unless the capital were reduced by about £1,000 by placing overhead wires instead of underground mains, the company could not be floated. The Council has now been informed that all the shares in the company have been taken up, and that the original scheme for underground mains will be carried through.

**Egypt.**—The Egyptian Government requires six 3,950 k.v.a. and five 875 k.v.a. three-phase 5,000-volt generators, switchboard, sub-stations, and a 40,000-volt transmission line. Consulting Engineers, Messrs. Harper Bros. & Co., 13 St. Helen's Place, E.C.

**Ellon.**—The proposed electric lighting scheme by Messrs. T. Smith & Co. is to be carried out.

**Fleetwood.**—A loan of £2,500 for electrical extensions is to be applied for.

**Hindley.**—A loan of £2,500 for electrical extensions is to be applied for.

**India.**—The Allahabad Club requires a generating plant consisting of oil engine and 20-kw. dynamo, together with battery. (See an advertisement on another page.)

**Kenilworth.**—A consulting engineer is to be engaged to advise upon an electric lighting scheme.

**Knaresborough.**—An electric lighting scheme, utilising the water power at a local mill, is to be reported upon.

**Maidstone.**—A L.G.B. inquiry was held last week concerning a loan of £6,120 for plant extensions.

**Manchester.**—Two 5-ton electric derrick cranes. R. Carlyle, Elsinore Road, Old Trafford.

**Moffat.**—The Council has abandoned an electric lighting scheme involving the use of water power, but is negotiating with regard to an alternative proposal.

**Newport (Mon.).**—A loan of £10,772 has been sanctioned.

**Norwich.**—A L.G.B. inquiry was held last week concerning a loan of £25,000 for electrical extensions.

**Pickering.**—The proposed electric lighting scheme is to be further considered by the Council.

**Rathmines.**—A 400-kw. generating set (tandem dynamos). Borough Electrical Engineer, November 4th.

**Rawtenstall.**—A loan of £10,000 for plant and mains extensions is to be applied for.

**Rhyl.**—A loan of £3,900 for the purchase of an additional Diesel engine set is to be applied for.

**Tasmania.**—Oil-cooled transformers, underground cable, and H.T. switchboard are required by the Launceston City Council. Copy of the specification may be seen at 73 Basinghall Street, E.C.

**Trowbridge.**—Messrs. Samuel Salter & Co., Stone Mills, require a 200-ampere 115-volt dynamo and switchboard; also wiring for 250 lights.

**Warrington.**—A 2,000-kw. turbo-alternator, condensing plant, &c., and water-tube boiler. Borough Electrical Engineer, October 28th.

**Watford.**—A loan for three years' requirements of mains and services, to include also dealing with the Council's extension order granted last session, is to be applied for.

FOR  
STEAM JOINTS  
USE



JOHN HUDSON & CO.'S SUCCESSORS, Mansell St., London, E.

### Wiring

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Barnsley.**—New theatre, Doncaster Road.

**Blackburn.**—New fire station (£24,960). Architect, W. Stirrup, Richmond Terrace.

**Croydon.**—Thirty-four houses in Meadvale Road. A. J. Fraser, 1 Mortimer Road, West Ealing.

**Dundee.**—New school. Architects, Maclaren, Son & Sowter, 10 Reform Street.

**London: Islington.**—An electric lighting scheme has been adopted for the two workhouses and school belonging to the Guardians. The estimated cost is £3,372.

Ninety-five lighting points in Colebrooke Row Special School, and 180 lighting points at Chelsea County Secondary School. (See an advertisement on another page.)

**Malifax.**—New theatre.

**Ipswich.**—Additions to isolation hospital. Architect, H. Munro Courtley, The Thoroughfare.

**Lowestoft.**—New school.

**Sheffield.**—Additions to north-east wing, University of Sheffield. Architects, Gibbs, Flockton & Teather, 15 St. James Row.

**Swansea.**—New sanatorium.

**Margate.**—New fire station.

### Miscellaneous

**Banbridge.**—Tenders are invited for public lighting for three years. Town Clerk.

**Glasgow.**—Twelve months' supply of stores, including electrical machinery for the Caledonian Railway Company. 302 Buchanan Street.

**Russia.**—British firms desiring to tender for electric lighting on the Russian State railways should notify the Minister for Ways of Communication, St. Petersburg.

## TENDERS RECEIVED AND ACCEPTED

**Cleethorpes.**—The contract for prepayment meters has been placed with Messrs. Chamberlain & Hookham.

**South Africa.**—The South African Railways & Harbours Administration has accepted the tender of the A.E.G. Electrical Co. of South Africa for the supply of 36,000 train-lighting lamps.

## APPOINTMENTS AND PERSONAL NOTES

Mr. H. F. Osler, late Chairman of Messrs. F. Osler, Ltd., electrical fittings makers, of Birmingham, has, after making a number of bequests, bequeathed one-third of the ultimate residue of his estate to the Birmingham University.

Mr. Arthur Chamberlain (brother of the Rt. Hon. Joseph Chamberlain, M.P.), who died last week, was Chairman of Chamberlain & Hookham, Ltd.

Mr. W. H. Hulhall, who was formerly associated with Siemens Bros.' Dynamo Works, Ltd. (Dalston) as traction lamp expert, has been transferred to the Glasgow branch to handle their general electrical business in that district.

Mr. L. Lee, Chief Meter Inspector to the Watford U.D.C., has resigned, and Mr. V. A. Woodland, at present Assistant Meter Inspector, has been promoted.

An engine-room assistant is required in the Stepney Electricity Department. (See an advertisement on another page.)

## MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. George Smith & Son, of 5 Philpot Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night, was £78 to £78 10s. (last week, £76 to £76 10s.).

**Metal Filament Lamps.**—Pope's Electric Lamp Co. (Hyth Road, Willesden) are issuing the following letter to their customers:—"After many verbal threats of proceedings, which we were unable to trace to a definite source, we have at last

been asked in writing for the names of our solicitors. We therefore expect, and indeed welcome, legal proceedings, and would remind our customers our indemnity holds good."

**Ghent Exhibition Award.**—The Grand Prix awarded to Ferranti, Ltd. (see page 584 of our last issue) was for an exhibit including a high-tension three-phase motor panel of the totally enclosed interlocked type, such as they supply in large quantities for works, sub-stations, &c.

**A New Cable Works.**—The Macintosh Cable Co., Ltd., have installed a complete plant for the manufacture of high- and low-tension paper-insulated lead-covered cables, and inquiries addressed to the following from the districts indicated will receive prompt attention:—*South of England:* Gillespie & Beales, Amberley House, Norfolk Street, Strand, London, W.C. *Manchester and District:* Chas. Macintosh & Co., Ltd., Cambridge Street, Manchester. *Liverpool and District:* W. Rickard, Dale Street, Liverpool. *Newcastle and District:* F. H. Morley, Star Buildings, Newcastle-upon-Tyne. *Export inquiries:* F. Hardy-Smith, 19-21 Fore Street Avenue, London, E.C. The new company is financially controlled by Messrs. Chas. Macintosh & Co., Ltd., and the works and registered offices are situate in Rice Lane, Walton, Liverpool.

**Gillespie & Beales.**—This firm, by taking up the sole selling agency for the south of England for the Macintosh Cable Company, have made a new departure, as their agencies have so far not included one for heavy lead-covered paper cable. Their agencies, together with their business, as factors for some of the leading electrical firms, and their third department, viz., that of expert buyers for foreign and colonial clients, now cover a very wide field in the electrical industry.

**Ediswan Advertising.**—The Edison & Swan United Electric Light Co. are carrying out a wide and effective advertising campaign. A fine new poster has appeared on the hoardings, designed by Francis Barraud, and in rich oriental colouring. The subject-matter is explained by the inscription: "Sun Worship—A Pardonable Error." A more personal appeal to attention is being made by postcards with an Ediswan lamp and suitable wording printed in front; these are being sent out in batches to customers and other friends with their own address printed at the back, so that they may use them and assist Ediswan lamp publicity. Some compact cases of paper matches for the waistcoat pocket are being distributed also, each match bearing a reminder of Ediswan activities, and last but not least, some of the firm's friends have received an ingenious two-blade pocket knife which contains an 18-in. steel spring tape measure, reading both in inches and centimetres—an extremely neat and well-made arrangement.

**Removal.**—We have been asked to announce that Haseltine, Lake & Co. have recently removed to 28 Southampton Buildings, W.C. All correspondence should bear this address.

## COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &c.

**Drake & Gorham.**—The report and accounts given in our issue of October 9th, page 576, were adopted at the meeting last week. Mr. B. M. Drake, who presided, referred to the company's share of the better-class work during the year, and expressed regret that at present no diploma or examination is necessary for plumbers and men of other trades to qualify for carrying out electrical wiring work. The best protection for the public was to deal with old-established firms who had a reputation to maintain, even though this might mean having to pay a slightly higher price for of course considerably better quality work. In conjunction with Colonel Holden, a semi-automatic generating set had been designed, and was now under test. The company had also, he said, made arrangements for supplying electric cars, and he anticipated that this would develop into a large business.

**Wireless Electric Light Co.**—Some time ago we announced the incorporation of this company, which, we now learn from the *Financial News*, is to acquire certain British patents from Otto Markiewicz, the British Thomson-Houston Co., Max J. Stoeck, and Richard H. Markiewicz. The purchase consideration is £18,000, payable in £5,000 in cash to the B.T.H. Co., and £13,000 in cash, and £14,500 in shares to the others. J. F. Gilmore, the promoter, is to receive £32,000 in cash and shares in repayment of moneys paid by him on behalf of the company. First directors are E. Wilding, Chartered Accountant, 47 Victoria Street, S.W., J. F. Gilmore (same address), and M. J. Stoeck, 19 St. Dunstan's Hill, E.C.

**Metallic Seamless Tube Co.**—A 20 per cent. dividend is recommended for the past year, carrying forward £2,887.

# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 357 [Vol. IX., No. 44]  
*All rights reserved.*

THURSDAY, OCTOBER 30, 1913.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES and TECHNICAL COLLEGE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

Other Advertisement Rates on Application.

#### Latest Time for Receiving

Letters for Insertion, Tuesday first post.

Small Advertisements and Official Announcements, Wednesday first post.

Displayed Advertisements, Tuesday first post.

Corrections in Standing Advertisements, Monday first post.

All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 208-206, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Owring, Fleet, London."

Telephone No.: 5509 Holborn.

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

THE introduction of tungsten lamps in Bristol resulted, in 1909, in an increase of 50 per cent. in the average illumination of consumers' premises, but the cost of a service (exclusive of meter), is £3 8s. for an average revenue of 35s. per annum. (Page 600.)

At the last meeting of the "Point Fives," Mr. C. S. Davidson explained that, owing to the lack of a sales and hire department at Barnes, the introduction of the tariff had not produced such a diversified load as was hoped. (Page 600.)

A CORRESPONDENT refers to a push button emergency motor stopping system recently described in our columns. (Page 600.)

MR. C. VERNIER, in his address as Chairman of the Newcastle Section of the Institution of Electrical Engineers, maintained that the waste gases from coke ovens and blast furnaces would be sufficient for the supply of electricity for the whole of the United Kingdom. He referred to the power companies with municipal shareholders in Germany, and concluded with an interesting review of the overhead line question. (Page 601.)

SOME difference of opinion was expressed at the Institution of Mechanical Engineers on Friday, as to the economy of electrical driving for flour mills. One speaker mentioned a case where the output was increased by 7½ per cent. since the use of electric power was commenced. (Page 602.)

WE give some notes on the work of the late Dr. H. Aron. (Page 602.)

A NEW water-heater, controlled by a thermostat is described. (Page 602.)

AN Electrical Exhibition is now being held at Glasgow, at which most of the leading electrical firms are represented. (Page 603.)

SOME new accessories for the Henley Wiring System are illustrated. (Page 604.)

ADVICE is given in our questions and answers columns regarding the treatment of a dynamo which does not give its correct voltage. (Page 605.)

A NEW table lamp, a form of enclosed fuse, and an electrically driven pump are illustrated on page 606.

HIGH-TENSION D.C. traction is being adopted on the Canadian Northern Railway. (Page 607.)

AN international commission to carry out experiments in wireless telegraphy is being formed. (Page 607.)

AMONG the specifications published by the Patent Office last week was one by H. Leiser for a method of producing tungsten which can be drawn into filaments for incandescent lamps. Opposition has been entered to the grant of a patent to the B. T.-H. Co. for a method of annealing silicon steel. A number of important patents expire during the coming week after a full life. Included is one by H. Bremer, covering the addition of a flux to flaming arc carbons, and one by F. Braun covering the use of a jigger transformer in wireless transmitting circuits. (Page 608.)

A NET profit of £3,477 has been made on the Bradford electric supply undertaking.—New electric supply schemes are under consideration at Coniston, Llanfairfechan, Teignmouth, Waterford, and Whitstable.—The Lytham Council has decided not to take bulk supply from St. Anne's.—An electrical exhibition is in progress at Sheffield.—A strike of wiremen is in progress at Manchester. (Page 609.)

LOANS for extensions are under consideration at Bolton, Leicester, and Salford. Cables are required at Fleetwood, a gas-driven generator at Ormskirk, and stores at Grimsby. (Page 610.)

**Faraday House O.S.A.**—The annual smoking concert of the Faraday House Old Students' Association has been fixed for Friday, December 5th, at the Holborn Restaurant. The President, Mr. Haydn T. Harrison, will occupy the chair.

**Electrical Trades' Benevolent Institution.**—On Saturday, November 22nd, the Garrick Dramatic Society are giving a performance of *The Voyage of Inheritance* at the Royal Court Theatre. Tickets for all parts of the theatre should be obtained from Mr. F. B. O. Hawes (18 Park Mansions, Vauxhall Park, S.W.). Mr. L. G. Tate (20 Bucklersbury, E.C.), or members of the committee of the E.T.B.I., as the arrangement is that the Institution only benefits by the tickets so sold. It is hoped that the receipts may be considerably in advance of last year's, when, it will be remembered, the Garrick Dramatic Society gave a fine performance of *The Second Mrs. Tanqueray*, which was thoroughly enjoyed by a full house.

## ARRANGEMENTS FOR THE WEEK

FRIDAY, OCTOBER 31st.

*Batti-Wallahs' Society.*

7.45 p.m. Smoking concert at Holborn Restaurant.

TUESDAY, NOVEMBER 4th.

*Institution of Electrical Engineers: Manchester Section.*

7.30 p.m. At Midland Hotel. Address by the Chairman, Prof. E. W. Marchant. Smoking concert to follow.

*Institution of Civil Engineers.*

8 p.m. Address by the President, Mr. A. G. Lyster.

THURSDAY, NOVEMBER 6th.

*Institution of Electrical Engineers: Yorkshire Section.*

7.15 p.m. At Hotel Metropole, Leeds. Reception and Address by the Chairman, Mr. W. B. Woodhouse. Smoking concert to follow.

## The London Electrical Engineers.

MONDAY, NOVEMBER 3RD.—*A. Company.* Technical Instruction, 7 to 10 p.m.TUESDAY, NOVEMBER 4TH.—*B. Company.* Technical Instruction, 7 to 10 p.m.; Meeting of N.C.O.'s at 8 p.m.WEDNESDAY, NOVEMBER 5TH.—*Recruits only.* Infantry Drill and Technical Instruction, 6 to 10 p.m.; *Sergeants' Mess.*—Meeting in Mess Room at 7.30 p.m.THURSDAY, NOVEMBER 6TH.—*C. Company.* Technical Instruction, 7 to 10 p.m.; Meeting of N.C.O.'s at 7 p.m.FRIDAY, NOVEMBER 7TH.—*D. Company.* Technical Instruction, 7 to 10 p.m.; Meeting of N.C.O.'s at 7 p.m.SATURDAY, NOVEMBER 8TH.—*Headquarters open from 10 a.m. till noon.*

## THE HALF-WATT LAMP PANIC

IF Mr. H. Faraday Proctor had read the articles which I have appeared on the half-watt lamp in *ELECTRICAL ENGINEERING* during the past few weeks, particularly the one published in our issue of October 9th, we should have been deprived of an interesting portion of his Chairman's address to the Western Section of the Institution of Electrical Engineers last Monday. He would have realised that the half-watt lamp cannot displace the  $1\frac{1}{2}$ -watt lamp as rapidly as this has displaced the  $3\frac{1}{2}$  watt per candle. The tungsten lamp appeared on the market in sizes of about 50 c.p., and the only impediment which prevented the immediate production of the smaller sizes was the mechanical difficulty of making finer filaments. The nitrogen-filled half-watt lamp will in the first instance have a minimum candle-power in the neighbourhood of at least 300, and the research work which has led to its evolution has shown that lamps of ordinary domestic candle-powers constructed on the same principle would have a poorer rather than a better efficiency than the one-watt lamp. Nevertheless, Mr. Proctor's data as to the effect of the introduction of the tungsten lamp in Bristol, although unnecessary to allay a half-watt panic, are distinctly interesting.

In 1909 a careful comparison was made of the consumption of electricity by a large number of consumers in Bristol who had installed tungsten lamps throughout their premises, with that of the same consumers when using carbon filament lamps. Care was taken to ascertain that the results were directly comparable. The result showed an economy to the consumer (averaged) of 53.8 per cent. Since, however, the tungsten lamp represents an economy of about 68.5 per cent., it was evident that those consumers on the average had increased the candle-power installed by about 50 per cent. It is further interesting to note that after a lapse of four years, the proportionate figures still hold good. Thus the average consumer has been educated up to require illumination 50 per cent. in excess of that with which he had been satisfied previously.

But Mr. Proctor is still rightly concerned as to the disproportionately high cost of the consumers' service connections in view of the advent of the small consumer, who requires only a few of the more economical lamps on his premises. In Bristol the present cost of connecting premises adjoining the mains is £3 8s. (exclusive of the cost of the meter), and the average revenue per connection—derived from 20 per cent. of the lighting consumers—amounts to only 35s. per annum.

Mr. Proctor's address, which dealt with a variety of other topics, from purely local matters to the proper duties of the Institution, and from the standardisation of 2-pin plugs and catalogue sizes to the Daylight Saving Bill, will probably appear in full in the *Institution Journal* early in December.

**Finsbury Technical College O.S.A. Dinner.**—The Annual Dinner of the Finsbury Technical College Old Students' Association has been fixed for Saturday, November 15th, at the Trocadero Restaurant. Mr. H. A. Humphrey will take the chair, and in addition to the musical programme, intervals to allow members to meet and converse have been arranged. Mr. H. F. Knight (14 Old Queen Street, Westminster, S.W.) will be glad to receive applications for tickets, which are priced at 5s. 6d. each.

## THE "POINT FIVES"

A MEETING of the "Point Fives" was held on Friday, October 17th, at the "B. & K." electric restaurant, when Mr. S. T. Allen (Wolverhampton) and Mr. A. H. Shaw (Ilford) were elected members of the Society. The qualifications necessary for membership were discussed, but it was agreed that no alteration be made in the present arrangements. During the evening a new type of light-weight oven and grill, which was designed by Mr. R. S. Downe, was examined by the members present and favourably commented on. Fifty of these ovens are going through the B. & K. Accessories Co.'s workshops at the present time. In the course of his five-minute address, the Chairman, Mr. C. S. Davidson (Barnes), lamented that, unlike his predecessors in the chair, he could not record any very striking result of his department's increased activities due to the introduction of the point five tariff. This he attributed to the fact that he could not maintain a sales and hire department. Since the introduction at Barnes of the tariff from which the Society took its title, some ten per cent. of his consumers had elected to be charged on the rateable value basis, and he had received innumerable inquiries regarding the hire and purchase of all classes of apparatus. But owing to his inability to hire cookers, the result had been the installation of the cheaper classes of apparatus, such as radiators, in the proportion of about a hundred to one cooker. Thus they were selling cheap units without the anticipated advantage in diversity factor. He urged the Society to assist those local authorities who had not hiring powers to obtain them, and thought that architects should be persuaded to do away with the present unsatisfactory system of fireplaces and substitute modern electric heaters. Thus there would be a saving in the cost of brickwork, registers, space, and decorations.

The address was discussed, and a suggestion for co-operative action in regard to publicity matters made by the Association of Municipal Electrical Engineers (Greater London) was agreed to. These endeavours were, however, only regarded as temporary, and the meeting expressed the opinion that every possible effort should be exercised to bring about a general publicity scheme from the electric supply industry.

The next meeting (Chairman, Mr. A. H. Seabrook) was provisionally fixed for Friday, January 16th, at "Tricity House." After the business meeting at 4 o'clock there is to be a dinner and discussion at 7 o'clock, to which each member may invite one or two guests.

## CORRESPONDENCE

## EMERGENCY SWITCH SYSTEMS.

To the Editor of *ELECTRICAL ENGINEERING*.

DEAR SIR,—In reference to the description of an emergency push switch system in your issue of 23rd October, 1913, it may interest your readers to know that the method of first short-circuiting the "no-voltage" coil of a starter and then opening the coil circuit was originated by me and a colleague at least a dozen years ago, and it was successfully used at the time. I presume that the patent refers to details of the switch.

The difficulty of reliably releasing the "no-voltage" coil of starters, when operated on the shunt field circuit, particularly with large motors, is a very real one, and I have known seven-strand cables of substantial section to be run to the stop switch for this purpose with indifferent success.

A better method which I devised is to arrange the "no-voltage" circuit as an independent shunt or lamp circuit, with the coil wound to about, say, 20 per cent. of the total voltage. Small wires can then be run any reasonable distance to the push switch for the purpose of short-circuiting the coil, and in many years' experience of this method I have never known it to fail. This method has now become the regular practice with some well-known firms.

I may add that the term "no-voltage release" is generally misconstrued. Originally it was intended to release the starter in the event of supply interruption, which was prevalent in early days, but the usual manner in which it is carried out, together with the present-day constancy of supply, has led to the assumption that it is primarily intended as a protection to the field excitation.

The original interpretation seems to allow wider scope for the correct solution of reliable emergency switch systems, and also provides more complete compliance with modern specifications and regulations.

I am, yours faithfully,

ARTHUR E. GOTT.

Southall,

25th October, 1913.



## WASTE

"WASTE" may be taken as the keynote of Mr. C. Vernier's address last week as Chairman of the Newcastle Section of the Institution of Electrical Engineers: waste by the continued employment of comparatively small electricity works with small load factors; waste of the opportunity of remedying this in the case of electric power for railways; waste heat and waste gases from coke ovens and blast furnaces which would be sufficient to supply the whole demand for electrical energy in the United Kingdom; waste of capital on underground mains owing to the difficulties of obtaining overhead wayleaves; and waste of good dielectric by giving a thicker insulation than necessary to extra high-tension cables.

Mr. Vernier produced some startling statistics. During the past ten years the supply of electricity by power companies on the north-east coast of England has increased by over 3,200 per cent.; but an increase of 450 per cent. is the average increase for the whole country for the same period. Less than three per cent. of our electrical undertakings have a load factor of 25 per cent., and less than two per cent. have a works' cost as low as 0.5d. per unit sold. According to the last Census of Production, in 1907, 10½ million h.p. were employed in the factories and mines of this country, but the total plant capacity of the public electricity undertakings was only 1½ million h.p. (which has increased only by about ½ million since that date). Private electric plants in 1907 were responsible for about 1 million h.p., that is to say, actually two-thirds the total of the public supply undertakings. In supplying electrical energy to work our railways, we must not, he said, add to our already too numerous generating stations by compelling the railway companies to erect their own; the electricity supply industry must be ready, for the ability to supply will create the demand.

Mr. Vernier urged that further steps should be taken in the direction of turning all coal-fired generating plants into large power stations, interconnected as far as possible, and that all available sources of waste heat should be utilised. He estimated that if 80 per cent. of the waste heat in the gases from blast furnaces and coke ovens were employed, it would supply 1 million h.p. continuously, approximately equally contributed to by the two sources; but he pointed out that the share contributed by the coke ovens would under present conditions have to be discounted by 75 to 80 per cent., as the majority are of a type which does not allow any recovery of the waste gas to be made.

Germany is at present wrestling with this problem of the centralisation of power generation, and is putting down large stations for supply in bulk, many of them in connection with iron and coal companies, utilising waste heat from coke ovens and unsaleable qualities of fuel. But there a step far in advance of us has been taken. The co-operation of municipal authorities is being secured in some cases by buying out municipal undertakings upon terms advantageous to both sides, but more usually by giving these municipalities a financial interest in the power company. It may be remembered that this policy was referred to by Dr. Ferranti in the course of a speech which created some sensation at the I.M.E.A. annual dinner last year (*ELECTRICAL ENGINEERING*, Vol. VIII., p. 369). An instance quoted by Mr. Vernier was the municipality of Strasburg, which takes the whole of its supply from a power company, in which it owns a large number of shares, and from which also some seventy communes in Alsace-Lorraine are also supplied. As the result of the operations in 1909, the municipality received dividends and a share in the profits amounting approximately to £38,000, which, after deducting 4 per cent. interest on its invested capital, left a balance of over £21,000 for the relief of rates. In other instances, groups of urban and rural authorities co-operating with a power company have the option of subscribing for 40 or 50 per cent. of the total capital of the company in ordinary shares or even in some cases, in preferential shares, with a fixed dividend and a further share in the profits. In either case, the municipalities are directly represented on the Board.

It is perhaps in the United States of America, however, said Mr. Vernier, that the centralisation of electric power production and distribution is making the greatest progress, and it is also remarkable that in that country the supply of electrical energy is chiefly in the hands of private enterprise. We have nothing to compare with the electric service in Chicago, with its maximum load of 230,000 kw. (which compares with 20,000 kw. ten years ago), or with more urban supplies, such as the Public Service Corporation of Northern Illinois,

supplying 46,000 consumers in 150 communities, whose combined population is only one-half million distributed over a tract 150 miles long, and working on a system load-factor approaching 70 per cent. Another example is the Central Illinois Public Service Company, which is gathering into one system a rural district of 350 miles radius (larger than the United Kingdom), with a population of only a quarter of a million, whose present ninety local generating stations will shortly be replaced by a small group of modern central stations.

American progress brought Mr. Vernier to a subject upon which many power company distributing engineers have strong opinions, namely, the difficulties which are placed in the way of overhead mains in this country. Without overhead mains such results as those in Illinois would have been impossible. Here, the only case in which overhead mains have been very widely employed has been in the North-East of England, where there are already 170 miles of such transmission lines, chiefly running at 20,000 volts. Mr. Vernier was therefore able to speak authoritatively on the difficulties in connection with these, as he has successfully overcome them to a large extent. The chief trouble is to obtain way leaves, and he envies the position in Italy and Switzerland, where it is possible to acquire them compulsorily. He despaired, however, of a similar state of affairs being possible in this country for some time to come, as even the Post Office experiences great difficulties in this direction. He attributed his success in the North to the fact that the interests of landowners there are largely bound up with the industries, whose needs the power companies supply, and that they are already well accustomed to way leave matters in connection with the mining industry. Moreover, statutory companies are in a better position in this respect than those working under the Electric Lighting Acts, as they have not to obtain the consent of the local authority before erecting overhead lines. Mr. Vernier's reading of the Electric Lighting Acts is that this veto applies not only to public streets, but also to overhead wires erected entirely on private land.

The subject of overhead lines led Mr. Vernier into interesting matters of a more technical character. He put in a plea for a higher standard of design and workmanship than is common on our overhead line work. A great deal of the prejudice which exists against overhead wires, he maintained, arises out of the haphazard fashion in which much of it is only too frequently put up: crooked poles, neither set plumb nor in line, wires run with all sorts of twists and angles, and ugly cross-arms. Good overhead line work, he said, is entirely a matter of minute attention to details of design and construction. The use of overhead mains, he explained, not only resulted in considerable saving in route length, but even, length for length, the capital cost of a first-class 20,000-volt overhead line was only approximately one-half that of a similar 20,000-volt underground cable; while if the pressure were raised to, say, 60,000 volts, at which pressure the use of three-core three-phase underground cables would no longer be possible, the capital cost per kw. would only be from one-fifth to one-sixth that of a 20,000-volt underground cable of equal section. The chief obstacle at present in the way of the adoption of higher pressures is, he said, the heavy cost of switchgear, as the average distance between switching points is small in this country. A further consideration is the practical impossibility of erecting an entirely continuous overhead system. This led to an examination of the high voltage cable position, and Mr. Vernier mentioned that no very notable advance in this respect could be recorded since the laying of the extensive 20,000-volt three-phase cable system in his district some seven years ago, except a large system of 30,000-volt three-phase cables laid in Berlin about two years ago (see *ELECTRICAL ENGINEERING*, Sept. 11th, 1913, p. 513), and some short lengths of 45,000-volt three-core three-phase cables in use in France. He could not foresee any possibility of exceeding these pressures for long lengths of cable on account of the heavy capacity currents and increased dielectric losses, which increase in proportion to the square of the voltage in cables, but are practically non-existent on overhead lines up to the limit of pressure at which corona effects take place. On the other hand, he saw no very obvious difficulty in constructing single-core lead-sheathed cables for three-phase working up to a working pressure of 80,000 volts between phases, i.e., nearly 50,000 volts per cable with the neutral point earthed, for comparatively short lengths used as an adjunct to overhead lines. He deplored, however, the still very incomplete knowledge of the science of cable design, and contended that the thick-

nesses of insulation required for E.H.T. cables was in many cases unduly liberal and purely arbitrary. For instance, although the potential stresses are relatively greater for a small core than for a larger one, and for a "clover-leaf" than for a round conductor, yet our engineering standards demand thicker insulation on the larger sizes of cables, and permit the same thickness for cables of round and clover-leaf section.

We have reviewed the main points of Mr. Vernier's most interesting address; the full text of it will appear in the *Journal* of the Institution of Electrical Engineers early in December.

### ELECTRICAL DRIVING OF FLOUR MILLS

IN the course of a Paper on "Modern Flour-Mill Machinery" at the Institution of Mechanical Engineers on Friday, the author, Mr. R. B. Creak, said that although electric driving of flour mills was making some headway, it had been demonstrated that current must be obtained at about 0.4d. per unit before it could compete successfully with steam. Flour mills offered no field for individual driving, as the machines must run together as a complete plant. The usual plan was to put down a motor for driving the wheat-preparing plant, one for driving the roller-shafts on the bottom floor, and one for driving the upstairs line-shafting. There were about a dozen flour-mills driven by electric power at present in this country, and these reported very favourably on the system. Greater regularity of speed is one of the claims made for electric driving, and this was a matter of very great importance where so many separations were effected by the use of delicately adjusted air-currents.

There was some difference of opinion in the discussion on the question of electric driving. The President (Sir H. F. Donaldson, K.C.B.) asked whether the author, in arriving at his figure of 0.4d. per unit, had credited the electric drive with the saving in land, compared with steam, through the absence of the boiler-house and chimney, and also the various other savings in other ways. Mr. C. J. Robinson declared solidly for the electric drive, and mentioned the case of a mill where not only was the output  $7\frac{1}{2}$  per cent. more than with steam, but the product was finer owing to the delicacy of adjustment of the air currents and the uniformity of power to be obtained with electric power.

Mr. Horace Boot, on the other hand, disagreed that electric driving was the best, although he would like to agree. He had had recently to go into the question very carefully for a large mill, and, comparing an up-to-date steam equipment with "Uni-flow" engine, superheaters, and high-pressure boilers, he calculated that electric power must be supplied at 0.33d. per unit to compete. The capital charges for an electric power plant at the mill were £7,000, and the running costs £3,800 per annum, against capital charges of £2,704 and running charges of £6,000 per annum if power was purchased at  $\frac{1}{4}$ d. per unit. For steam plant the figures were £5,890 and £3,393 respectively.

In his reply the author said that his figure of 0.4d. per unit did not include any advantage in respect of the saving in land, but it included capital costs, depreciation, and repairs maintenance. He believed that there were situations, such as London, where land was dear, where the electric drive was the only thing; but where land was cheap, steam would be the cheapest. He confessed his surprise that a  $7\frac{1}{2}$  per cent. saving had been obtained in an electrically driven mill.

### THE LATE DR. ARON

WE have received from the General Electric Co., Ltd. (67 Queen Victoria Street), an interesting biographical sketch of Dr. Hermann Aron, whose sudden death on August 29th at Homburg was recorded in *ELECTRICAL ENGINEERING*, September 11th, page 512, written by some engineers who were connected with him during his life's work.

Dr. Aron's work on electrical measurement dates from as early as 1884, when electric light and power production was in its infancy, and the electrolytic meter of Edison was the only practical supply meter in existence. In searching to improve upon this, Aron conceived the happy thought of influencing the swing of the pendulum of a clock by the passage of an electric current, and of basing his calculation of the consumption of energy upon the acceleration of this clock, compared with one not so affected. The state of electrical measurements was at that time very primitive, and the only instrument available to check his meters was the copper voltmeter. There were many difficulties to overcome, but after a comparatively short time he succeeded in manufacturing serviceable meters, which in 1885 were adopted by the Berlin Electricity Works. He occupied himself for nearly 30 years in improving his clock meter, which is still to-day one of the most accurate in existence, and producing special patterns such as two-rate and maximum-demand meters. The second invention by which his name is well-known is the two-watt-meter method of polyphase power measurement, which he developed and patented in the very early days of three-phase work, and when, later, polyphase circuits were constructed with a neutral conductor, he again succeeded in evolving a formula which con-

siderably simplified the meter required for the measurement of power in such a circuit. With the spread of alternating-current work Aron engaged in the construction of motor meters on the Ferraris principle on a large scale, and this was followed by the production of direct-current motor meters. His activities, however, ranged over a considerable field of physico and electrical engineering. He studied in the Universities of Berlin and Heidelberg, assisted Prof. Paalzow in the physical laboratory at Charlottenburg, and lectured both at the Military Technical Academy and the University at Berlin on chemistry and physics. The subjects of his published papers include the elastic quality of crystals, the theory of condensers, the microphone, the influence of atmospheric electricity on cables, and secondary batteries. As far back as 1883 he spoke on wireless electric signalling at Vienna, and he was a regular writer in the *Electrotechnische Zeitschrift* on meters and other subjects. He also frequently wrote on patent and industrial law. His activities as a manufacturer extended to electric clocks, gas and slot meters, taximeters, &c., and he also at one time started the manufacture of insulated copper wire in order to procure suitable wire for his meters. He took great interest in the affairs of the Institution of German Electrical Engineers, and will be remembered by all who came in contact with him as a man of personal charm, inflexible integrity, and extraordinary intellectual acuteness.

### THE LOSLES ELECTRIC WATER HEATER

WE have received from Mr. C. Wilkinson (Beech Mount, Harrogate) some further particulars of the latest form of the Losles automatic electric water heater which he introduced not long ago. The principal feature of this apparatus is that it takes a small current for a long period, forming a very favourable load from the load-factor point of view, and contains a thermostat by which the current is cut off when the desired maximum temperature has been reached, avoiding losses due to the boiling away of the water. Its construction, with ample heat insulation and no metallic connection between the inner water chamber carrying the heating elements and the outer vessel, renders the heat loss almost non-existent—a point of very great importance in a heater taking small amounts of energy for a long time. These heaters have been made up to 40 gallons capacity, but the standard size is for 12 gallons, and is 36 in. in height and 12 in. diameter. There are two heating elements, each controlled by the thermostat, and each taking 500 watts. The thermostat acts on quick make-and-break switches of reliable construction. It can be set to cut off as high as 200° F., but is usually arranged to furnish water at from 160° to 180° F. With one heating element in action, about 24 gallons of hot water can be obtained per twenty-four hours, and when the second heater is switched in, the rate of heating and output of hot water is doubled. One heater may be connected direct to the service outside the meter and current supplied at a contract rate, while the other, the intermittent supply to which is more of the nature of a peak load, may be supplied from the house circuit in the ordinary way.

**Explosion in New York Generating Station.**—It is reported that as a result of an explosion which occurred in the Staten Island generating station on October 22nd, a large part of New York was put in darkness, while the supply of power to the railways and tramways also failed. Eight persons were killed.

**Damaging a Cable.**—An action was recently brought by the Glasgow Corporation against Robert Murdoch & Sons for damage to a cable, belonging to the Tramways Department, while taking a water-supply pipe underneath the cable duct. The Corporation would not allow Robert Murdoch & Sons to open up the pathway, and while they were tunnelling to locate the cable it was damaged by a pinch bar. As inspectors from the Tramways and Works Departments were present at the time and approved what was being done, the action failed.

**Electric Propulsion of Ships.**—Mr. A. Gracie's "James Forrest" lecture on "Twenty Years' Progress in Marine Construction," delivered last Thursday at the Institution of Civil Engineers, only dealt very briefly with electrical matters. Electrical transmission, he remarked, had now been applied to several vessels. Alternative schemes had been tried in which the power was generated by steam turbo-generators, and by the Diesel oil-engines, and applied to the propeller by alternating-current motors. Considering the transmission efficiencies likely to be attained and the increased weight and initial cost of the installation, he was not of opinion that a system of this kind could compete successfully, in ordinary cases, with the direct-driving engine or mechanically geared turbine. Where, however, power has to be provided for other than propelling purposes (in which case the same generating plant could be available), it was possible that this system would have advantages.

## THE GLASGOW ELECTRICAL EXHIBITION

**E**NCOURAGED by the success attained by recent Smoke Abatement Exhibitions in Glasgow, the Corporation jointly with the British Electrical and Allied Manufacturers' Association, have promoted a purely Electrical Exhibition, which was opened in the Zoo Buildings, New City Road, on October 23rd, by the Countess of Glasgow. It will be continued till November 15th, and will be open each day from 11 a.m. till 10 p.m. The Exhibition embraces electrical machinery and appliances of every description, but particularly as regards the applications of electricity to daily requirements in the home and in the workshop. The Exhibition should be successful in achieving the two-fold object of the promoters in emphasising the economical and labour-saving qualities of the many electrical devices now available for domestic and commercial use, and by their more extended use further the air purification crusade. Under the management of Mr. James M. Freer, who has been responsible for many similar undertakings, the success of the exhibition may be said to be assured, and so far the daily attendance of never less than 4,500 indicates the interest taken in the venture by the general public. A pleasing feature, unusual in this country, is the uniform scheme of decoration of the stands, in grey and pink. There are 80 stands, occupied by about 70 exhibitors.

The Glasgow Electricity Department have on their stand an information bureau, where officials are in attendance to give particulars relative to the supply of electricity for lighting, heating, cooking, and power purposes. A map showing the position of existing mains is exhibited, and terms can be quoted for extensions to premises where a supply is not at present available. Further information may be obtained by referring to the several pamphlets which are here distributed, including descriptions of the methods of charging and approximate annual costs, and series of articles in booklet form by the Kilowatt Publishing Company and others. A shop window of ordinary dimensions is shown lighted by different systems suitable for various trades, with heaters and fans for the dissipation of frost and moisture on the windows, and these combinations are each demonstrated at intervals by an automatic switch, the cost of installing the respective equipments and the annual charge being also indicated. Two radiators are on view, a "Belling" fire with folding down top rack, which may be used for a kettle or such like, and a lamp radiator with decorative screen or canopy.

Simplex Conduits, Ltd. (72A Waterloo Street, Glasgow), show a number of wiring accessories and heating and power accessories, including the "Plexsim" oven. Cooking demonstrations are given by an attendant cook, who claims to roast a 7 lb. joint in 2 hours 20 minutes with a consumption of 1 unit. In the construction of this oven, heat losses are avoided when open for inspection, and owing to the position of the heating elements the cooking temperature is reached within 5 minutes of switching on the current, and the heat is then continuously circulated around the food being cooked, which is thus kept at a uniform temperature. Two types of portable fan vacuum cleaners are shown, the larger being fitted with rollers and brush, and on sale for £8 10s. A sealing-wax heater has a special arrangement for regulating the flow of heated wax. The selection of electric light fittings includes several of the semi-indirect pattern with alabaster, intaglio and alabaster glass basins.

The Siemens firms (66 Waterloo Street, Glasgow) have quite a varied collection of apparatus on view on Stands 18 and 19, including a 10 b.h.p. Aster-Siemens direct-coupled generating set suitable for use with petrol or paraffin fuel, and the well-known "Melda" domestic water-pumping equipments supplying a fountain on the stand. The "Stannos" system of wiring for both concentric and double use is shown with relative fittings connected up on the surface of show boards. As already well known, the small diameter of the "Stannos" conductors makes it specially suitable for exposed use, whilst a considerable saving can be effected by adopting it on the concentric system. Owing to the limits of space, only a small number of motors, electric drills, &c., and switch panels are exhibited, including two A.C. loom motors for individual and belt drives. There are a special show of laboratory and tantalum dental instruments, also ebonite accessories and tools, and a comprehensive selection of telephones for general service, with the firm's latest gas- and water-tight types suitable for mines, with a mine-shaft signalling outfit operated at different levels by push or pull attachments. Specimens of different classes of cable suitable for bell, lighting, power, submarine, and telephone work are displayed. The temperature-recording apparatus for cold-storage plants, water meters and pyrometers of both optical and furnace types, and the recording and dial indicator fire alarm apparatus, are all of

interest as representative of the comprehensive range of manufactures supplied by the firm.

Ferranti, Ltd. (Central House, Kingsway, W.C.), have an interesting exhibit on Stand 21, where they have a 200 k.v.a., 6,000/210-volt totally enclosed three-phase oil-immersed transformer, with the case removed to show coils and workmanship. Besides an assortment of meters and switches, there are two ovens and boiling plates, which have interchangeable elements guaranteed for two years, of very substantial construction, and very suitable to withstand ordinary kitchen usage. The feature of this exhibit is a water heater for domestic purposes. It is this duty that often precludes the more general use of electric cooking, as the kitchen range or separate slow combustion boiler must otherwise be always retained to provide the necessary supply of hot water throughout the house. The Ferranti water heater operates on the thermal storage system, taking a constant load, depending on the amount of hot water required in each household. The ordinary size for domestic use takes 300 watts continuously, and gives a supply of 40 gallons in 24 hours at 120° F. In the event of all the hot water being drawn off from the receiver at any time, it is not necessary to wait till the whole bulk is heated, as after one hour about 2 gallons is available at 110° F., and this quantity is gradually increased.

No. 45 Stand, of Kelvin, Bottomley and Baird, Ltd. (16-20 Cambridge Street, Glasgow), is one of the first noticed by the visitor on entering the exhibition. For some time this firm, formerly well known as Kelvin and James White, have made a speciality of exhibiting in their Cambridge Street showroom an assortment of heating and cooking appliances of their own and other firms' manufacture. Many of these are of the "universal voltage" type, and are therefore very convenient, as they are suitable for connection to any supply. The selection at the exhibition, which is most comprehensive, includes an electric radiator for bathroom use in cupboard form, and a heater of bulkhead form for warming cabins on board ship.

One of the brightest displays is exhibited by the Edison & Swan United Electric Light Co., Ltd. (153 West George Street, Glasgow). Amongst the principal manufactures of this company on view at Stands Nos. 29 and 30, special importance attaches to the Royal Ediswan wire-drawn Lamp. The half-watt lamps, of 1,250 and 2,000 candle-power each, are shown alight, and constitute a source of interest to the visitors. There are also accessories manufactured at Ponders End, which include many patterns of lamp holders, adapters, ceiling roses, plugs, fuses, and a popular house service iron-clad switch. There is a fine selection of fittings for ship, mill, and colliery use, and these include pendants, oyster, bulkhead, and watertight fittings, also specimens of hand lamps, including the Home Office pattern. Amongst other exhibits to which attention might be drawn are the convertible fans, which may be used as a table, desk, or bracket fan, and owing to its simple conversion it is proving most popular. Specimens are shown of Ediswan heavy service switchgear, including the "W" and "E" types of circuit breaker for 1,000 and 2,000 amperes. Inside the stand offices may be seen an Ediswan main switch and distribution board in use for the stand lighting. Many patterns of Ediswan heaters (Bastian and Dowsing patents), including the "Royal" heater, are on view.

On Stand No. 32 the "Hestia" automatically controlled electric heating and ventilating system is shown by A. Schonfield and Co. (21 Hope Street, Glasgow). In this system a predetermined temperature can be obtained within a mean variation of  $\frac{1}{2}^{\circ}$  C. by this firm's patent thermostat outfit. The "Hestia" stove, which heats a room as a convector, is a welcome innovation on quite novel lines, and as a flat, perforated grating is fitted on the top it is very convenient to warm household articles or act as a hot plate.

**Electricity in Agriculture.**—The Journal of the Board of Agriculture and Fisheries for October contains a long communication from Prof. J. H. Priestley, of Leeds University, upon the further experiments he has been carrying out on the application of electricity to improve crop production, with the aid of a grant placed at his disposal by the Board. He has been proceeding systematically, and two of his results are of considerable interest. He found that with the usual arrangement of wires the current passing to the plant was extremely small; the ordinary atmospheric discharge was increased from about  $10^{-16}$  ampere per sq. cm. to  $10^{-12}$  or  $10^{-11}$  ampere per sq. cm. The other important observation was that a slight wind had the effect of increasing the area of discharge considerably, and that probably in all cases of experiments made hitherto, the "control" area was also "electrified" to some extent. In view of the exceedingly small currents observed, it would be interesting if Prof. Priestley were now to conduct some experiments (which could easily be carried out in houses, so as to eliminate the action of the wind) with wires charged at a much lower potential and much nearer to the plants. Currents of the same magnitude could easily be obtained in this manner, and the observations would then determine once for all whether the stimulating effect on the plant is really due to the current or is due to the formation of nitrogen compounds in the air above the plant due to the discharge from the high-tension wires.

## THE HENLEY WIRING SYSTEM

A NEW list of materials for the Henley wiring system, which is being issued by W. T. Henley's Telegraph Works Co., Ltd., contains one or two new accessories. The system was originally described in *ELECTRICAL ENGINEERING*, September 28th, 1911, Special Exhibition Supplement, page 31, and employs specially sheathed cable, which can be

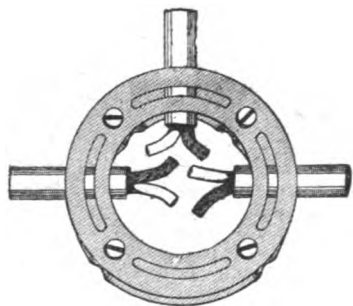


FIG. 1.—UNIVERSAL BONDING CLAMP.

used without casing or tubing. One of the novelties is the bonding clamp shown in Fig. 1 which has been designed so that one clamp only instead of several may be used at any point, thereby reducing to a minimum the necessity for stocking several sizes of the original pattern. A new form

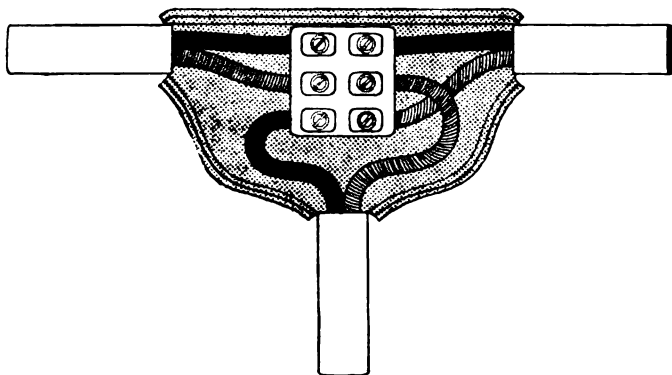


FIG. 2.—TEE BOX FOR TWIN SYSTEM.

of tee and joint-box for the twin system is shown in Fig. 2 connected up for a switch circuit. These boxes are manufactured from brass heavily tinned, and the internal connectors are of the porcelain type. The continuity of the metal sheathing of the cables is preserved by means of mechanical bonds that clamp the lugs on the boxes to the cables. The series of accessories listed is very complete, and the list contains some useful instruction for wiring on the Henley system, as well as views of buildings wired by this method, which give a good idea of the large extent to which the system has been adopted.

## CATALOGUES, PAMPHLETS, &c., RECEIVED

**METAL FILAMENT LAMPS.**—Pope's Electric Lamp Co., Ltd., have produced a series of artistic, and in some cases humorous, coloured post-cards calling attention to their Elasta wire lamps, and are prepared to supply these over-printed with customers' names to any firms who have not yet received a supply.

**ALUMINIUM.**—A leaflet from the British Aluminium Co., Ltd. (109 Queen Victoria Street, E.C.), illustrates various applications of aluminium to motor-car construction.

**BATTERIES.**—We have received two new illustrated leaflets from the Chloride Electrical Storage Co., Ltd. (Clifton Junction, Manchester). One of these deals generally with the manufacture of the Chloride accumulator and its leading features, while the other is devoted to new types of the "Plantide" cell with special reference to country-house lighting.

**TIME RECORDERS.**—We have received a booklet from the Gledhill-Brook Time Recorders, Ltd. (43 Market Street, Huddersfield), describing in some detail their system of time recording and cost keeping, which is extensively adopted in large factories.

**ACCESSORIES.** The Metallic Seamless Tube Co., Ltd. (Meta House, Corporation Street, Birmingham), send us a card

illustrating a few examples of their standardised series of "metallic" accessories.

**MOIST-HEAT RADIATORS.**—Leaflets from the Altheat Co., Ltd. (62 Oxford Street, W.), deal with the moist-heat radiator which was shown at the recent "Ideal Home" Exhibition (*ELECTRICAL ENGINEERING*, Oct. 16th, p. 581). It will be remembered that carbon filament heating lamps are used behind specially treated metal louvres, so that a cheerful red appearance, suggestive of warmth, is given, while the heat waves are caused to take up moisture from a water reservoir before they are radiated from the stove.

*Readers desiring copies of catalogues or pamphlets should apply to the firms in question, referring to the notice in "Electrical Engineering."*

**BELLS, INDICATORS, AND TELEPHONES.**—We have received from the International Electric Co., Ltd. (111-115 Salisbury Road, Kilburn, N.W.), the bell, indicator, and telephone sections of its new catalogue (1913 edition) now in course of preparation. A very wide range of bells is covered, from the cheap trembler type to gas- and water-tight bells for mines, shipyards, and other places where reliability under rough usage is essential. Included also are magneto bells, sirens, and hooters for indoor, outdoor, and vehicular purposes. No less complete is the section dealing with indicators, while the telephone section gives particulars of domestic, naval, C.B., magneto, and intercommunication instruments. Strong magneto type telephones for railways, including one of a patented loud-speaking selective-ringing type, and some for use in mines, are also listed. A pocket-size list also deals with the "Talkyphone" for connection to existing bell installations. These instruments are made in several varieties of both table and wall types.

## A STRIKING POSTER

WE give an illustration below of the striking new poster recently introduced by the Edison & Swan United



Electric Light Co., Ltd., to which we referred in *ELECTRICAL ENGINEERING*, October 23rd, page 598.

**Osram Lamp Patents.**—On Friday last the Osram Lamp Works applied to Mr. Justice Joyce for an injunction to restrain the Ostra Light Co. from selling lamps infringing Osram patents. The Ostra Co., however, said that all the lamps sold by them bore their mark, and the lamps produced by the Osram Lamp Works in support of the injunction did not. They thought, therefore, that there had been some mistake, and as they were indemnified by the vendor of the lamps, they wanted an opportunity of seeing them. They therefore asked that the lamps be kept in the custody of the Court. Finally Mr. Justice Joyce said that unless the parties could agree on some place for the deposit of the lamps in which they could be seen by both sides, he would order them to be brought into Court. Meantime the matter stood over for a week.

On Tuesday last Mr. Justice Joyce had before him a motion for judgment in a similar action to the above by the Osram Lamp Works against the London and Provincial Electric Lamp Co. It was stated that the latter company had disappeared entirely since the injunction. Judgment in default of defence was given as asked, and the question of the costs of the inquiry as to damages was reserved.



## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,362.

How is the reduction in power calculated on internal combustion engines where they are required to work in places of high altitude? A paraffin engine has to work on a high flash point oil, namely, 110, and is required to develop 30 B.H.P. at an altitude of 2,000 ft. above sea-level. Can this requirement be obtained from the ordinary engine by any simple means?—W. A. E. M.

(Replies must be received not later than first post, Nov. 6th.)

### ANSWERS TO No. 1,360.

I have recently come into possession of a dynamo rated at 19 amps. 110 volts 1,400 r.p.m., but find that I cannot get more than 60 volts at this speed, 88 at 1,580 r.p.m., or 92 at 1,620 r.p.m. The armature is ring-wound, and the connections, &c., appear to be in good order. There is no sparking, but the armature and the bearings at the commutator end get rather hot. Is it advisable to run the machine at a still higher speed to obtain 100 volts, or would it be preferable to use lamps of lower voltage, if no method can be suggested to make the machine give the correct voltage at the right speed; and in this case what ampere capacity should be expected from the machine? It should be mentioned that the armature was recently re-wound, and it is possible that some error may have been made. What would be a fair cost for re-winding correctly if this is so?—"SMALLMAN."

The first award (10s.) is made to L. C. for the following reply:—

By the fact that the dynamo is rated 19 amp., 110 volts, 1,400 r.p.m., and that it now refuses to give more than 60 volts at that speed, it is certain that one of two things has happened, viz.: (a) that the field strength is less for a certain current than it was originally, or that (b) the effective number of turns in series on the armature is less than that originally. The case (a) is very improbable, at least to affect the voltage to such an extent. The case (b), especially since the armature has been rewound recently, is far more likely to be the cause of the trouble. As the armature heats up, it points to either shorts or incorrect connecting of the wires at the commutator. It is advisable for "Smallman" to do a little simple testing, provided he has either a milli-voltmeter or a moving-coil ammeter, half-a-dozen lamp fittings and lamps, and a source of electric supply of constant pressure. He should take out the armature and place in V blocks on a table, wire up the lamp fittings in parallel, and join in series with the armature, as in Fig. 1. Place one lamp in the holder, and notice the deflection obtained from any two adjacent segments of the commutator. If the reading is not about 75 per cent. of full-scale deflection, add lamps until it is obtained. If the deflection is too high, close the contacts of main circuit nearer together on opposite side to the segments where preliminary test is made, as in Fig. 2. Mark the segments which give readings different from the average; if too high, examine the soldered connection to commutator for bad joints; if too low, look for shorts, particularly at the ends of the core, where the wire is drawn tightest, or for too few turns in the coil. As the armature is ring-wound, the start should be in one bar and the finish in the next. Either all finishes are left hand of their starts or all right hand. Another point which should not be overlooked is the spacing of the brush gear; the brushes should bear exactly on the half of the

commutator for a two-pole and on the quarter for four-pole. Also the brush rocker should be moved whilst the dynamo is running with a voltmeter across the brushes to see that the position for maximum volts is obtained. If rewound with the tails of the coils in a different position from the original, the brushes will also have to be moved relatively. If each of the foregoing have been tried and found correct, it is possible that the armature has been rewound with too few turns in each coil, but as it is stated the armature gets hot, the trouble is almost sure to be wrong connections or shorts. If this, however, should not be the case, according to the figures relating to the speed and voltage (see Fig. 3), the poles are not nearly saturated, and would give a proportionate increase of magnetism with an increase of ampere turns. This could be accomplished by re-winding the field coil or coils with larger section wire and an increased number of turns. This, of course, depends on the room available. It is not advisable to run the machine at the increased speed to obtain normal voltage until the heating of the armature is done away with; neither should the lower voltage lamps be used, because, although the voltage is reduced,

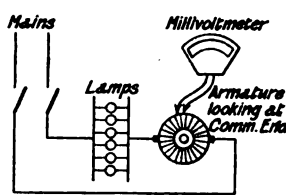


Fig. 1.

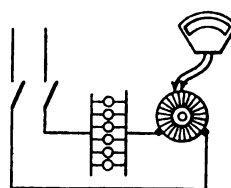
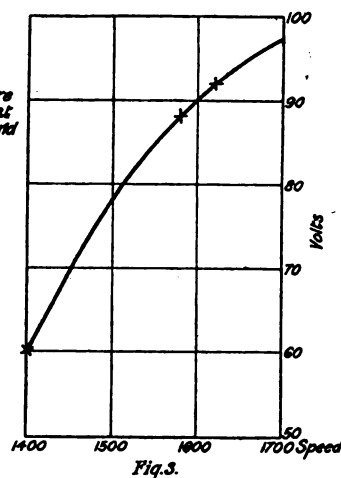


Fig. 2.



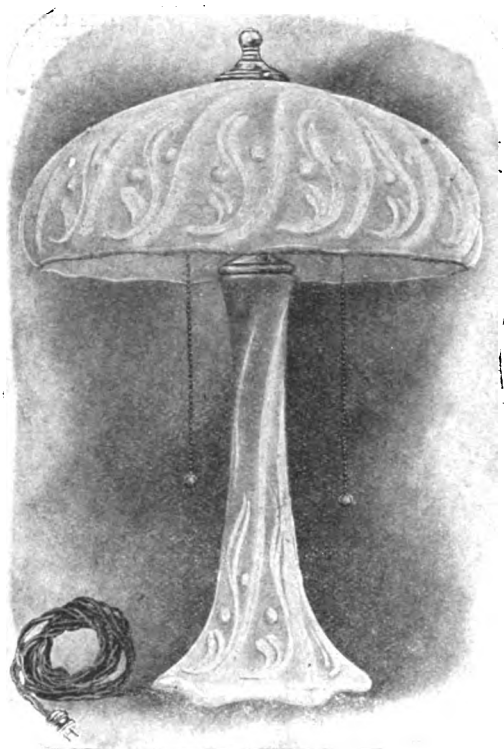
the current-carrying capacity of the armature is unaltered, and therefore the output of the machine would alter with the voltage, i.e., from 110 to 60 volts, or nearly 50 per cent. less than original output. To have the armature rewound by an electrical manufacturing company it would cost approximately £2, but if "Smallman" could get in touch with an armature winder he would probably get it done for a quarter of this sum. The heating of bearing is a mechanical defect. It should be taken out, scraped, and the oil grooves cleaned, and if slotted for rings it should be seen that the rings rotate and pick up the oil from the well.

The second award (5s.) is made to W. H., who writes as follows:—

It would appear from the figures given that the armature is incorrectly wound, the probability being that a wrong winding pitch has been used. It may be, however, that some of the coils are short-circuited, especially as the armature gets hot, even though not fully loaded. The best way to find out whether the armature coils are short-circuited would be to separately excite the fields and run the armature on open circuit; if any particular coils show signs of heating, these should then be replaced. If no local heating takes place, the probability is that the armature, as stated above, has been wrongly wound. In either case, it is not advisable to run the machine up to such a speed as would be required to generate 110 volts (about 2,000 r.p.m.), as the defective coils may be burnt out if present, and if the armature is wrongly connected up it should most certainly be rewound. Neither would it be advisable to use lamps of a lower voltage, as there is obviously something wrong with the generator. No mention has been made of the field coils, so it is presumed that these are quite satisfactory. An easy way to test for a partially short-circuited field coil (which may be the cause of the trouble) is to test for stray magnetism at the end of the armature shaft while the machine is running and fully excited. Or, if possible, take the resistance of each field spool as a further check. If the trouble is in the armature, an approximate charge for rewinding the armature of the machine would be £5 or £6; this may seem rather a high figure, but it must be remembered that there will be no data available, and all connections will require to be checked very carefully; also it is, of course, a ring-wound machine, which necessitates hand-winding, and does not allow of the use of form-wound coils.

## GLASS TABLE LAMPS

AMONGST the many improved lighting appliances, for the development of which the British Thomson-Houston Co. (Mazda House, 77 Upper Thames Street, E.C.) have recently been responsible, possibly one of the most novel and interesting is the "Fostoria" table lamp, made entirely of white or tinted glass moulded into quaint shapes and etched with charming designs. Both the pedestal and the dome or reflector of the "Fostoria" table standard are made of glass. Beautiful effects are obtained by using, in the case

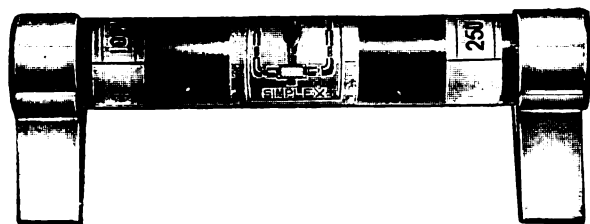


FOSTORIA TABLE LAMP OF WHITE VELURIA GLASSWARE.

of three out of the four available types, a small lamp in the pedestal as well as under the dome. The glass of which these table standards is made has wonderful diffusive qualities, so that when both Mazda lamps are alight, the whole of the standard radiates a soft, uniform brilliance. Of course, the greater part of the light from the lamps is reflected downwards on to the table. These table standards are an agreeable change from the metal standard and silk shade convention, which has been rigidly observed since oil-lamp days.

## ENCLOSED FUSES

SOME new patterns of enclosed fuses have recently been added to the large number of substantial construction previously stocked by Simplex Conduits, Ltd. (Garrison Lane, Birmingham). One of these new arrivals is here illustrated. It is designed to take the place of ordinary porcelain fuse

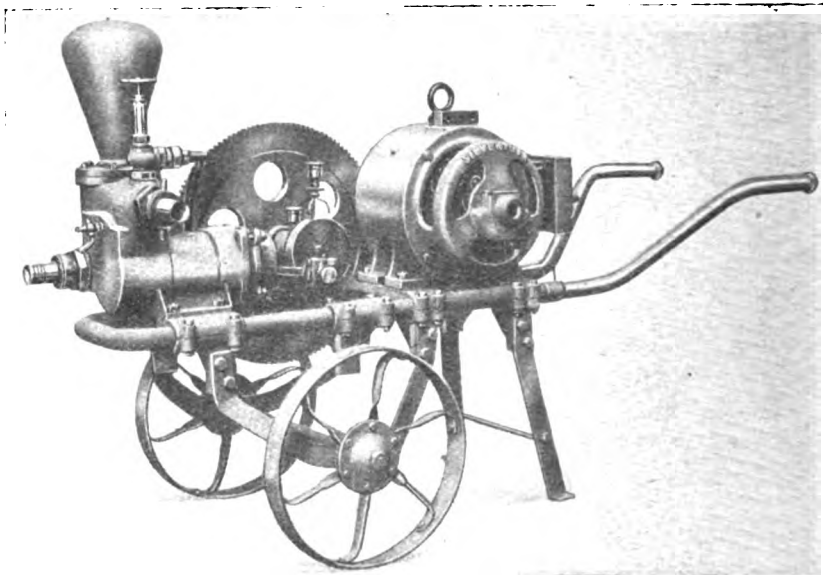


SIMPLEX ENCLOSED FUSE (FULL SIZE).

carriers on standard distribution boards, having a 2½-in. break. Among the other types included in the new catalogue may be mentioned a rewirable pattern and a range manufactured by the company in accordance with the National Electric Code of America.

## A PORTABLE WINE PUMP

THE India Rubber, Gutta-Percha & Telegraph Works Co., Ltd. (Silvertown, E.), has designed a portable electrically-driven wine pump, which is here illustrated. The pump body and plunger are of gunmetal, and the air vessel of copper. A relief valve, fitted with a by-pass to prevent damage to the pump in case of any stoppage in the delivery pipe, is provided. The pump capacity is 12,000 litres per hour (2,640 gallons per hour), against a head of 35 feet. The "Silvertown" 2-b.h.p. motor used runs at 1,000 r.p.m. and drives through machine-cut spur gear. The total weight of the set complete with motor starter is 5½ cwt., and is balanced on the trolley so that this can be easily moved by



PORTABLE ELECTRICALLY-DRIVEN WINE PUMP.

one man and yet be quite stable in use. Though this set was designed for dealing with grape juice containing husks and pulp, it can, of course, be used for other liquids, and the motor can be supplied for D.-C. or A.-C. circuits of any standard pressure, while, if electricity is not available, a petrol or paraffin engine can be substituted for the electric motor.

**The Growth of Electricity Supply.**—Mr. W. W. Lackie, Chief Engineer of the Glasgow Corporation Electricity Department, in his presidential address to the Glasgow University Engineering Society last Thursday, gave some interesting figures showing the growth of the Glasgow undertaking. Twenty-five years ago there was one generating station in Glasgow, with 200 h.p. of plant; twenty-one years ago the Corporation put down a station with a plant capacity of 1,000 h.p. in six plant units. At the present time two turbines each of 9,000 h.p. are being installed, and it was stated that in the immediate future the plant unit would have a capacity of 20,000 h.p. Referring to his recent visit to America, he said that in Chicago he saw three power-houses each containing over 100,000 h.p., but two new stations were proposed, each with a capacity of 300,000 h.p. at least, leaving room for a third station on the same site. In Glasgow last year the Corporation sold 66 million units; in Chicago 800 million units were sold. In Glasgow last year the revenue was £346,000; in Chicago the revenue was £4,000,000 for the same period.

**Regulation of Signs in London.**—Included in the agenda for consideration by the last meeting of the London County Council were by-laws framed by the Building Acts Committee under the London Building Act, 1894. The by-laws state that no part of a sign or lamp, except for public lighting, shall be less than 8 ft. from the surface of the footway, nearer the roadway than 2 ft. 6 in. from the kerb, nor more than 5 ft. from its support. The size of new signs is also limited to 5 ft. in height and 3 ft. horizontally, and the weight is limited to 84 lb. A duplicate support must also be provided. If any new sign extends more than 2 ft. along a wall, it may not project more than 2 ft., and must not in any case be more than 2 ft. 6 in. in height, nor extend more than 6 ft. in any direction. Exemptions are granted for lamps used solely for the external illumination of windows if they are at least 7 ft. 6 in. from the footway, not nearer the roadway than 2 ft. 6 in. from the kerb, and do not project more than 3 ft. from the window. The actual lamp may not exceed 3 ft. in height, nor 2 ft. horizontally.

“ THE INDUSTRIAL APPLICATION OF ”  
**Superlux**  
 GIVES PERFECT LIGHT



“ **Superlux** ”  
 GIVES PERFECT LIGHT

### Stands for Scientific Illumination.

Write for  
 Catalogue G. 1727.

“Superlux” metal reflectors embody a  
 self-contained ventilated gallery.

- ☐ By every known test it is proved that “Superlux” provides “the perfect light.” It produces the greatest quantity and the finest quality of illumination, with maximum efficiency.
- ☐ The Aluminium type, called “Superlux” Class III, is the popular warehouse type, remarkable for its superior reflecting surface prepared by a complex technical process, and for “truth” of contour. It is easy to clean and lightest in weight.
- ☐ In the TEXTILE WAREHOUSE “Superlux” Reflectors provide perfect illumination of even distribution; in ENGINEERING or HARDWARE STORES they enable the rapid assembling of parts and their accurate adjustment.
- ☐ In essentially damp or dirty situations the Vitreous Enamelled Steel type (“Superlux” Class II) is to be recommended. This reflector has the added quality of practical indestructibility of surface.
- ☐ “Superlux” Reflectors are made in Distributing and Concentrating types and a range of sizes and materials by which they

**COVER THE WORLD'S REQUIREMENTS IN SCIENTIFIC ILLUMINATION.**

*The G.E.C. Illuminating Engineering Department  
 is always at your disposal for Information and Advice.*

**THE GENERAL ELECTRIC CO., Ltd.,**

HEAD OFFICE: 67, Queen Victoria Street, LONDON, E.C.

Branches: Manchester, Glasgow, Birmingham, Cardiff, Newcastle, Dublin, Belfast,  
 Hull, Southampton, Bristol, Swansea, Liverpool, Leeds, Sheffield, Nottingham, &c.



# TRADES DIRECTORY OF ADVERTISERS IN "ELECTRICAL ENGINEERING."

(One Free Entry is given to every Advertiser. Entries under additional headings, 6d. per insertion.)

## ACCESSORIES (Electric Light and General Supplies).

Cuttriss (S. W.), 72, Prudential Buildings, Park Row, Leeds.  
Edison & Swan United Electric Light Co., Ltd., Ponders End, Middlesex.  
Electrical Co., Ltd., 192 to 124, Charing Cross Rd., W.C.  
General Electric Co., Ltd., 67, Queen Victoria St., E.C.  
Guilbert-Martin, 9, Edmund Place, E.C.  
Lundberg (A. P.) & Sons, Liverpool Rd., N.  
Scholey & Co., Ltd., 151, Queen Victoria St., E.C.  
Simplex Conduits, Ltd., 118 to 117, Charing Cross Rd., W.C.  
Sua Electrical Co., Ltd., 118, Charing Cross Rd., W.C.  
Wardle Engineering Co., Ltd., 198, Deansgate, Manchester.

## ACCUMULATORS, &c.

Capper, Pass & Son, Ltd., Bedminster Smelting Works, Bristol.  
D.P. Battery Co., Ltd., Bakewell, Derbyshire.  
Electrical Power Storage Co., Ltd., 4, Great Winchester St., E.C.  
Hart Accumulator Co., Ltd., Marshgate Lane, Stratford.  
Naylor Battery Co., 1, Lammernoor Rd., Balham, S.W.  
Tudor Accumulator Co., Ltd., 119, Victoria St., S.W.

## ALUMINIUM.

British Aluminium Co., Ltd., 109, Queen Victoria St., E.C.

## ARC LAMPS AND ACCESSORIES.

British Thomson-Houston Co., Ltd., Rugby.  
General Electric Co., Ltd., 67, Queen Victoria St., E.C.  
London Electric Firm, Croydon.  
Oliver Arc Lamp Ltd., Cambridge Place, Burrage Rd., Woolwich.  
Union Electric Co., Ltd., Park Street, Southwark, S.E.

## ARMATURE REPAIRS.

Marryat & Place, 28, Hatton Garden, E.C.

## BOILERS.

Bahcock & Wilcox, Ltd., Oriol House, Farringdon St., E.C.

## CABLES AND WIRES.

Callenders Cable & Construction Co., Ltd., Hamilton House, Victoria Embankment, E.C.  
General Cable Manufacturing Co., 15, Garlick Hill, E.C.  
Ges. für Elektrotechnische Industrie m.b.H., 88 Belle-Alliance Str., Berlin.  
Hewley's (W. T.) Telegraph Works Co., Ltd., Blomfield Street, E.C.  
Hooper's Telegraph & Indiarubber Works, Millwall Docks, E.  
India Rubber, Gutta Percha & Telegraph Works Co., Ltd., 106, Cannon St., E.C.  
Key Engineering Co., Ltd., 4, Queen Victoria St., E.C.  
Liverpool Electric Cable Co., Ltd., Linacre Lane, Bootle, Liverpool.  
London Electric Wire Co. & Smiths Ltd., Playhouse Yard, Golden Lane, E.C.  
Macintosh (Chas.) & Co., Ltd., 22 & 23, Jewin St., E.C.  
Rickard (Wm.), Ltd., Ashbourne Road Mills, Derby.  
Siemens Bros. & Co., Ltd., Woolwich.  
Union Cable Co., Ltd., Dagenham Dock, Essex.

## CASTINGS, &c.

Dore (J.) & Co., Bromley, E.

## CATALOGUES AND PROCESS ENGRAVING.

Swain (John) & Son, Ltd., Shoe Lane, E.C.

## CONDENSING PLANTS.

Mirrlees Watson Co., Ltd., Scotland Street, Glasgow.  
Storey (Isaac) & Sons, Ltd., Empress Foundry, Cornbrook, Manchester.  
Williams & Robinson, Ltd., Rugby.

## CORRESPONDENCE INSTRUCTION.

International Correspondence Schools, Ltd., Kingsway W.C.

## DIE-FINISHED CASTINGS.

Aerators, Ltd., Upper Edmonton, N.

## DYNAMOS, see Motors and Dynamos

## ELECTRO-PLATING.

Canning (W.) & Co., 188 to 187, St. Hampton St., Birmingham.

## FLEXIBLE METALLIC TUBING.

United Flexible Metallic Tubing Co., Ltd., 112, Queen Victoria St., E.C.

## GAS AND OIL ENGINES.

British Westinghouse Electric & Manfg. Co., Ltd., Trafford Park, Manchester.  
Premier Gas Engine Co., Sandiacre, Nottingham.

## HEATING AND COOKING APPARATUS.

Belling & Co., Lancaster Works, Derby Road, Edmonton, N.  
British Prometheus Co., Ltd., Salop St. Works, Birmingham.  
British Thomson-Houston Co., Ltd., Rugby.  
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester.  
Downing Radiant Heat Co., Ltd., 105, Great Portland St., W.  
Ferranti, Ltd., Central House, Kingsway, W.C.  
General Electric Co., Ltd., 67, Queen Victoria St., E.C.  
Holmquist Electric Coy. 1911 Ltd., 27, Kingly St., Regent St., W.  
London Electrical Trading Co., Ltd., 185, Wardour St.  
Schleiwint Electric Co., 40-1, Stamford St., Birmingham.  
Siemens Bros. Dynamo Works, Ltd., 39, Upper Thames St., E.C.  
Simplex Conduits, Ltd., 118 to 117, Charing Cross Rd., E.C.  
Townshend's Art Metal Co., Ltd., Ernest St., Birmingham.

## INSTRUMENTS.

Everett, Edgumbe & Co., Ltd., 117, Victoria St., S.W.  
Evershed & Vignoles, Ltd., Acton Lane Works, Chiswick.  
India Rubber, Gutta Percha and Telegraph Works Co., Ltd., 106, Cannon St., E.C.  
Kelvin, Bottomley & Baird, Ltd., 18, Canbridge St., Glasgow.  
Nalder Bros. & Thompson, Ltd., 34, Queen Street, E.C.  
Record Electrical Co., Ltd., Caxton House, Westminster, S.W.  
Insulating Varnish, ENAMELS, PAINTS AND LACQUERS.  
Blume (Chas. H.), The White Building, Sheffield.  
Fredk. Crane Chemical Co., 22 & 23, Newhall Hill, Birmingham.  
Griffiths Bros. & Co., Macks Rd., Bermondsey, S.E.  
Pinchin, Johnson & Co., Ltd., 26, Bevis Marks, E.C.  
Sterling Varnish Co., Royal London Buildings, 196, Deansgate, Manchester.

## INSULATORS AND INSULATING MATERIALS.

MacIntyre (J.) & Co., Ltd., Burslem.  
Moseley (D.) & Sons, Ltd., Ardwick, Manchester.  
Mosses & Mitchell, 122 to 124, Golden Lane, E.C.  
Sugg (William) & Co., Ltd., 63, Regency Street, S.W.  
Traun (Dr. Heinrich) & Sons, 25, Goswell Rd., E.C.  
Weidmann (H.), Rapperswil, Switzerland.

## INSURANCE.

Phoenix Assurance Co., Ltd., 19 & 70, Lombard St., E.C.

## LADDERS.

Heathman & Co., 10, Parsons Green, S.W.

## LAMPS (Incandescent).

Brimedown Lamp Works, Ltd., Ringway House, Kingsway, W.C.  
British Thomson-Houston Co., Ltd., Mazda House, 77, Upper Thames St., E.C.  
British Westinghouse Electric & Manfg. Co., Ltd., Trafford Park, Manchester.  
Cryselco, Ltd., Kempston Works, Bedford.  
Edison & Swan United Electric Light Co., Ltd., Ponders End, Middlesex.  
General Electric Co., Ltd., 67, Queen Victoria St., E.C.  
Pope's Electric Lamp Co., Ltd., Hythe Road, Willesden, N.W.  
Siemens Bros. Dynamo Works, Ltd., Tyssen St., Dalston, N.E.  
Simplex Conduits, Ltd., 118 to 117, Charing Cross Rd., W.C.  
Stearn Electric Lamp Co., Ltd., 47, Victoria St., S.W.

## LIFTS.

Marryat & Place, 28, Hatton Garden, E.C.  
Waygood (R.) & Co., Ltd., Falmouth Road, S.E.

## MACHINE TOOLS.

Taylor & Challen, Ltd., Constitution Hill, Birmingham.

## METERS.

Bestian Meter Co., Ltd., Kentish Town, N.W.  
Ferranti, Ltd., Central House, Kingsway, W.C.  
Isaria, Ltd., 208, Tower Bridge Road, S.E.

## MICA.

British Mica Co., Ltd., Lebanon Road Works, Wandsworth, S.W.  
Jaroslaw (D.), 19, Tower Hill, E.C.  
Micanite & Insulators Co., Ltd., Walthamstow, E.  
Sear, Page & Co., 16 & 17, Devonshire Sq., E.C.  
Wiggins (F.) & Sons, 102 to 104, Minories, E.C.

## MINE EQUIPMENTS AND APPARATUS.

Dick, Kerr & Co., Ltd., Abchurch Yard, E.C.  
Ellison (George), Warstone Lane, Birmingham.  
Ferranti, Ltd., Central House, Kingsway, W.C.  
General Electric Co., Ltd., 67, Queen Victoria St., E.C.  
Reynolds & Co., Ltd., Hebburn-on-Tyne.  
Siemens Bros. Dynamo Works, Ltd., Caxton House, Westminster, S.W.  
Switchgear & Cowans, Ltd., Springfield Lane, Salford, Manchester.  
Williams & Robinson, Ltd., Rugby.

## MOTORS AND DYNAMOS.

British Thomson-Houston Co., Ltd., Rugby.  
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester.  
Brown Boveri & Co., Ltd., Caxton House, Westminster, S.W.  
Dick, Kerr & Co., Ltd., Abchurch Yard, E.C.  
Matthews & Yates, Ltd., Swinton, Manchester.  
Feebles (Bruce) & Co., Ltd., Edinburgh.  
Siemens Bros. Dynamo Works, Ltd., Caxton House Westminster, S.W.  
Vickers, Ltd., River Don Works, Sheffield.

## OIL CANS.

Kays (J.) & Sons, Ltd., Lock Works, Leeds.

## PACKING.

United States Metallic Packing Co., Ltd., Bradford.

## PATENT AGENTS.

Lorrain (J. G.), Norfolk House, Norfolk St., W.C.  
Raworth (J. E.), 39, Broadway, Westminster.

## PETROL AIR GAS.

Safety Light, Ltd., 118, Queen Victoria St., E.C.

## PRESSPAHN, &c.

Weidmann (H.), Rapperswil, Switzerland.

## PUMPING PLANT.

Merryweather & Sons, Fire Engine Works, Greenwich, S.E.  
Williams & Robinson, Ltd., Rugby.

## STEAM ENGINES AND TURBINES.

Allen (W. H.) Son & Co., Ltd., Queen's Engineering Works, Bedford.  
British Thomson-Houston Co., Ltd., Rugby.  
Dick, Kerr & Co., Ltd., Abchurch Yard, E.C.  
Vickers, Ltd., River Don Works, Sheffield.  
Williams & Robinson, Ltd., Rugby.

## STEAM ENGINE ACCESSORIES.

Lea Recorder Co., Ltd., 82, Deansgate, Manchester.

## SWITCHGEAR.

British Thomson-Houston Co., Ltd., Rugby.  
Dorman & Smith, Ordsal Electrical Works, Salford.  
Eckstein, Heap & Co., Ltd., Caroline Street, Broughton, Manchester.  
Ellison (George), Warstone Lane, Birmingham.  
Ferranti Ltd., Central House, Kingsway, W.C.  
Ignatie Electric Co., Ltd., 147, Queen Victoria St., E.C.  
Record Electrical Co., Ltd., Caxton House, Westminster, S.W.  
Reynolds & Co., Ltd., Hebburn-on-Tyne.  
Switchgear & Cowans, Ltd., Springfield Lane, Salford, Manchester.

## TECHNICAL BOOKS AND JOURNALS.

Cambridge University Press, Fetter Lane, E.C.  
Cassell & Co., Ltd., La Belle Sauvage, E.C.  
Caxton Publishing Co., Clun House, Surrey Street, Strand, W.C.  
Constable (Archibald) & Co., Ltd., 10 Orange St., Haymarket, W.  
Crosby Lockwood & Son, 7, Stationers' Hall Court, E.C., and 5, Broadway.  
Electric Journal, Donington House, Norfolk St., Strand, W.C. (Westminster, S.W.).  
Gresham Publishing Co., 34, Southampton St., W.C.  
Griffin (Chas.) & Co., Ltd., 12, Exeter St., Strand, W.C.  
Indian Industries and Power, 204, Temple Chambers, E.C.  
Longmans, Green & Co., 39, Paternoster Row, E.C.  
Macmillan & Co., Ltd., St. Martin's St., W.C.  
Whittaker & Co., 2, White Hart Street, Paternoster Square, London, E.C.

## TELEPHONES.

British L.M. Ericsson Mfg. Co., Ltd., 4, Chancery Lane, W.C.  
General Electric Co., Ltd., 67, Queen Victoria St., E.C.  
Graham (Alfred) & Co., St. Andrew's Works, Crofton Park, London, S.E.  
Siemens Bros. & Co., Ltd., Woolwich.  
Sterling Telephone & Electric Co., Ltd., 200, Upper Thames St., E.C.  
Western Electric Co., Ltd., North Woolwich, E.

## TESTING LABORATORIES.

Electrical Standardising & Testing Institution, (Faraday House), 62 to 70, Southampton Row, W.C.

## TRANSPORTERS.

Bleicherts Aerial Transporters, Ltd., Egypt House, 36, New Broad St., E.C.

## WATER SOFTENERS.

Kennicott Water Softener Co., Wolverhampton.

## WIRING CONTRACTORS. See page iv.

When corresponding with Advertisers, please mention "Electrical Engineering."



**SWITCHGEAR  
FOR  
HEAVY DUTY**

**SPECIFY**

**'IGRANIC'**

**IGRANIC ELECTRIC CO. LTD.**

(Incorporating the Electrical Business of the Adams Manufacturing Co., Ltd.)

147, Queen Victoria St., LONDON

Manchester: **WORKS:** Glasgow:  
20, Cross St. & Bedford. 20, Wellington St.

### ELECTRIC TRACTION NOTES

It is expected that the extension of the Baker Street and Waterloo (Tube) Railway to Paddington will be opened to the public on December 1st. Escalators are to be installed in place of lifts. An ordinary stairway will also be provided.

The Pietermaritzburg Corporation has decided, says the *Board of Trade Journal*, not to proceed with the trolley omnibus scheme, but a 40-h.p. petrol-electric char-a-banc has been ordered, so that the traffic value of different routes may be tested.

The Canadian Northern Railway has placed with the Canadian General Electric Company an order for the electrification of its lines between Montreal and Cartierville. There will be about ten miles of double track, and this passes through the Mount Royal Tunnel. Direct-current at 2,400 volts will be used on the contact line. The order includes seven locomotives and eight multiple unit motor-cars. The weight of each locomotive will be about 80 tons, and there will be two four-wheel trucks, each containing two interpole motors, permanently connected two in series and driving through twin gearing. The energy is to be purchased in the 11,000-volt three-phase 60-cycle form and converted by motor-generator sets, each consisting of a 2,100-k.v.a. synchronous motor driving two 750-kw. 1,200-volt interpole generators connected in series. The Castlegar branch of the Canadian Pacific Railway is also being electrified by the same company on this system at 2,400 volts D.-C.

In connection with the various proposals for tube railways to the Crystal Palace, the Underground Electric Railways Co. announce that they are prepared to make an extension of the "Bakerloo" line from the Elephant and Castle to the Crystal Palace, if the scheme receives support from the districts passed through.

### TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

A meeting was held in Brussels at the commencement of last month, at which the organisation of an International Commission to carry out wireless experiments was further discussed. At the International Time Conference in Paris last October the formation of an International organisation for the study of Hertzian waves was proposed, and Mr. Goldschmidt, of Brussels, placed his high-power station at Brussels and the sum of £1,000 for preliminary studies at the disposal of the proposed International Commission. The representatives of the different countries who were present at Brussels drafted a provisional constitution for the International Commission and a scheme for its work. The objects of the Commission are: to carry out experiments on the propagation of electric waves, to make wireless telegraph measurements, and to study problems relating thereto. The provisional programme includes measurements in different countries and at different distances and in different directions of the strength of signals sent out from the station at Brussels. These measurements will be repeated from day to day or hour to hour as necessary, in order to determine the variation of the strength of the signals, both with time, with distance, and with direction, and later the effect of wave length and decrement will be studied. It is proposed to set up a receiving station near the transmitting station in Brussels, in order to control the strength of the waves sent out accurately, so that an allowance can be made for any unavoidable variation. The organisation consists of a number of National Committees, who will send delegates to the International Commission. It is proposed that the Commission should meet once a year or more often if the

work is sufficiently advanced. The Institution of Electrical Engineers has decided to undertake the formation of the National Committee for Great Britain under the scheme for the organisation and encouragement of electrical research which was announced at the Institution meeting on December 12th last.

The first meeting of the newly formed Post Office, Telephone and Telegraph Society of London was held in the lecture theatre of the Institution of Electrical Engineers on October 27th. The President, Mr. A. Moir, read a Paper entitled "Some Features of the London Engineering District," in the course of which he stated that during the past year 102,000 miles of underground telephone line had been substituted for overhead work. At present, he said, there were 130,000 and 220,000 telephone stations in existence in London, while in 1921 it was estimated these figures would be increased to 267,000 and 432,000 respectively, and in 1928 still further increased to 414,000 and 680,000.

Among the countries to be represented at the International Conference on Safety of Life at Sea, which meets in London on November 12th, will be: the United Kingdom, Canada, New Zealand, Belgium, Denmark, France, Germany, the Netherlands, Norway, Russia, Spain, Japan, and the United States. The use of wireless telegraphy is among the many things to be considered.

The report of the Canadian Marconi Company for 1912-13 shows that the ship-to-shore station receipts totalled £10,850, compared with £9,450 in 1911-12. The Transatlantic returns totalled £9,380, compared with £5,760. Duplex working will be instituted between the wireless stations at Glace Bay and Clifden as soon as the latter station is complete. The company now works forty-four steamers on its own behalf, and four on behalf of affiliated companies.

An order has been placed for the equipment of a 1,200 line telephone exchange at Purley.

The *Board of Trade Journal* states that under a new Ordinance a licence granted by the Governor of Mauritius is necessary for working any wireless apparatus in the Colony, or on any ship registered in the Colony. The Ordinance also covers the working of wireless telegraph apparatus on board any ship in the territorial waters of the Colony. A similar Ordinance is also now in effect in Southern Nigeria.

Communication via Eastern Besika-Tenedos and Tchesme-Chio-Syra was restored on 24th inst.—The Pernambuco-Para cable of the Western Telegraph Company failed on the same day, and all telegrams for Ceara and north of that place are being sent via the Brazilian land lines.—On the 25th inst. the Cape St. Jacques-Pontianak cable was put into working order again.—On this day also the Chio-Tenedos and two cables between Chio-Tchesme again broke, but the repair, it is hoped, will soon be effected.—The French Cable Company is again in the list of sufferers by the failure of the Mole St. Nicholas-Port-au-Prince cable. Telegrams for the latter place are sent by land lines.—The first telephone and telegraph cable has been laid across the Danube between the New Roumanian territories.

**The Breakdown on the Metropolitan Electric Supply Co.'s System.**—In reference to our note on page 590 of last week's *ELECTRICAL ENGINEERING*, on the recent interruption of supply at Willesden, which was originally thought to be due to the failure of one of the 250-kw. step-up transformers (which are all of the Berry type), we are now in a position to state that none of these transformers had suffered injury or failed.

**Obituary.**—The death has occurred at Lisbon of Mr. A. S. Giles, General Manager Lisbon Tramways, at the age of forty-seven. Mr. Giles was formerly with the Edison Electric Light Co., the Edison & Swan Co., Messrs. Thomson, Ritchie & Co., and, from 1895 to 1904, with the Blackburn Corporation as Engineer and Manager of the electricity undertaking. In 1905 he went to Cape Town to undertake the management of an electrical scheme for a London firm, and in 1911 he was transferred to Lisbon.

# "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

## Specifications Published October 23rd, 1913

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

**Names in italics indicate communicators of inventions from abroad.**  
19,345/12. **Vehicle Lighting Dynamos.** S. L. PRICE. A pole pair is extended to form an auxiliary pole pair for the armature cross flux so as to distort the main field. The brushes have two or more places of contact, and a circumferential adjustment of the pole faces may be provided. One figure.

22,041/12. **Tungsten for Drawn Wire Lamps.** H. LEISER. An intimate mixture of dry powders of the crystalline and amorphous modifications of the metal, in the proportion of about 16 to 1, are pressed and heated to a temperature far below the melting point of the metal until the amorphous modification is changed into the crystalline.

27,069/12. **Parallel Running of Machinery with Different Characteristics.** BROWN, BOVERI ET CIE. Regulators which do not maintain constant the value of the quantity to be regulated over the whole range of regulation, but which vary it with the position of the regulating members within the regulating range in a definite sense, are used. For generators working in parallel the main windings of the regulators are fed from the pressure to be regulated, and additional windings are fed by the total current of all the generators. Six figures.

7,896/13. **Motor Speed Regulation.** A.E.G. A booster with series field winding is connected to the driving motor. This winding has a compounding effect during positive boost and a differential effect during negative boost. Thus the motor speed is kept constant irrespective of the load. Two figures.

8,821/13. **Wireless Telegraphy.** W. P. THOMPSON (*Ges. für Drahtlose Telegr.*). The receiver has a gaseous path permanently ionised by a heated cathode influenced by the incoming waves, which are strengthened by an auxiliary current, and by means of a rectifier are received by an indicator. The low-frequency currents furnished by the rectifier are also strengthened by a gaseous path. Three figures.

12,148/13. **Motor-driven Railway Signals.** C. W. WARD. The semaphore is biased towards the danger position, and is driven by a motor to the clear position, where it is held by a clutch. When this is released the semaphore tends to fall to the horizontal position, but may be stopped by a catch so that a third or "caution" position is given. Four figures.

## Specifications Published To-day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free. Summaries of some of the more important of these patents will appear in our next issue.

**Arc Lamps:** CANNOCK, 22,952/12; B.T.-H. Co. (*G.E. Co., U.S.A.*), 28,122/12; GEBR. SIEMENS [Electrodes] 7,108/13.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** LANDIS & GYR [Mixed load systems] 22,591/12; BROWN [Signalling and controlling apparatus by oscillations in supply mains] 22,649/12; B.T.-H. Co. (*G.E. Co., U.S.A.*) [Motor control systems] 23,594/12; ROUTIN [Collective control of A.C. motors] 755/13; CREIGHTON [Circuit protection] 5,662/13.

**Dynamos, Motors, and Transformers:** PRICE [Conversion of electric energy] 22,524/12.

**Electrometallurgy and Electrochemistry:** QUAIN [Ozonisers] 22,854/12; LEE and BRAME [Metallic electro-deposition on hollow tubes] 23,096/12; WIELGOLASKI [Elongated arcs for gas treatment] 2,165/13 and 2,214/13; DECLERE, GRESY, and PASCALIS [Protecting silvered glass] 15,109/13; BALLY [Transformer furnace] 16,011/13.

**Heating and Cooking:** VENNEN, 23,082/12; NASH [Vulcanisers] 23,451/12; MARKS (*Landers, Frary & Clark*) 5,285/13.

**Ignition:** LEITNER [Starting internal combustion and other engines] 23,157/12; [Ignition] 23,430/12.

**Incandescent Lamps:** POPE'S LAMP CO. (*Trenzen*) [Metal filaments] 22,548/12; WARREN [Packings] 3,591/13.

**Instruments and Meters:** SMITH [Periodically testing currents] 24,960/12; B.T.-H. Co. and HOLDEN [Motor-meters] 28,227/12; HOLDEN and CHAMBERLAIN & HOOKHAM [Commutators] 28,316/12; SCHOTT & GEN. [Electrolytic meters] 10,512/13.

**Switchgear, Fuses, and Fittings:** CURTIS, MACKLEY and ADAMS MFG. CO. [Motor controllers] 22,747/12; PRENTICE and ATLAY [Distributing fuse board] 23,014/12; RIPPINGILLE and BROUGHTON [Conduits] 7,931/13; VOIGT and HALFFNER [Switches] 8,409/13; ELLISON and MUELLER [Motor controllers] 12,882/13; CHARLES [Tumbler switches] 16,151/13.

**Telephony and Telegraphy:** MARR [Telephone receivers] 23,240/12; HAMMER [Telephones] 29,036/12; SIEMENS & HALSKE [Number impulse transmitters for automatic telephones] 7,530/13; SIGNAL GES. [Submarine leakage telegraphy] 13,919/13.

**Traction:** WARD [Railway signalling] 22,833/12; McQUADE

[Trolley poles] 23,639/12; WELSH [Trolley wire anchor clips] 24,522/12.

**Miscellaneous:** SIMONSSON [Dash pot] 28,817/12; MARTIN and NIXEY [Signs] 3,562/13; HENRY [Advertising] 5,652/13.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Distributing Systems, &c.:** HEINS [Substitutional lamp resistances] 9,530/13.

**Incandescent Lamps:** BLECKE [Metallic filament lamps] 22,093/13.

The following Amended Specifications may now be obtained.  
**Arc Lamps:** SIEMENS DYNAMO WORKS (*Siemens & Halske*) [Multiple carbon lamps with separate economisers] 14,685/11.

**Ignition:** B. BROOKS and W. HOLT [Self-starter for internal-combustion engines] 10,996/12.

## Amendments made to Specification

11,871/12. **Automatic Regulator for Variable Speed Dynamos.** H. D. EARL. The desired amendments (*ELECTRICAL ENGINEERING*, July 31st, p. 446) have been allowed with some modifications. A new paragraph states that the regulation is effected by an automatic shunt circuit resistance regulator having pairs of contacts whose resistance varies inversely as the pressure between their surfaces. A series and shunt coil are used. The former is "arranged to do more or less work on the contacts without an actual increase or decrease of current therein."

## Applications for Restoration of Lapsed Patents

5,522/07. **Electro-magnetic Separator Drum for Grain Conveyors, &c.** JAMES HAWLEY, LTD., and A. S. JONES. Any opposition to the restoration must be made at the Patent Office before December 22nd.

5,286/08. **Apparatus to Determine Time Integrals.** H. L. MERRICK. Any opposition to the restoration must be made at the Patent Office before December 11th.

## Opposition Entered to Grant of Patent

25,902/12. **Annealing Silicon Steel.** B.T.-H. Co. (*G.E. Co., U.S.A.*). The claims are for treating silicon steel so as to improve its magnetic qualities by heating it above the ordinary annealing temperature to about 1,000° C., as it is passed through a non-oxidising atmosphere or reducing gas.

## Expiring and Expired Patents

The following Patents expire during the current week, after a life of fourteen years:—

21,637 of October 30th, 1899. **Arc Lamp Electrodes.** H. BREMER. In addition to the admixture of 10 to 70 per cent. of metallic powder or salts to the pure carbon, one or more per cent. of a flux, e.g., boron and fluorine, is added to soften the otherwise solid scoria formed on the electrodes by the luminous metallic vapours, so that it may drop off.

21,778 of October 31st, 1899. **Lifts, Automatic.** H. ROWNTREE. There are 14 figures and 59 claims to this specification, which describes in detail a complete automatic push-button lift system.  
21,881 of November 1st, 1899. **Incandescent Lamps.** H. H. LAKE (*Soc. de Commentry-Fourchambault et Decazeville, France*). The leading-in wires for incandescent lamps are made of nickel steel alloys, 29 to 30 per cent. nickel, or 43 to 48 per cent. nickel, having the same expansion as the glass.

22,020 of November 3rd, 1899. **Wireless Telegraphy.** W. P. THOMPSON (*F. Braun, Germany*). This, together with Patent No. 1,862/99 by the same inventor, was unsuccessfully cited in the patent action by the Marconi Co. against the British Radio-Telegraph & Telephone Co. in 1910-11 as anticipating the Marconi patent 7,777/00. The claim reads: "In electric wireless telegraphy the use of transformers the primary of which is joined in the circuit of the air gap and the secondary of which is connected in the sending wire."

The following are the more important Patents that have become void through non-payment of renewal fees.

**Arc Lamps:** D. TIMAR and K. VON DREGER [Parallel carbon lamps] 12,656/08.

**Distributing Systems, &c.:** F. CONRAD [Pressure regulation by storage battery, boosters, &c.] 15,441/07; [Dynamo regulation] 15,442/07.

**Electrochemistry and Electrometallurgy:** M. RUTHENBURG [Fritting comminuted ores in furnace] 15,867/01.

**Instruments and Meters:** E. S. HALSEY [Modified construction of mercury motor meters described in specification 12,635/99] 2,345/01; M. KALLMANN [Self-adjusting load for A.C. meter calibration] 28,048/06; L. A. BERLAND [Prepayment meter] 4,828/07; H. J. HADDON (*Bergmann A.-G.*) [Induction motor meter] 15,551/07.

**Miscellaneous:** R. W. ROBSON and G. W. CLEGG [Temperature indicator for bearings, &c.] 15,245/06; G. SCHAULI [Dry battery] 14,609/08, 24,355/08, and 24,356/08.

## LOCAL NOTES

**Barnes: Tariff for Arc Lamps.**—It has been decided to reduce the tariff for supply to outside arc lamps to 3d. per unit.

**Bradford: Electricity Accounts.**—The report for the year ended October records increase in all branches of supply. The total units (for the financial year ended March 31st) were 24,418,292, or over two million in excess of the figure for the previous year. The revenue was £9,802 greater than in any previous year, and notwithstanding an increase of £5,000 in the cost of fuel, a net profit of £8,477 was made, £425 greater than that of the previous year. The plant extensions carried out during the year are recapitulated in the report. The number of consumers connected increased by 10 per cent., and the total costs (not including capital charges) work out at 0.568d.

**Bromley: Demonstration of Electric Cooking.**—Demonstrations of cooking and other domestic uses of electricity are being given at the offices of the Bromley (Kent) Electric Light & Power Co.

**Coniston: Proposed Electric Power Scheme.**—A scheme for supplying the district by utilising water-power in the neighbourhood has been submitted to the Council and is under consideration. Probably the Mines Fall would be utilised.

**Dudley: Sale of Electrical Undertaking.**—The opposition of the Traders' Association to the proposed sale of the electrical undertaking has now been withdrawn.

**Edinburgh: Electricity Supply.**—The question of whether the projected new generating station is to adjoin the M'Donald Road works or be near the sea is still under consideration, but in the meantime the Electricity Committee has agreed to accept an estimate of £12,000 for plant extensions at M'Donald Road. It has been decided not to accede to the demand for continuous current in Portobello, on account of the high cost of mains that would be involved. A tariff of 1½d. per unit for heating purposes has been fixed for consumers outside the city boundary, which is ¼d. more than that within the city.

**Exeter: Interruption of Supply.**—The newspaper reports as to interruption of supply last Tuesday seem to have been exaggerated. We find on inquiry that there was a failure of the supply in a small section of the town, which lasted about twenty-five minutes, due to water penetrating the lead sleeve joint on a H.T. cable.

**Glasgow: The Supply to Partick.**—In order to bring the district into line with the rest of Glasgow, the voltage at Partick, which was recently incorporated into the city, is to be raised from 240 and 480 to 480 and 500 volts. The Corporation will bear any cost of the change to consumers.

**Llanfairfechan: Electricity Supply.**—It has been decided to apply for a provisional order for an electric lighting scheme, which is estimated to cost £5,500.

**Lossiemouth: Electric Supply Scheme.**—The Board of Trade has not yet given its decision regarding the use of overhead mains, and is still in communication with the Post Office on the subject, but the Scottish Office has sanctioned the borrowing of £6,000 on certain terms.

**Lytham: Bulk Supply.**—The Council has decided not to take a bulk supply from St. Anne's, and steps will probably be taken to construct a generating station in Lytham.

**Manchester: Wiremen's Strike.**—A strike of wiremen commenced on Monday. An application has been made for an advance in wages of 1d. per hour, and the Electrical Employers' Association has offered to submit the question to arbitration, or, in the alternative, to grant an advance of ¾d. per hour, making the rate 9½d. per hour, to take effect on the first pay day after January 1st, 1914, on the understanding that six months' notice of any proposed alterations shall be given by either side. This offer has been refused. Between 300 and 400 men are out.

**St. Helens: Electricity Accounts.**—The total costs for the year are given as £25,722, including interest and other capital charges, and the receipts as £27,351, so that a final surplus of £1,629 remains. The total units sold were 4,890,438, and the maximum demand was 2,135 kw.

**Sheffield: Electrical Exhibition.**—The Fuel, Light, and Power Exhibition which is being held in connection with the smoke abatement movement in Sheffield was opened at the City Exhibition Hall on Friday by Mr. C. D. Leng, who, in his opening speech, referred particularly to the cheapness and other advantages of electric power.

**Teignmouth: Electricity Supply Scheme.**—A report by Mr. E. M. Lacey on a proposed supply scheme is being considered by the Council. The cost of the scheme, which includes distribution by underground cables in Teignmouth itself, and by overhead mains in Shalden and other outlying districts, is put at £20,800.

**Waterford: Electric Supply Scheme.**—A report has been received from Mr. E. M. Lacey estimating the cost of a local electric lighting scheme at £27,338, and it has been decided to apply for a provisional order in order to bring this into effect.

**Whitstable: Electric Supply Scheme.**—As the result of recent negotiations with the Council regarding street lighting, &c., the Whitstable Electric Co., Ltd., has been registered with a capital of £18,000.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

### Generating Stations, Sub-Stations, Mains, &c.

**Bolton.**—A loan of £7,889 for extensions has been sanctioned by the L.G.B.

**Fleetwood.**—Tenders are invited for L.T. cable by November 1st. Particulars from A. Cottam, Town Clerk.

**Grimsby.**—Tenders are invited by November 18th for metal filament lamps, continuous-current motors, motor panels, house fuse and service boxes, &c. (See an advertisement.)

**Leicester.**—A L.G.B. inquiry was held last week into an application for a loan of £52,350 for additional generating plant at the Aylestone power station.

**London: Hackney.**—A loan of £56,748 for extensions has been sanctioned by the L.C.C.

**New Zealand.**—Tenders are invited by January 5th for series incandescent street lighting equipment, including underground and aerial cable, ten constant current transformers and control panels, 1,950 metal filament lamps with reflectors, four miles of flexible steel span wire, with 5,500 porcelain insulators.

**Ormskirk.**—A loan of £1,000 for new generator, gas engine, and water-softening plant is to be applied for.

**Salford.**—Application is to be made to the L.G.B. for sanction to a loan of £10,500 in connection with the additional supply of current to the No. 9 Dock of the Manchester Ship Canal.

**Todmorden.**—A Local Government Board inquiry into an application for a loan of £5,800 will be held on November 7th.

**Whitworth.**—A Local Government Board inquiry into an application for a loan of £10,965 will be held on November 5th.

### Wiring

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Banff.**—The Lunacy Board has decided to instal electric lighting at the asylum.

**Barrow.**—New police station.

**Darwen.**—New warehouse, Wallpaper Manufacturers, Hollins Mill.

**Durham.**—New army barracks.

**Hastings.**—A winter garden or kursaal on the hospital site on the sea-front.

**Hendon.**—Swimming bath and public hall at Burroughs.

**Horwich.**—New Reform Club.

**Leigh.**—Enlargement of Territorial headquarters. Surveyor, E. L. Territorial Association, Town Hall Chambers, Ashton-under-Lyne.—Extensions of technical school. Architect, H. Littler, 16 Ribblesdale Place, Preston.

**London: Islington.**—Cinematograph theatre, 83-86 Upper Street.

**Poplar.**—Cinematograph theatre, Robinhood Lane.

**Stepney.**—Cinematograph theatre, Osborn Place.

## THE RECORD ELECTRICAL Co., Ltd.

LONDON OFFICE:  
CAXTON HOUSE,  
WESTMINSTER, S.W.

Telephone:  
3067 Victoria.  
Telegrams & Cablegrams:  
"Infusum,"  
London.

**ON A SCALE  
OF INSTRUMENTS.**

**RECORD'S PATENT.**

**Write for Prices & Particulars.**

WORKS:  
BROADHEATH,  
MANCHESTER.

Telephone:  
104 Altrincham.  
Telegrams & Cablegrams:  
"Infusum,"  
Altrincham.

**Middleton.**—Addition to works of Malta Mill Co., Mills Hill Road.

**Ruthin.**—New infirmary.

**Stoke-upon-Trent.**—Children's Hospital.

### TENDERS RECEIVED AND ACCEPTED

**Carlisle.**—The tender of the Union Electric Co. for two motor alternators and switchgear at £900 is recommended for acceptance, subject to the sanction of the Local Government Board.

**Glasgow.**—A pair of boilers is to be equipped experimentally with a new automatic stoker by the American Engineering Co., at a cost of £1,400. The company is to remove them free of cost if not satisfactory.

**Heywood.**—The tender of Bertram Thomas for switchboard alterations has been accepted.

**London: St. Pancras.**—The tender of Heenan & Froude for a wet-air filter to be used in connection with the new 1,000-kw. Ljungstrom turbine for £160 has been accepted.

### APPOINTMENTS AND PERSONAL NOTES

The wedding of Mr. W. M. D. Pell, director of Oliver Arc Lamp, Ltd., Engineering & Arc Lamps, Ltd., and the Varley Magnet Co., Ltd. (second son of the late Mr. Bennett Pell), to Miss E. G. Sandwith, only daughter of the late Col. Hartley Sandwith, C.B., took place at Woking, on Tuesday.

Mr. W. W. Warren has resigned his position as charge shift engineer at the L.C.C. tramway generating station at Greenwich.

Mr. D. Blackley has resigned his seat on the special Committee of the L.C.C. on London Electricity Supply.

The salary of Mr. E. Lunn, Station Superintendent at Huddersfield, is to be increased from £180 to £200 per annum. The National Boiler & General Insurance Co., of Manchester, require electrical inspectors. (See advertisement on another page.)

### MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. G. Smith & Son, of 5 Philpot Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night, was £77 10s. to £78 (last week, £78 to £78 10s.).

**Pope Lamps.**—With reference to our notice in this column and to Pope's Electric Lamp Company's advertisement last week, the company announce that they have been asked for the name of their solicitors, with a view to legal proceedings being taken against them for infringement, and specially ask their clients to note their absolute assurance that their indemnity holds good against all risk of action and damages.

**Shooting Match.**—On Tuesday evening last, a return match between Siemens Dalston Miniature Rifle Club and the Western Electric Co. was shot at Dalston, the result being a win for Siemens. The average scores were 95.3 for Siemens and 88 for the visitors.

**Exhibition Awards.**—J. H. Heathman & Co. (Parsons Green, Fulham, S.W.) have been awarded gold medals at the Anglo-German and Imperial Services Exhibition for exhibits of ladders, trestles, and steps. Mr. Heathman informs us that he has erected a water tower 65 ft. high at his factory, and intends to install a system of automatic sprinklers of his own manufacture.

**Anti-vibration Foundations.**—The Korfund Company (320 Bank Chambers, High Holborn, W.C.) inform us that they have been awarded a gold medal of the International Building Trade Exhibition at Leipzig for their Korfund insulation system.

**Igranic Electric Co.**—The liquidator of the Adams Manufacturing Co., Ltd., has now issued a formal notice that the sale of the electrical business of this company to the Igranic Electric Co., Ltd., has now been completed, and

all business communications should be sent either to the works of the latter company at Bedford, or to their London office, 147 Queen Victoria Street. The Igranic Electric Co. announce that they are prepared to enter into contracts for the manufacture and supply of motor control gear for all purposes, as well as the types manufactured by their predecessors under the trade name "Igranic."

**Bankruptcies.**—A meeting of creditors of the Ridings Arc Lamp Co. (in liquidation) will be held on November 6th at 9 Parr Street, Liverpool.—A dividend of 20s. in the pound and 4 per cent. interest will be paid by Mr. C. Lewis, electrical engineer, of 29 Seymour Grove, Old Trafford, on Friday, October 31st, at the Official Receiver's offices, Byrom Street, Manchester.

**Liquidations.**—A general meeting of the De Forest Wireless Telegraph Syndicate will be held at the offices of Messrs. Allen Attfield & Co., 147 Leadenhall Street, London, on November 6th, at 11.30 a.m., to hear the liquidator's account of the winding up.

A general meeting of the Provincial Electrical Co., Ltd., will be held at the offices of Mr. T. B. Scattergood, 125 Edmund Street, Birmingham, on November 4th, at 2.30 p.m., to hear the liquidator's account of the winding up.

### COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &c.

**Cleveland & Durham Electric Power.**—The accounts for last year, which show a net profit of £43,590, were adopted at the meeting last week. Mr. James Falconar, M.P., who presided, said that the position of the company was very satisfactory, and that among the contracts pending was one with the North-Eastern Railway Co. in connection with the electrification of a further 20 miles of single line as a test for working goods traffic. If this was successful, it was no secret, he said, that further extensions of their electric lines would be made by the railway company, which held out good prospects for the company in the future.

**Chloride Electrical Storage Co.**—An interim dividend of 5 per cent. is announced on the ordinary shares.

### NEW COMPANIES

**OSTRA LIGHT CO.**, 11 Queen Victoria Street, E.C. Capital £1,650. To deal with electric lamps, apparatus, &c.

**FORWARD ELECTRIC CO.**, Fountain Works, Lennox Street, Birmingham. Capital, £2,000.

**WENSLEYDALE GAS AND ELECTRICITY CO.** Registered by Jordan & Sons, 116 Chancery Lane, London. Capital, £5,000.

**CONTINUITY JOINT & TUBE CO.**, 27, St. Mary Axe, E.C. Capital £5,000. Electrical engineers and contractors.

**BENTHAM ELECTRIC SUPPLY CO.**—Capital, £1,000. Private company. Subscribers:—C. H. Best, T. E. P. Ford, E. Ayrton, J. Parker, J. Cumberland, C. Bullan, and H. H. Cass. 24 Cunliffe Terrace, Bradford.

**The Electrical Trades Union.**—Members of this Union in the London district met on Tuesday last in a large hall in Holborn to consider the final arrangements to secure an advance of wages. A resolution was carried instructing the London District Committee to formulate demands on both associated and non-federated employers, embodying 11d. an hour for electrical fitters and wiremen, with a recognised code of working rules, other grades to receive corresponding increases.

**The Storm in South Wales.** Considerable damage was done in the Aber Valley by the great storm on Monday night to the electrical undertakings, and at Senghennydd, Abertridwr, Penyrhoel, and Caerphilly supply was interrupted owing to lightning effects. Great inconvenience was caused at the pit-head of the Universal Colliery, where the work preparatory to exploring the mine after the disaster is being continued night and day. The roof of the Pontypridd generating station was torn off, and the telephone wires got so entangled with the tramway wires that the service had to be suspended. Supply was also interrupted at Bargoed in the Rhymney Valley, and telephone communication in that district was seriously interfered with.



# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 358 [VOL. IX., No. 45]  
*All rights reserved.*

THURSDAY, NOVEMBER 6, 1913.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry.

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES AND TECHNICAL COLLEGE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

*Other Advertisement Rates on Application.*

#### *Latest Time for Receiving*

Letters for Insertion, Tuesday first post.

Small Advertisements and Official Announcements, Wednesday first post.

Displayed Advertisements, Tuesday first post.

Corrections in Standing Advertisements, Monday first post.

All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 208-206, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Circling, Fleet, London."

Telephone No.: 5509 Holborn.

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

PROF. E. W. MARCHANT in his address to the Manchester Local Section of the Institution of Electrical Engineers, urged that the remuneration of electrical engineers was in general too low to attract the best into the profession in the future. (Page 612.)

SOME notes on the progress made in the application of electricity to mines in Cornwall, and some information concerning the working of different classes of mining machinery, were recently given by Mr. L. A. Hards in a Paper read before the Cornish Institute of Mining, Mechanical and Metallurgical Engineers. (Page 613.)

THE exhaust steam generating equipment at the Bedwas Colliery is referred to, and some notes on the method of driving and on the pumping plant are given by Mr. E. L. Hann. Although three-phase supply is utilised, D.C. motors, supplied through a rotary-converter, are employed, and the author's reasons for this course are interesting. (Page 614.)

SOME details are given of an electric winding engine in Scotland. (Page 614.)

A HOME OFFICE prosecution for contravention of the electrical mining rules in Scotland has resulted in conviction of the manager on a few of the charges with a nominal fine. The agent was acquitted, but the electrician was fined for failing to examine the plant properly. (Page 615.)

THE patent specifications dealing with electrical mining and metallurgical matters, published last month, deal with miners' safety lamps, hauling and winding

plants, the driving of three-high rolling mills by induction motors, and electric furnaces. (Page 615.)

WE give some further notes on the exhibits at the Glasgow Electrical Exhibition. (Page 617.)

AN accumulator truck, a traction lamp, a new design of radiator and an electrically driven fire-pump are described in short articles on page 618.

THE relative merits of the tree and distribution board systems of wiring are discussed in our "Questions and Answers" columns. (Page 619.)

A PROGRAMME of Papers and addresses to be read at London and provincial meetings of the Institution of Electrical Engineers has been issued. (Page 619.)

AMONG the specifications published last week by the Patent Office was one by the B.T.-H. Co. dealing with the dynamic braking of motors for machine tool driving. The B.T.-H. Co. are also protecting a design of A.C. flame arc lamp in which a specially designed auto-transformer is used. R. F. Venner protects cooking apparatus in which the heating element is encased in oil, and Pope's Electric Lamp Co. has a process for drawing metal filament from a cold sintered mixture of tungsten and thorium. (Page 620.)

WE give some detailed particulars of the new loaded telephone cable between England and Ireland. Considerable dissatisfaction is being felt in the watch and clock making industry at the charges made by the Post Office for licences to receive time signals. (Page 622.)

CONSTRUCTIONAL work has been started on the lines of the London & South Western Railway, which are to be converted to electric traction.—The "Railophone" system of signalling is to be adopted experimentally on the Midland Railway. (Page 622.)

THE dispute as to whether the Bury Corporation or the Lancashire Electric Power Co. shall supply in bulk to the Heywood Council was inquired into by the Board of Trade last week.—The Shoreditch Borough Council has rejected an offer by the County of London Electric Supply Co. to give a supply of electricity in bulk.—Some interesting electric cooking demonstrations and lectures have been carried out at Llanelly.—There are signs that the electrical wiremen's strike in Manchester will soon terminate by the employers granting the men's demands.—The rateable value system of charging has been adopted at Dewsbury.—The Gillingham Council are contemplating arranging their Diesel engine for running on gas tar oil. (Page 623.)

EXTENSIONS to plant, mains or services are contemplated at Wigan (£8,000); Darlington (£21,000); South Shields (£33,000); Finchley (£13,500); Harrogate (£9,439); and Gillingham (£5,000). A new sub-station is to be erected at Hornsey, and electric lighting schemes are under consideration at Teignmouth and other places.—Ten bogey trams are required at Bournemouth; and arc lamps at Hammersmith. (Page 623.)

## ARRANGEMENTS FOR THE WEEK

(TO-DAY) THURSDAY, NOVEMBER 6TH.

*Institution of Electrical Engineers: Yorkshire Section.*

7.15 p.m. At Hotel Metropole, Leeds. Reception and Address by the Chairman, Mr. W. B. Woodhouse. Smoking concert to follow.

SATURDAY, NOVEMBER 8TH.

*Manchester Association of Engineers.*

7 p.m. At Grand Hotel, Manchester. "Recent Developments in Steam Condensing Plants," by A. E. L. Scanes.

*Birmingham and District Electric Club.*

7.30 p.m. At Swan Hotel. "Motor-car Lighting by Electricity," by H. F. Steventon.

MONDAY, NOVEMBER 10TH.

*Institution of Post Office Electrical Engineers.*

5 p.m. At Institution of Electrical Engineers. "Telephone Engineering Economics," by H. A. Smith.

*Institution of Electrical Engineers: Newcastle Section.*

7.30 p.m. At Armstrong College. "Steam Boiler Working in Electrical Power Stations," by J. W. Jackson.

TUESDAY, NOVEMBER 11TH.

*Institution of Electrical Engineers: Scottish Section.*

8 p.m. At 207 Bath Street, Glasgow. Inaugural Address by J. A. Robertson.

WEDNESDAY, NOVEMBER 12TH.

*Institution of Electrical Engineers: Birmingham Section.*

7.30 p.m. At the University. "The British Standard Specification of Consumers' Electric Supply Meters," by S. H. Holden.

*Association of Engineers-in-Charge.*

7.45 p.m. At Marconi House, Strand. "Wireless Telegraphy," by Capt. H. Riall Sankey.

THURSDAY, NOVEMBER 13TH.

*Institution of Electrical Engineers.*

8 p.m. At Victoria Embankment. Address on "Pressure Rises" (experimentally illustrated), by the President.

## The London Electrical Engineers.

(TO-DAY) THURSDAY, NOVEMBER 6TH.—C. Company. Technical Instruction, 7 to 10 p.m.; Meeting of N.C.O.'s at 7 p.m.

FRIDAY, NOVEMBER 7TH.—D. Company. Technical Instruction, 7 to 10 p.m.; Meeting of N.C.O.'s at 7 p.m.

SATURDAY, NOVEMBER 8TH.—Headquarters open from 10 a.m. till noon.

MONDAY, NOVEMBER 10TH.—A. Company. Technical Instruction, 7 to 10 p.m.

TUESDAY, NOVEMBER 11TH.—B. Company. Technical Instruction, 7 to 10 p.m.

WEDNESDAY, NOVEMBER 12TH.—Recruits only. Infantry Drill and Technical Instruction, 7 to 10 p.m.

THURSDAY, NOVEMBER 13TH.—C. Company. Technical Instruction, 7 to 10 p.m.

FRIDAY, NOVEMBER 14TH.—D. Company. Technical Instruction, 7 to 10 p.m.

SATURDAY, NOVEMBER 15TH.—Headquarters open from 10 a.m. till noon.

## REMUNERATION OF ELECTRICAL ENGINEERS

PROF. E. W. MARCHANT'S address to the Manchester Local Section of the Institution of Electrical Engineers was entitled, "The Vocation of an Electrical Engineer," and contained a plea that the importance of the work being carried on by members of the electrical engineering profession should be better recognised and rewarded, as by this means only could we ensure that men of the high degree of training, ability, and intelligence required to keep pace with the ever-widening developments of that branch of engineering could be available to carry on its progress. Dealing with the various sections of the profession in turn, he showed first how enormous was the field for the central station engineer, although the remuneration offered to those taking up this work was quite inadequate to the responsibility. Many successful central station engineers had forsaken their positions to take up consulting work, and the difficulty experienced by the large power companies in obtaining suitable men was increasing. Electric railway work was increasing in importance, and he looked forward to the time when the position of mechanical engineer to a railway would be filled by an electrical engineer, who, like the former, could reasonably aspire to the general managership. All this showed the high type of man demanded. In manufacturing work also, technical knowledge of the highest order is required to fill the highest posts, but men eligible for these positions are discouraged by the low salaries obtainable while they are climbing the ladder. In order to attract the best type of men into the profession, it was imperative that the standard of remuneration for technical men must be advanced. Prof. Marchant had also a good deal to say regarding telephone and telegraph work, and hoped that the higher administrative posts in this service would in the future be more open than they appear to be at present to those who have a thorough knowledge of the technique of telegraphy and telephony. To get the right kind of person, the engineering side must be made attractive enough to ensure that the most able men shall think it worth while to become telegraph engineers. Similar arguments were applied to electrochemical engineering. The matter, he said in conclusion, is one of supply and demand; the supply hitherto has been ample, the demand meagre; now demand is overtaking supply, and the necessary consequence to an increased demand is either a worse quality of product or a higher price.



WASTE (see "ELECTRICAL ENGINEERING," October 30th, page 601).

Mr. Vernier in his address at Newcastle spoke of the desirability of co-operation between Municipalities and Power Companies by giving the former a financial interest in the undertaking and representation on the Board.

COUNCILLOR REDRAGGE (who represents £200,000 held by the Corporation of Manningborough), interrupting the reading of the Balance Sheet:—Afore we proceed, gen-l-mn, I'd like ter raise the question o' the discharge of stoker Slacke because 'e disagreed with the shift engineer about the rate at which it was desirable to fire the boilers. . . . (Consternation.)

## ELECTRICAL ENGINEERING IN THE MINING AND METAL INDUSTRIES

### ELECTRICITY IN CORNISH MINES

AT the opening meeting of the Cornish Institute of Mining, Mechanical, and Metallurgical Engineers, held last month, Mr. L. A. Hards (engineer and manager, Cornwall Electric Power Co.), read a Paper on "The Application of Electricity to Cornish Mining." The output of the Cornwall Power Co.'s works at Hayle, said the author, was now nearly 20 million units per annum. To illustrate the saving in capital outlay by the adoption of electric power from an outside source, he assumed a mining undertaking, with a capital of £50,000, earning 25 per cent. and using 1,500,000 units per annum, at a cost of 0.75d. per unit, or £4,680 per annum. Private plant would cost about £10,000, and, allowing 10 per cent. for depreciation, the distribution would be reduced from 25 per cent. on a capital of £50,000 to 19 per cent. on £60,000. Thus the cost per unit would have to be not more than 0.19d. per unit to bring the profit back to 25 per cent. This calculation was made on the assumption of a 25 per cent. profit, which is not high for a mining concern, and the £10,000 cost of plant might have meant the difference between 25 per cent. and no dividend at all if there was a shortage of money to get the concern into fair working operation.

The author then dealt with the question of pumping, which he divided into two classes, unwatering and permanent pumping. Nothing, he supposed, had retarded the progress of electricity in Cornish mines so much as the trouble experienced with turbine pumps, where it had been tried to pump comparatively small quantities of gritty water through small passages with impellers running at high speed. High-speed machinery of this kind required careful attention, and in using this type of pump it would be well to work in two shafts at the same time. He thought it preferable for unwatering not to use pumps for too high a lift. It would certainly be more economical for, say, a 1,000-ft. water lift, to use two 500-ft. pumps—generally a turbine pump has a maximum efficiency when the gallons per minute are approximately equal to the head in feet. To prevent overloading of the main motor he suggested that it might be possible to have one or two small single-stage sinking pumps below the main pump, capable of pumping, say, 40 or 50 ft., delivering to a tank about 3 ft. 6 in. square by 10 ft. long, from which the large pump could pump intermittently. The ideal arrangement would be pumps running intermittently, spaced at various levels on moderate heads, so that economies in the power demand would result.

So far no satisfactory rock drill had been tried in Cornwall. The question of weight was serious, but the author did not think that there was much in the argument that with the pneumatic drill there was a supply of air for ventilation, since it took about 20 h.p. at the surface to produce 3 or 4 h.p. below, so that there was some margin for ventilation at low pressure with electric drills. There were a number of electrically-driven compressors connected to the mains. One especially was interesting. This was a Holman's 1,000 cub. ft. rope-driven compressor, arranged to start and stop automatically. It was driven by a 215 h.p. motor running at 240 r.p.m. The control was by a small relay operated by the air pressure, so that the compressor was always at work at full load and maximum efficiency. It took 25 secs. to start, but by increasing the current this could be reduced to 10 secs. At present there were no large winders connected to the system, but, said the author, there is every possibility of some being connected in the near future. From particulars for a number of collieries using steam winding, and raising 2,000 to 3,000 tons per day, he found that on the average about 14 lbs. of coal per effective h.p. hour in the shaft were required, which, at 18s. per ton, gave a cost as high as 1s. 4d. for coal only. Large electric winders could not, however, be dealt with in the generating station until recently, but the present plant at Hayle could do this satisfactorily. With regard to rock-breakers, there were now a number electrically-driven, and the use of electricity was proving very economical: for instance, a rock-breaker, 20 ft. by 10 ft. and motor 40 h.p. to start, and 45 h.p. peak, only took about 7 h.p. average as registered by meter. With regard to stamps, there was no difficulty in driving any kind, but the author pointed out that the motor should drive, whenever possible, through high-class single reduction gearing or through chain belts.

Vanners and shaking tables took very little power to drive, and were generally grouped. Recently there had been a tendency to speed up the countershafts. This allowed the use of cheaper shafting and higher-speed belts, and, consequently, a lower belt tension and lighter belts, as larger pulleys might be used. Pulverisers also were machines which had been very satisfactorily driven electrically for a number of years. Whenever possible, gearing was used on low-speed drives, and was placed between the low-speed machines and the counter-shaft, and not between the motor and the counter-shaft.

The following figures relate to the h.p. in motors at the present time connected to the mains of the Cornwall Power Co.:—Stamps, 826; crushers, 315; vanners, 240; pulverisers, 916; pumps, 1,200; dredges, 75; haulage, 190; compressors, 1,185; and miscellaneous, 339. In addition, the company has a lighting load of 720 h.p. and a tramway load of 500 h.p. and 934 h.p. connected to engineering works. It has been found that Californian stamps, with a 30-h.p. motor, 10 heads of 1,050 lbs. each, and 98 drops, takes 20 units per hour. Nissen stamps, with an 11-h.p. motor, two heads of 2,000 lbs. each, and 94 drops, take 7.85 units per hour; but it is thought that with more heads and a larger motor, these would be more efficient. Pneumatic stamps, with a 130-h.p. motor, 4 heads of 1,250 lbs. each and 120 drops, take 80 units per hour. Crushers present a considerable variation in power according to duty, but on the average a 24-in. crusher at 192 r.p.m., takes a maximum demand of 56 kw. and 12.7 units per hour; while a 20-in. crusher at 190 r.p.m. takes 17 kw. and 3.0 to 9.0 units per hour. A 13 ft. 6 in. by 3 ft. 6 in. tube mill pulveriser, running at 24 r.p.m., dealing with 45 tons per day, takes 12 units per hour; four 6 ft. by 2 ft. 6 in. pulverisers, also running at 24 r.p.m. and dealing with 2 tons per day, take 13 units per hour; while a 6 ft. by 2 ft. 6 in. machine at 35 r.p.m. takes 2.3 units per hour, and at 56 r.p.m. 3.3 units per hour. Twenty vanners take 7.3 units per hour, and 22 Wilfly tables take 9.8 units per hour.

**"Wireless" Telephones in Mines.**—The Reineke system of telephonic and telegraphic communication in mines, previously referred to in *ELECTRICAL ENGINEERING*, has been installed by the Clifton & Kersley Coal Co., Ltd., in its colliery at Astley Green.

**Scottish Mining Electrical Engineers.**—The opening meeting of the session of the West of Scotland Branch of the Association of Mining Electrical Engineers was held on October 18th, in Glasgow. The President, Mr. M. Brown, in his address, mentioned that the branch was now the leading one in point of numbers. It was further announced that arrangements were being made for holding district meetings in Hamilton, Larbert, and Kilmarnock, with a view to creating additional interest in the branch. In the course of a discussion with the Scottish branch of the National Association of Colliery Managers on October 25th, Mr. A. Anderson (Wishaw), observed that it was pleasing to note that the number of accidents due to electricity was decreasing. This was due both to the design, manufacture, and maintenance of the plant. The latter was most essential. It seemed to him that the scarcity of labour at the present day made the use of electricity not only advisable but absolutely essential if the country was to go on its way uninterrupted.

**Power Generation at the Pit's Mouth.**—A joint meeting of the Kent Branch of the National Association of Colliery Managers and the London Branch of the Association of Mining Electrical Engineers was held recently at Dover, and Mr. E. Kilburn Scott read a paper on large prime movers and boilers for power houses. The prosperity of the country, he said, depended largely on cheap power supply, and the only way to compete with water-power countries was to centralise electric-power supply in the colliery districts. Turbo-alternators of 20,000 to 50,000 kw. were already being built, and in his opinion an ideal electric power station would give, say, 100,000 kw. in four or five steam turbines supplied with steam from boilers fired by gas obtained from by-product plants using coal direct from the pit. Such a station could supply power to a profitable electrochemical or electrometallurgical load with a good load factor at one-tenth of a penny per unit. He thought that the primary power houses of the future would be situated on the coal fields, and the present municipal and other stations would become sub-stations. The sixty odd power stations of greater London, for example, could derive their energy from the Nottingham, Warwickshire, Forest of Dean, and Kent coalfields. The transmission lines could be along the railway routes, and the railways themselves would be converted to electric traction.

## ELECTRICAL PLANT AT BEDWAS COLLIERY

THE last issue of the *Proceedings* of the South Wales Institute of Engineers contains a Paper on the sinking and equipping of the Bedwas Navigation Company's Colliery, by Mr. E. L. Hann. There are two shafts, each 21 ft. in diameter, about half a mile east of Bedwas Station. The permanent plant was installed before sinking, and the cost of fuel during sinking was £7,786, which the author compares with £16,801 spent on fuel in sinking at Penallta under similar conditions. At Bedwas the sinking was carried out at a faster rate, and, by the use of a mixed-pressure turbine, practically the whole of the electric power required for pumping, ventilating, and small surface motors was produced from the exhaust of the winding engines and air compressor. A 500-kw. 3,000-volt 50-cycle reciprocating set was used to drive the small motors, for lighting, and to do any electric pumping that might be necessary before the larger electric generators were installed, and the ventilation was done by means of an electrically-driven fan of 8,000 cub. ft. per hour capacity at the top of each pit, and air pipes 2 ft. in diameter were used in the shaft.

The exhaust-steam plant was installed almost immediately after sinking commenced. This comprised a Rateau accumulator, designed to give sufficient storage to bridge over winding-engine stops of 45 secs.; a 1,250-kw. B.T.H. Curtis mixed-pressure turbo-alternator with Le Blanc jet type condenser, and motor-driven rotary air pump designed for 27½ in. vacuum. The engines can exhaust into the accumulator, or, if the turbine is not running, into the condenser direct. Any surplus steam from the accumulator is taken to a feed-water heater, so that no exhaust steam escapes to the atmosphere unless the feed water is already at approximately boiling-point. In order to obtain duplicate fan and compressor drives, as well as economical driving on low loads, and also to use all the exhaust steam available, the main ventilating fan was provided with steam and electric drive, and one of the three air compressors (two are of 4,000 cub. ft. per minute and the other of 5,000 cub. ft. per minute capacity) are driven electrically. At the same time, a second 1,500-kw. mixed-pressure turbo-alternator, running at 3,000 r.p.m., was installed.

Many schemes for variable-speed electric drives were considered, and eventually 500-volt D.C. motors, driven through rotary converters, were chosen. In considering the best system to adopt, the following were the conditions which influenced the decision in favour of the D.C. plant:—

(1) A complete range of speed between 72 and 135 revolutions per minute would be obtained for the fan drive, which would be required in opening out the colliery. (2) Simplicity of speed control. This is especially valuable on the air-compressor drive, where it is done automatically by a Thury regulator between the limits of 80 and 125 r.p.m. (3) The power factor of the load on the generating plant could be improved. (4) Owing to the fact that only one 500 kw. rotary converter would be required at first for the two motors the initial cost was moderate. (5) The 3,000 volt and 500 volt transformer for the A.C. side of the rotary would act as spare to the existing transformer, which is used for small A.C. motors. (6) Any surplus current from the rotary converter became available for a variable-speed D.C. motor drive, such as the induced-draught fan motor, or for any other drive when variable speed is required. (7) A comparatively slow-speed air compressor could be used with a direct-coupled motor.

Mr. Hann pointed out that the general experience at collieries where mixed-pressure electric-power plants have been installed, and where the colliery is so situated that its supply cannot be linked up with other collieries, has been that, owing to the large fluctuations in the amount of exhaust steam available and the current demand, it has not been possible either to utilise fully the exhaust steam or to obtain a satisfactory load factor. The installation at Bedwas was designed to get over this difficulty, and, with the choice of electric drives available, Mr. Hann thinks that a high load factor will be realised, and that the exhaust steam should be almost completely utilised.

It was also mentioned in the Paper that, in order to cope with an inrush of water into a district at the rate of about 10,000 gallons per hour, which gradually reduced to 4,000 gallons per hour, two sets of Sulzer centrifugal electric pumps, each capable of delivering 560 gallons per minute to the surface, were ordered. The total manometric head against which these pumps have to throw is 2,507 ft. This required the employment of thirteen stage pumps, each set consisting of a five-stage and an eight-stage pump, coupled in series, with a combined bed-plate to take also the electric motor, which is placed between the pumps.

## AN ELECTRIC WINDING ENGINE IN SCOTLAND

AT a meeting of the Mining Institute of Scotland on October 11th, Mr. W. M. Dunn read a Paper on the electrical winding plant which has been installed at the South Kennmuir Colliery. When the reopening of this pit was under consideration, it was found that the space was too limited to put in a steam winder easily, and that electric power could be obtained at a reasonable figure from the mains of the Clyde Valley Electric Power Co. Careful estimates were made of the relative costs of steam and electric winding, and finally an electric plant was ordered from Crompton & Co. (Chelmsford). The winder is capable of winding 720 tons per shift, or 180,000 tons per annum from a depth of 76 fathoms, at the following estimated costs:—Wages of three enginemmen, £373; oils, waste fuel, &c., £9 14s. 5d.; winding minerals, men and stores, £362 10s.; depreciation (5 per cent. on £2,460), £123; difference between first cost of steam and electric winder (5 per cent. on £825), £41 5s.: giving a total of £909 11s. 5d., equal to 1'213 pence per ton. The time taken to wind 17cwt. from the 76 fathom level is twenty-four seconds plates to plates, and with ten seconds allowed for banking; the winder, if kept running without a halt, is capable of raising 720 tons from that depth in eight hours.

The winder is on the continuous-current system of Messrs. Crompton & Co., without flywheel storage, and the winding motor, which is direct-coupled to the drum, receives current at a variable voltage from a motor-generator of special construction driven by a three-phase motor from the supply circuit. The safety devices are as follows:—An electromagnetic brake comes into action automatically either when the controller cuts off the current or when the limit switches are reached. Immediately after the limit switches are passed, mechanical trips on the indicator column release a weight which applies the post brake. This same weight is also released by a solenoid in event of the current failing. The controller is so arranged that the normal acceleration cannot be exceeded, even if the handle is put hard over. The control was found to be very easy, and there was no difficulty in training ordinary enginemmen to work the winder.

**Electricity in Mines in New South Wales.**—The annual report for 1912 of the Department of Mines, New South Wales, notes the advisability of having a duplicate drive for ventilation fans. A non-fatal accident is recorded in which a sinker received a shock owing to the winding rope of the sinking winch becoming alive through an unearthed defective controller. A horse-driver was prosecuted and convicted under the electric special rules for baring an electric cable and connecting it to a chain fence on which a filler was sitting. He was rendered unconscious for a considerable time. No fatal accidents due to electricity occurred, and but little of electrical interest is recorded.

**Collieries and Electricity.**—In the course of his address to the Yorkshire Branch of the Association of Mining Electrical Engineers at Sheffield on October 25th, Mr. H. C. Jenkins looked forward to the time when each colliery would become a huge generating station, from which electrical energy would be distributed. It was important, he also said, that members of the Association should broaden their knowledge of electricity as much as possible, because at all mining disasters the first question was whether electricity installed underground was the cause. Electricity was made the scapegoat wherever possible, and it was the duty of the mining electricians to disprove this charge. Mr. J. Bentham (New Sharlston Collieries) gave a paper on testing transformers for colliery work.

**Association of Mining Electrical Engineers.**—At the annual meeting of the Association of Mining Electrical Engineers, which was held in Birmingham, the retiring President, Mr. W. C. Mountain, said that they now had 1,081 members of the Association. The Association and especially the certificates granted by it were now being regarded as things of value. In the past electrical machinery in collieries had suffered a great deal from the fact that the class of men who looked after it were incompetent. That, however, was being got over, and the present class of men were a great improvement. Mr. A. Anderson was elected president for the ensuing year, Messrs. A. Hall and R. Holliday vice-presidents, and Mr. C. F. Jackson treasurer. In the course of his address Mr. Anderson expressed the opinion that the day of the mining engineer with only a little elementary electrical knowledge was gone. He foresaw a steady development of the use of electricity as an aid to mining, and the average underground distributing station would compare badly with that of the future when they might expect to see well-made walls, and clean and even floors. He advocated a thorough course of technical training for young men entering the profession. Unreliable plant was often the outcome of unreliable attention due to lack of technical knowledge. He deplored the lack of first-class men at the present time.



## HOME OFFICE PROSECUTION

EVIDENCE in the case against the agent and the manager of the Dalzell & Broomside Colliery, Motherwell, with regard to alleged contravention of the Coal Mines Act, mentioned in *ELECTRICAL ENGINEERING*, October 2nd, page 556, has been continued since our last report. The charges included failure to have certain fuses properly protected, failure to cover parts of certain unarmoured cables with insulation, and failure to secure certain cables with readily breakable non-conducting material, failure to keep signal wires away from cables, failure to earth a gate end box, and failure to provide a suitable trailing cable to a coal-cutter. There were other charges of a non-electrical character. Mr. Robert Nelson (H.M. Electrical Inspector of Mines), spoke of having seen a distribution box containing fuses not so constructed as to prevent risk of shock. In some of the cables the insulation was quite worn away in parts, and in some places the cables rested on nails instead of being secured in proper slings; also in one of the gate end boxes, the earth-conductor was not soldered into a lug for the earth connection, and the trailing cable of a coal-cutter was not connected to the system by a properly constructed connection. Mr. Nelson's evidence was corroborated by Mr. W. Walker (H.M. Chief Inspector of Mines for Scotland).

For the defence, Mr. G. L. Kerr (Inspector for the Scottish Mine Owners' Association), said that, from his reading of the regulations, the fuses in the distribution box were exempt under the Act, and Mr. D. Martin considered that there was no risk of shock with reasonable care; but admitted, in cross-examination, that there was a possibility of live contact. The installation of a box, as suggested by the inspectors, and the replacement of the trailing cable connection, would have involved new apparatus, which would have come under the clause of the Act, which allowed an extension of time for its installation. The suspension of the cable on nails was a temporary expedient until suspenders were obtained. He thought that it was the electricians' duty to detect absence of covering on the cables. The manager (Mr. J. Dalgleish), in his evidence, urged that he was taking all reasonable means to get everything up to the requirements of the Act, and complained that he could not get experienced men to carry

out the work in the specified time. The agent (Mr. R. W. Dron) was satisfied that the manager was doing all he could to meet the requirements of the Act. His own position was that of an outsider giving technical advice. Sheriff Shennan, in his judgment, first took up the question of the position of the agent, and, finding that he was a skilled adviser without power to issue orders, dismissed the complaint as against him. With regard to the charges against the manager relating to the electrical rules, the sheriff finds that the rule on which the charge relating to the fuse-box is founded relates to construction, and accordingly Rule 20, allowing extension of time, applies. It would have been simple for the inspector to require that matter to be remedied in virtue of his powers under Rule 20. In any case, he regards it as the duty of the electrician rather than the manager to inspect the fuses minutely. The charge of failure to cover cables with insulation he regards as more serious, and convicts on this count. The four remaining charges are characterised as relating to matters of detail for which the manager could not be held responsible, and are dismissed. The sheriff convicted on some of the non-electrical charges, but, remarking that he did not regard any of the offences as serious, he imposed a fine of £5. It will be remembered that the electrician to the colliery was originally included in the charges, but it was decided that he could only be proceeded against for failure to examine the plant properly. To this he pleaded guilty at a subsequent hearing, and was fined £2.

## ELECTRICAL MINING AND METALLURGICAL PATENTS OF OCTOBER

## Mining.

THE following Specifications published by the Patent Office during October are of particular interest to mining electrical engineers. In No. 20,352, of 1912, F. Farber, a safety lamp is described. It comprises a strong metal cylinder forming the base and battery container, while the lamp-head is secured by a bayonet fastening, and is magnetically locked. The battery is maintained central by a ridge engaging with a slot in the base, and loosely mounted spring plunger contacts bear against the lamp-head. The circuit is made or broken by turning this head. The lamp is held between two concentric contact springs, and is pressed against them by a third co-axial spring. The accumulator elements are mounted on the lid of the cell, and the lid is fixed to the cell by a thin strip of celluloid. Specification No. 22,738, of 1912, by W. H. Hanson, H. L. Langston, and the Electrical Power Storage Co., Ltd., also deals with a safety lamp in which control of the light is effected by movement of the head. An airtight space is provided between the base-plate and the lamp and the cover of the battery casing. An airtight joint is made by a V-shaped circular projection on the former engaging a groove in the latter. The lamp chamber, which contains more than one lamp, is connected to the cover of the battery casing by a central bolt. In Specification No. 24,438, of 1912, O. Oldham (Denton, Manchester) describes a construction of internal switches to effect control of the light by rotation of the lamp-head. A bottom cap is free to screw up and down in the lower end of the case to a limited amount, and to support and turn the battery with it. Specification No. 4,707, of 1913, by T. Heaton, deals with a gas detector for miner's safety lamps, and is an improvement on the lamps covered by Patent No. 239, of 1912. A platinum or nickel-chrome wire is supplied with current from the accumulator, and the heat evolved is arranged to volatilise oil in a container, which is ignited in the presence of fire-damp. Either the detector or lamp may be used by turning the head which is provided with an ordinary miner's lamp top. Specification No. 1,407, of 1913, by Friedr. Krupp, A. G., of Essen, Germany, deals with the control of machines on the Leonard system. The main field of the dynamo is separately excited. It is connected in parallel with the armature by a potentiometer arrangement. By means of an auxiliary brush only part of the armature pressure need be

FOR  
BRITISH  
MANUFACTURED  
PAPER  
INSULATED  
CABLES

THE  
UNION  
CABLE  
CO., LD

DAGENHAM DOCK,  
ESSEX.



applied to the potentiometer circuit. Another specification relating to hauling and winding sets is No. 11,007, of 1913, by Siemens-Schuckert. The supply to the set is regulated by means of an automatic speed regulator, which, during the acceleration of the working motor, driven by the Ilgner set, is set higher, and during retardation is set lower, so as to produce a more gradual acceleration of the flywheel. The sensitiveness of the speed governor is adjusted by a load or current relay. The speed governor described in Specification No. 27,588, of 1911, is specially referred to.

### Metallurgical.

The following Specifications are of particular interest to electrometallurgists:—In No. 21,263, of 1912, by the B.T.-H. Co., to which it was communicated by the General Electric Co. of America, the control of A.C. induction motors for use with three-high rolling mills, &c., is dealt with. Two motors are used, one has about twice the synchronous speed of the other, both are geared to the lifting table, and are controlled by a circuit changing limit switch. An automatic reversing switch is also provided for the high-speed motor. The operations are as follows:—The high-speed motor starts and accelerates the table; it is then cut out, and the low-speed motor is cut in, and is driven by the momentum above its synchronous speed, so that it acts as a generator, and retards the speed of the table. Just before the low-speed motor has reached synchronous speed, the high-speed motor is cut in again in a reversed direction, and the two motor torques tend to balance at about one-quarter full high speed. The table is then stopped by a solenoid brake.

In Specification No. 24,626, of 1912, the Morgan Crucible Co. and C. W. Spiers describe a conducting crucible for tilting furnaces. The upper part is made with an annular extension, so that it may be clamped up to form one of the terminals, the other being at the bottom as usual. The extension is made of larger cross-section than the body of the crucible, so that it is not so greatly heated. In Specification No. 16,011, of 1913, J. Bally describes a design of transformer furnace in which the secondary circuit consists of vertical or inclined holes connected by horizontal conduits or solid connections. These are situated on one cylindrical surface or several concentric cylindrical surfaces. In the

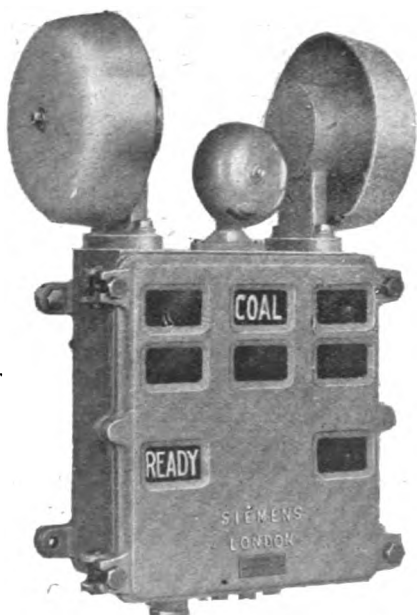
interior is the primary, which is made up of several coils arranged radially on a central axis. Several advantages are claimed for this construction. The magnetic body may be used for binding the insulating material; a long secondary circuit, automatic filtration of the bath, and collection of the scum in certain holes; heating centres well distributed, and a single ventilation shaft for the primary coils only is required. The primary may be readily withdrawn, so that any repairs to the working chambers are easily effected.

**Telephones in Rescue Work.**—After the overcoming by gas of one of the rescue parties in the Universal Pit at Senghenydd, telephonic communication was established between the rescue parties and the colliery offices over a distance of a mile. This was done by means of Army field telephones and a reel of cable, with other apparatus, lent by the Welsh Telegraph Company, Royal Engineers. The men were then able to carry portable telephones, and to remain in touch with the surface.

**Fatal Accident due to Electric Shock.**—An inquest was held recently into the death of a coke-oven ram-driver named George Smith at the works of the Coppee Co. (Great Britain), Ltd. Electrical power was supplied by the Pinxton Colliery Co., who saw to the keeping in order of the wires and cables, lamps, &c., but no systematic examination was made. It was shown that Smith's death was due to shock from touching a handrail which had become alive from the cable in an adjacent faulty conduit during wet weather. No blame was attached to the management.

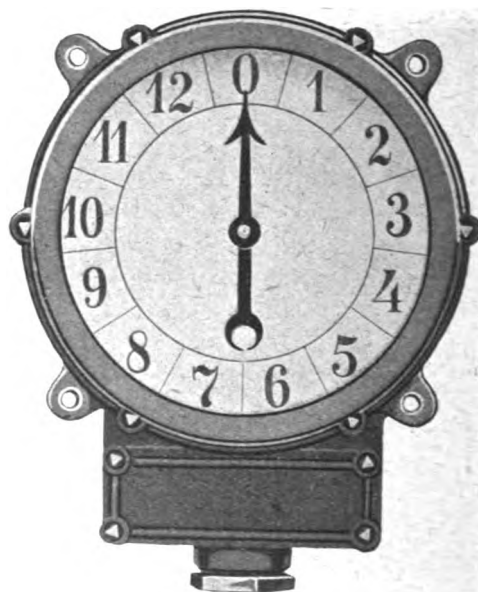
**Electric Safety Lamps in Mines.**—In the course of a speech at West Kirby recently, Sir Arthur Markham urged that the use of electric safety lamps should be made compulsory in all mines, even where naked lights were now used. An electric light, he said, gave much more light than a candle, and was far safer than an oil lamp. Men who used electricity said there was no comparison between that and the oil safety lamp, and they would have nothing more to do with oil. The cost on the industry to "scrap" the oil lamps and to buy new ones for electricity would be about one million sterling, but the added safety would be worth the expense. If this last disaster were proved to be due to a defective safety lamp, then it might be that Parliament would compel the use of electric lamps as an additional precaution in mines. As far as he was concerned, he was going to put electric lamps into every pit with which he was connected.

# SHAFT SIGNALS



LUMINOUS APPARATUS  
ENGINE ROOM INSTRUMENT.

to comply  
with the  
**NEW**  
**REGULATIONS**



BELL INDICATOR.

## SIEMENS BROTHERS & CO., LTD.

APPARATUS  
DEPT.

WOOLWICH, LONDON, S.E.

APPARATUS  
DEPT.

# THE GLASGOW ELECTRICAL EXHIBITION

## Second Notice

WE give below some further notes on the Glasgow Electrical Exhibition, including descriptions of some stands not mentioned in our last issue.

We are now able to give an illustration of the stand of the Edison and Swan Electric Light Co., which was described last week.

On the Stand of The General Electric Co., Ltd. (71 Waterloo Street, Glasgow), will be found a large selection of Osram lamps from 2 to 1,000 candle-power. The firm have recognised the large demand for small heating and cooking appliances, such as electric irons, kettles, saucepans, toasters, radiators, &c., and are showing a varied range of their well-known "Magnet" type of apparatus. Amongst these perhaps the most popular are the domestic types of electric iron, the 4 lb. size of which is sold for 12s. 6d., and the 6 lb. type at 16s., with guarantees for three years. They are highly finished and nickel-plated, and at Glasgow rates they cost only 1d. for nearly four hours' continuous use. A neat little 2 pint copper "Magnet" kettle is also shown that will boil 2 pints of water in 7 minutes. There are also on view a breakfast set consisting of hot plates, chafing dish, teapot and coffee percolator. The General Electric Co. also show a varied collection of telephones to meet all requirements, from the small battery telephone to the latest model central battery lamp signalling switchboard. Examples of "Superlux" glass are also on view.

At Stand No. 47 R. Waygood & Co., Ltd. (Falmouth Road, London, S.E.), show a working model of an automatic electric passenger lift, with push button control, and gates fitted with interlocking gear. For the purpose of the model the floor pushes



THE EDISWAN STAND.

that would ordinarily be in the cage are placed outside, so that the working of the lift may be easily demonstrated.

An excellent selection of electric cables of all types and for all purposes are shown at Stand No. 49 by W. T. Henley's Telegraphs Works Co., Ltd. (Blomfield Street, London, E.C.). There is also a varied selection of joint boxes, jointing material, Henley Patent Cable Suspension, and other accessories. The Henley wiring system is explained, and samples of the work are shown.

The Record Electrical Co., Ltd. (Caxton House, Westminster, S.W.), are exhibiting a variety of measuring instruments and automatic circuit breakers. The pedestal iron-clad type of ammeters and voltmeters shown are very suitable for factories, shipyards, and exposed positions. The patent "Circscale" instruments are on view, and some models are connected up to demonstrate the instruments under working conditions.

Besides showing several small hand vacuum cleaners The Scottish Vacuum Cleaner Co. (111 Bothwell Street, Glasgow), are exhibiting the "Santo" Vacuum Cleaner, and their later production, the "Ruby." By a special pump in this cleaner fully 10 in. of vacuum, and an air volume of fully 33 cubic feet of free air per minute is obtained. This ensures a strong blast of air for use with the blowing hose, which removes dust from corners and crevices where it is not possible to apply the suction. There are also being given demonstrations of the "Perfection" Vacuum Clothes Washer, which has proved so effective.

The British Electric Plant Co., Ltd., Alloa, are exhibiting at Stand No. 39 several of their well-known specialities in con-

nection with colliery equipments. They make a speciality of high and low lift turbine pumps, in which it is claimed that the end thrust is neutralised at each impeller, and consequently no balance pistons of any description are required. In this connection they are showing one of their D4 size pumps, direct coupled to one of their special A.C. motors, which is very compact and specially adapted for colliery work. The output of the system is 400 gallons of water per minute against 300 feet head when running at a speed of 1,500 r.p.m. The Company have also developed turbine pumps for boiler feed purposes, and one of their C7 size pumps represents this type coupled to one of their standard D.C. motors, the pump having an output of 150 gallons per minute against 200 pounds pressure. A complete set of pump impellers are shown mounted on the shaft, a unique feature being that the whole shaft where it comes into contact with the liquid is protected by bronze sleeves. A new design of D.C. motor is also on view, suitable for pipe ventilation, also a 20 h.p. single drum haulage, fitted with new mining type D.C. motor, with drip-proof cover.

The Skefko Ball Bearing Co., Luton, are showing at the stand of Mr. David Martin (45 Hope Street, Glasgow) their well-known bearings under running conditions, fitted to a badly bent shaft. The great success of these bearings can be understood from the fact that over 8,000 employees are engaged in their manufacture. It is claimed that they are the only self-aligning ball bearings made where the rolling motion is solely on the balls. The hardened steel balls run on a spherical-shaped seat, so that when shaft flexure develops the race self-aligns to the new conditions without injuring. It is claimed that friction is reduced by over 90 per cent., while skewed bearings are entirely eliminated, thus reducing lubricating costs. Messrs. A. Reyrolle, Hebburn-on-Tyne are also showing at this stand some of the lighter class of switchgear in which they specialise.

The British Electric Co., Ltd. (73 Dunlop Street, Glasgow) show a selection of their water heaters of the geyser and tank types. With the geyser type it is possible to obtain a supply of hot water in five seconds from any water main, the cold water being filtered and the hot water sterilised. The applications of the circulating or tank system for ship and railway carriage purposes are shown. The tank is contained in the fitting, and by a reliable automatic arrangement the heating element is switched on when the temperature of the water drops as hot water is drawn away, thus continuing a constant supply. For boiling water in thirty seconds this firm show a compact and serviceable apparatus, and there are also on view electrically-heated towel-rails and electrically-heated bath tanks.

The Carron Co. (Carron, Stirlingshire), who were pioneers in the progress of kitchen ranges and gas fires, have a splendid exhibit on Stand No. 72. From their works at Carron they have turned out electrical cooking and heating appliances of most useful, modern, and durable design. These include cookers, ovens, grillers, hot-plates, toasters, boilers, radiators, and convectors, all fitted with their special heating elements fixed to a fireclay base. The electrical appliances shown on this stand will maintain the Carron Co.'s high reputation for the manufacture of only the finest goods in their trade.

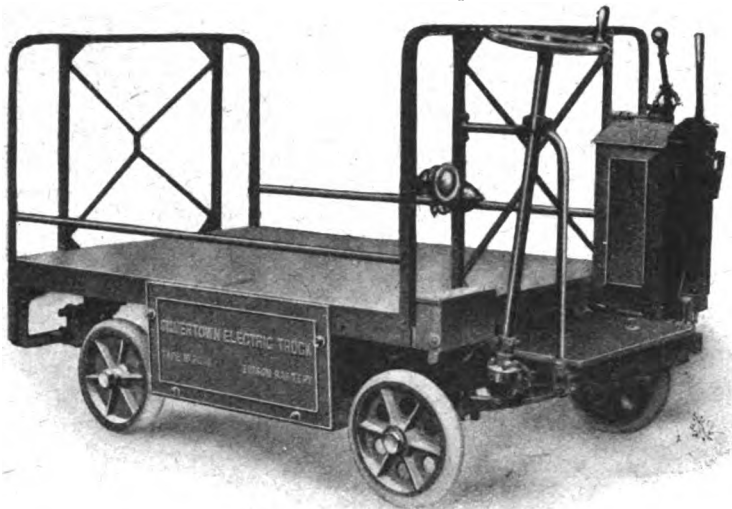
The Electrical Contractors' Association (Glasgow Branch) have a stand (No. 61) which is occupied by a combination of eighteen local contracting firms, who are displaying a comprehensive range of electrical accessories and novelties. The stand is attractively arranged, and a fine collection of suspended fittings for domestic lighting have been brought together, including Georgian and Jacobean designs. An assortment of shop fittings and brackets are also shown, with a selection of grills, cooking ovens, and heating apparatus, including an electric incubator.

**Physical Society's Exhibition.**—The annual exhibition promoted by the Physical Society of London will be held during the afternoon and evening of Tuesday, December 16th, at the Imperial College of Science, South Kensington.

**The Circle Diagram of the Polyphase Induction Motor.**—A Paper entitled "The Efficiency of the Polyphase Induction Motor from the Current (Circle) Diagram; together with an Equation connecting the Output and Input of the General Electric Circuit," by Mr. J. S. Nicholson, has been published in the current *Journal of the Institution of Electrical Engineers*. A previous Paper on the same subject was published in Vol. 49 of the *Journal*. The Author reduces the induction motor to an equivalent electric circuit and an approximately equal equivalent circuit, and from these he draws circle diagrams. The details of tests are given to show that the method gives very accurate results. The form of diagram dealt with is that due to Ossanno, Bragstad and La Cour, and others. The effects of altering the resistance and other constants are easily seen, and have been checked by experiments, the results of these being given.

### AN ACCUMULATOR TRUCK FOR POST OFFICE WORK

**A**MONG the many types of industrial vehicles which are being introduced by Edison Accumulators, Ltd. (49 Old Bond Street, W.), is the very convenient truck for post office and general parcel work, which we illustrate here. This truck was designed to carry a load of 10 cwt., plus driver, at a



EDISON ACCUMULATOR TRUCK FOR POST OFFICE SERVICE.

speed of five or six miles an hour, and to travel twelve miles on one charge. In point of fact, on trial a speed slightly in excess of requirements was realised, and the truck will travel on level wood pavement a distance of 26 miles on one charge. This represents a ton mileage of about 34, or a battery output of about 110 watt-hours per ton mile. The accumulator equipment consists of forty Edison cells B-4 type, giving 4 kw.-hours at 45 volts. The 1-h.p. motor is series-wound and totally enclosed, and is capable of withstanding severe overloads. Some idea of the powerful torque available may be gained by the fact that the truck on trial ascended a gradient of one in five fully loaded and with a battery equipment only half the size of that ultimately fitted. The transmission is by means of a bevel-driven enclosed ball-bearing rear axle. The controller is designed with a special view to preventing accidents when the vehicle is in the hands of comparative novices, and is interlocked with an electric brake. A further internal expanding brake is provided on the rear hubs. The platform is 5 ft. 8 in. long and 3 ft. 6 in. wide, the over-all height being 4 ft. The accumulator is carried amidships—under the floor-boards—where it is easily accessible to enable occasional additions of distilled water to be made to the cells, this being, in fact, the only upkeep that the Edison accumulator entails. Satisfactory tests have been made at Bristol and Birmingham by the Post Office officials, and although future models of this truck may be improved in some minor details, it has already been demonstrated that a considerable field of utility lies before small industrial accumulator trucks of this type.

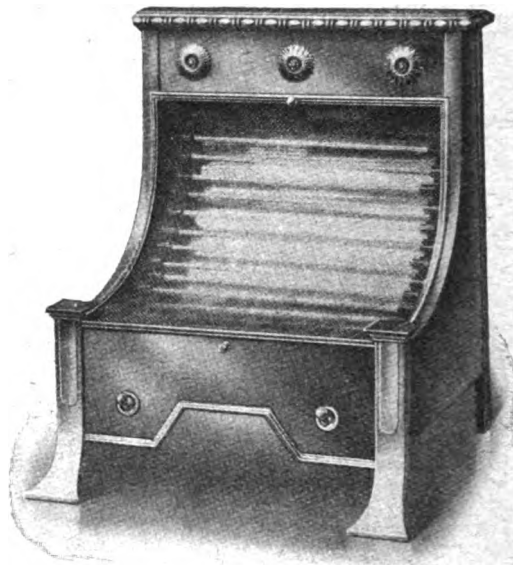


### A TUNGSTEN TRACTION LAMP

**T**HE Edison & Swan United Electric Light Co. (Ponders End, Middlesex) send us the accompanying illustration of their Royal Ediswan traction lamp with wire drawn metal filament. It is made with the popular small pear-shaped bulb, and the filaments, having only short unsupported lengths, are very rigid and withstand vibration well. Particular care is taken in the selection of lamps for series running. The same pattern of lamp is well adapted to ship, mill and mine lighting.

### A GLOWING RADIATOR

**T**HE illustration below represents a new design of heater marketed this season by the Edison & Swan United Electric Light Co., Ltd. (Ponders End, Middlesex). It is

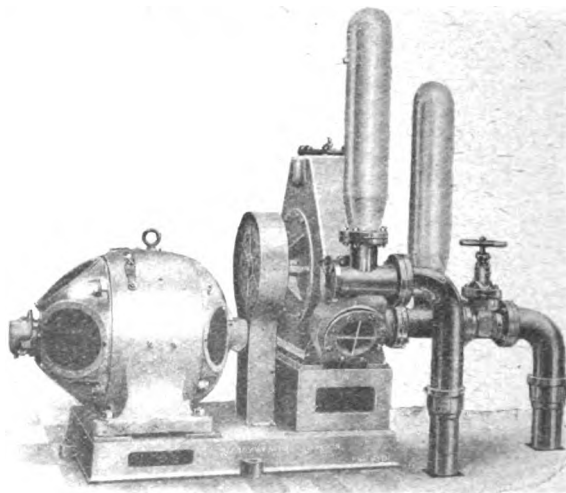


OXIDISED SILVER GLOWING HEATER.

finished in oxidised silver and fitted with two switches, twelve glowers, and two yards of flexible. The full-on consumption is one and a half units.

### AN ELECTRICALLY-DRIVEN FIRE PUMP

**T**HE illustration shows an electrically-driven "Hatfield" pump which has just been installed by Messrs. Merryweather & Sons, Ltd. (Greenwich Road, S.E.), for fire protective purposes, at Balcombe Place, Sussex, which is one of Lord Cowdray's country seats. The pump is capable of delivering 300 gallons per minute, and is driven by an electric motor through spur reduction gearing. It draws its supply of water from a pond in the grounds, and delivers into a fire-main installation with hydrants at various points. The



ELECTRICALLY-DRIVEN FIRE PUMP.

pieces, each carrying an air vessel, are bolted to the suction and delivery flanges of the pump. A sluice valve and cast-iron bend are connected to the suction tee piece, and the delivery tee piece has a flange for the cast-iron bend, and also a flange for taking a spring loaded relief valve. The relief valve, which is not shown in the illustration, is provided so that in the event of the hydrants being shut down while the pump is at work no damage would be caused to the pipes. Being electrically driven, the pump can, of course, be instantly started, and will permit of a powerful jet being brought to bear on a fire in the shortest possible time.



WHEN YOU  
WANT  
BETTER SERVICE  
LONGER LIFE

INSIST ON  
**'IGRANIC'**

HEAVY DUTY  
SWITCHGEAR  
IGRANIC ELECTRIC CO. LTD.  
LONDON and BEDFORD

### QUESTIONS AND ANSWERS BY PRACTICAL MEN

#### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

#### QUESTION No. 1,363.

An Otis elevator designed to lift 2,000 lb. is used for passengers only, and at times, with only two or three persons on, will not travel at more than half speed. At other times, when the car is run down to the limit switch, the potential switch will drop off. A short time ago, whilst the car was on its downward journey (with six persons on), a sudden drop of about two feet was experienced, and on examination the rope was found to have dropped over the side of the drum. What is the cause of slow running? Why did the rope drop off the drum?—C. W. A. (Western Australia).

(Replies must be received not later than first post, Nov. 13th.)

#### ANSWERS TO 1,361.

If a 60-light 3-storey house were to be wired on the "tree" system, but utilising screwed barrel, modern connection boxes with porcelain interiors, and also specially designed continuity iron fuse boxes, why would it still be incorrect practice?

The first award (10s.) is made to "M. M." for the following reply:—

Provided the installation be arranged for a definite demand and that neither this demand is exceeded on the original circuits nor any further additions made, the "tree" system can be made safe. If, however, any additions are made to the work on the installation, all fuses on the supply side of such additions should be proportionately increased. In one way the tree system cannot possibly be correct; that is, that any addition is bound to cause an increase in the drop in all conductors carrying current to such addition. Generally, the tree system is wanting in flexibility, and is not adapted for general conditions.

"F. T." to whom the second award (5s.) is made, writes:—

An installation wired on the "tree" system necessitates a long run of wiring which is only controlled by the main fuses; consequently there is a much greater possibility of a fault operating these fuses, and putting the whole installation in darkness, than if wired on a modern distributing board system. Further, the "tree" system does not comply with the wiring rules of the Institution of Electrical Engineers, which are now adopted by the leading Fire Insurance Companies and Electrical Supply Authorities throughout the country. Rule 23 reads that "Conductors must radiate from distributing centres, and in large systems from those centres to sub-centres."

Although the above are the best two answers received, both omit two of the chief reasons why the "tree" system is incorrect practice. One is that the fuses may have to be

scattered all over the building (wherever a branch is taken off or the wire reduced in section), and the other that the tree system, when modified as the question implies, would actually be more costly to put in than a modern distributing board and looping-in installation with the same quality of workmanship.

### THE INSTITUTION OF ELECTRICAL ENGINEERS

THE opening meeting of the Institution of Electrical Engineers will be held on Thursday, November 13th, when the President, Mr. W. Duddell, F.R.S., will give an experimentally illustrated address on "Pressure Rises," and premiums will be presented.

The following further London meetings are announced:—November 27th: Paper by Mr. S. Evershed on "The Characteristics of Insulation Resistance"; December 4th: Address by D. G. Klingenberg on "Electric Supply in Large Cities"; December 18th: Paper by Mr. H. C. Gunton on "The Employment of Power in H.M. Post Office"; January 8th: Paper by Mr. H. R. Speyer on "The Development of Electric Power for Industrial Purposes in India"; January 22nd: The Fifth Kelvin Lecture by Sir Oliver Lodge. Papers on the following subjects are also in preparation:—"Some Railway Conditions governing Electrification," "Electrification of Railways as affected by Traffic Considerations," "Difficulties of the Electrification of existing Termini and Goods Yards, and the effect of existing Rolling Stock on the Main Line Electrification Problem," "Generation of Electrical Energy for the Purposes of Main Line Traction," "The Design of Traction Motors for Alternating and Continuous Currents," "Rolling Stock and its Design and Influence on the Energy Consumption of Trains," "Electric Locomotives," "Electric Signalling on Railways," also a Discussion on Battery Vehicles.

#### BIRMINGHAM LOCAL SECTION.

The following meetings are announced:—Nov. 12th, Paper by Mr. S. H. Holden on "The British Standard Specification for Consumers' Meters"; Nov. 26th, Mr. Evershed's Paper on insulation will be discussed; Dec. 10th, Discussion on the rating of electrical machinery, introduced by Mr. A. R. Everest; Jan. 7th, Mr. Speyer's Paper on electric power in India will be discussed; Jan. 28th, Discussion on "Means for Securing the Further Employment of Electricity for Domestic Purposes (Rates, Publicity, and Apparatus)," or alternatively a Paper by Dr. T. F. Wall on "The Theory of the Three-phase Synchronous Machine."

#### DUBLIN LOCAL SECTION.

On Nov. 14th, Mr. G. M. Harriss will deliver his inaugural address.

#### MANCHESTER LOCAL SECTION.

Nov. 18th, Paper by Mr. H. H. Perry on "A Two-rate Tariff System without Time-operated Control"; Dec. 2nd, Mr. Evershed's Paper on insulation will be discussed; Dec. 16th, Mr. Gunton's Paper on "Power in the Post Office" will be discussed; Jan. 13th (probably), Paper by Mr. T. Ferguson on "Train Lighting"; Jan. 27th, Paper by B. Welbourn on "British Practice in the Construction of High-tension Lines."

#### NEWCASTLE LOCAL SECTION.

Nov. 10th (at Newcastle) and Nov. 14th (at Middlesbrough), Paper by Mr. J. W. Jackson on "Steam Boiler Working in Electrical Power Stations"; Dec. 8th (at Newcastle) and Dec. 12th (at Middlesbrough), Dr. Klingenberg's address on "Supply in Large Cities" will be discussed; Jan. 12th (at Newcastle) and Jan. 16th (at Middlesbrough), Paper on "Inductance and Induction Coils in Industrial Work."

#### SCOTTISH LOCAL SECTION.

Nov. 11th (at Glasgow), Mr. J. A. Robertson's inaugural address; Nov. 18th (at Edinburgh), Dr. Klingenberg's address on "Supply in Large Cities" will be discussed; Jan. 13th, Mr. Gunton's Paper on "Power in the Post Office."

#### WESTERN LOCAL SECTION.

Dec. 1st (at Cardiff), Mr. Evershed's Paper on insulation will be discussed; Jan. 19th (at Bristol), Mr. Gunton's Paper on "Power in the Post Office" will be discussed.

#### YORKSHIRE LOCAL SECTION.

Nov. 6th (at Leeds), Mr. W. B. Woodhouse's inaugural address; Dec. 10th (at Leeds), Mr. Holden's Paper on meters; Jan. 14th (probably), Mr. Perry's Paper on tariffs.

# "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

## Specifications Published October 30th, 1913

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

**Names in italics indicate communicators of inventions from abroad.**  
**22,524/12. A.C. Rectifiers.** W. A. PRICE. To convert single, two, or three phase current to direct current, or *vice versa*, combinations of condensers and inductances are used, and the switching is controlled by a synchronous commutator. The condenser is inserted across the switch, which finally breaks the circuit, and the other side of a main switch is an inductance and resistance in parallel. Eleven figures.

**22,548/12. Drawn Tungsten Filaments.** POPE'S ELEC. LAMP Co. (C. Trenzen, Germany). The filaments are drawn from a sintered mixture of tungsten and thorium, or some of its salts, in the cold and without previous mechanical treatment. The resistance of the filament is 20 per cent. less than the resistance of a similarly made pure tungsten filament.

**22,649/12. Signalling and Apparatus Control over Supply Mains.** A. C. BROWN. High-frequency currents are made by a rapid make-and-break contact, connected one side to the mains and the other to earth through a condenser, and also to another wire of the mains at a different potential through a resistance or inductance. The oscillations are received by two inertia contact relays, one actuating the other and magnifying the received oscillations. Six figures.

**23,082/12. Cooking Apparatus.** R. F. VENNERS. The heating element consists of a resistor surrounded by a horizontal layer of a liquid insulator, such as oil, of a large area and small uniform thickness enclosed in a chamber with cavities to take up expansion. Three figures.

**23,451/12. Vulcaniser.** H. R. NASH. Vulcanising at atmospheric pressure is effected by immersing the articles to be treated, which are protected by a wrapping, in a bath of oil in an open vessel electrically heated by resistances. The article is kept from the resistor by wooden cleats. Two figures.

**23,594/12. Motor Control System.** B.T.-H.Co. (G.E.Co., U.S.A.). The motor, particularly for machine-tool driving, is rapidly stopped by dynamic braking, even with a weak field. The switchgear consists of a relay energised by the braking current for short-circuiting resistance in the braking circuit, and a differential electromagnetic holding-out device, having its windings across the supply and in series with motor field. Thus the relay closes as the field nears full strength. One figure.

**28,122/12. A.C. Flame Arc Lamps.** B.T.-H.Co. (G.E.Co., U.S.A.). The lamp is fed from an auto-transformer which is normally unsaturated, but when the arc resistance exceeds a certain amount, it becomes saturated, and cannot supply the energy to maintain the arc, which is therefore extinguished and then re-made by a series magnet in the secondary circuit of the auto-transformer, which actuates the electrode feed. One figure.

**28,227/12. Motor Meters.** B.T.-H.Co. and F. HOLDEN. To prevent the constant of the instrument from varying with the temperature, the meter drives a friction disc, while a second disc is connected through gearing with the registering train. The axes of these discs are parallel but out of alignment. Motion is transmitted from the first to the second disc through a friction wheel carried by a bi-metallic strip, which moves the friction wheel radially owing to unequal expansion of its constituents with the temperature. Four figures.

**735/13. Control of A.C. Motor Systems.** J. D. ROUTIN. The invention is particularly adapted for the control of gun mechanism on warships. A number of asynchronous motors have their stators and rotors connected in series, and the stators may be fed with single or three-phase current from an alternator provided with switch mechanism for this purpose. The rotors are automatically connected to a three-phase rheostat when three-phase current is being supplied. When supply is stopped, the short-circuiting produces a powerful braking. Two figures.

## Specifications Published To-day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free. Summaries of some of the more important of these patents will appear in our next issue.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** CASE [Motor control] 27,837/12; HUNTINGDON [Cable suspenders] 2,449/13; SIEMENS-SCHUCKERT [Circuit protection] 6,164/13; ORINSCHNIG [Insulators] 18,755/13.

**Dynamos, Motors, and Transformers:** B.T.-H. Co. (G. E. Co., U.S.A.) [A.C. commutator motors] 20,849/12; VEDOVELLI, PRIESTLEY ET CIE. [Small power transformers] 4,090/13; CONRAD [Vapour rectifiers] 12,471/13; ELLISON [Protection of A.C. motors] 12,710/13; OTIS ELEVATOR Co. (Otis Elevator Ges.) [A.C. magnets] 13,315/13; EICHERT [Regulation of the efficiency of variable-speed dynamos] 17,922/13.

**Electrometallurgy and Electrochemistry:** SULMAN, PICARD and BROADBRIDGE [Nitrates] 23,591/12; MARKS (Hooker Electrochemical Co.) [Electrolytic cells] 12,208/13; WAGNER [Electrolytic diaphragms] 16,048/13.

**Heating and Cooking:** BERRY [Heaters] 23,860/12.

**Ignition:** O'FLAHERTY [Magneto driving] 25,531/12; RENOUF [Ignition of motor vehicle lamps] 29,453/12; RUTHARDT [Timing] 12,871/13; SOC. GÉNÉRALE DES HUILES ET FOURNITURES INDUSTRIELLES L'OLEO [Spark plugs] 18,753/13.

**Incandescent Lamps:** BEUTTELL [Lamps and holders] 23,774/12; CHÉRON, DOMINICI and BIQUARD, 13,822/13.

**Switchgear, Fuses, and Fittings:** LAKE (Soc. Anon. Du Temple) [Motor controllers] 23,669/12; DAMEY [Incandescent lamp reflectors] 27,276/12; B.T.-H. Co. (G.E. Co., U.S.A.) [Switches] 29,842/12; HORNE [Switches] 764/13; RHODUS [Rheostat] 4,131/13; LÉDERS [Lamp pendants] 5,228/13; YOUNG [Switch movements] 5,321/13.

**Telephony and Telegraphy:** BROWN [Relays] 24,043/12; NICOLSON [Intensification of intermittent electromagnetic impulses] 24,136/12; GRAHAM [Telephony] 2,022/13; MARX [Telephone attachment] 4,502/13; SIEMENS BROS. and PETTIGREW [Selective telephone exchanges] 7,128/13; SIEMENS & HALSKE [Telephone circuits] 7,130/13; SIEMENS BROS. and LAIDLAW [Telephone instrument sets for two lines] 9,167/13; GARDNER and FERGUSON [Impulse transmitter] 13,793/13.

**Traction:** GATH [Control of motor-operated points] 23,279/12; ANGUS [Signalling and train control] 6,329/13.

**Miscellaneous:** BEUTTELL [Illuminated signs] 22,990/12; BOOTH and WILKINSON [Motor vehicle lamp indicator] 23,211/12; MARLOR, HANN and FOSTER [Conduit cutters] 23,607/12; J. PINTSCH A.-G. [Driving vehicle lighting dynamos] 23,854/12; GALE [Organs] 24,142/12; GRÜNDEL [Indicator or signal with advertisements] 28,349/12; MARTIN and NIXEY [Signs] 5,637/13; NATHORST [Magnetic separators] 8,485/13; KRAUS [Electrostatic grit or grain separator] 14,587/13.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Distributing Systems, &c.:** STORER [Regenerative braking system] 21,140/13; [Motor control systems] 22,390/13.

**Switchgear:** VON MERKL [Automatic speed regulation of direct electrically-driven machine tools] 14,259/13.

**Telephony:** SIEMENS & HALSKE [Automatic] 22,850/13.

**Miscellaneous:** SOC. ANON. G. ANSALDO & Co. [Remote control of ships' propeller turbines] 19,743/13.

The following Amended Specification may now be obtained.

**Switchgear, &c.:** H. D. EARL [Automatic regulator for variable speed dynamos] 12,871/12.

## Application for Amendment

19,948/11. **Synchronous Rotary Spark Gap Transmitters for Wireless.** L. ROUZET. The patentee has applied for leave to amend the claims so as to define the invention more precisely and also to add explanatory notes to the description of the invention. The specification was abstracted in ELECTRICAL ENGINEERING, Oct. 10th, 1912, p. 564, Vol. VIII.

## Expired Patents

The following are the more important Patents that have become void through non-payment of renewal fees.

**Arc Lamps:** VERITYS and F. S. WORSLEY, 14,982/08.

**Heating and Cooking:** W. E. SANDER [Resistors for heaters or incandescent lamps are made from thorium, zirconium, uranium, &c., or their compounds; the filaments when made are mounted in bulbs containing nitrogen or hydrogen, &c.] 14,411/01; G. and L. FULLER [Electrolytic water-heater: current flow reversed each time used] 14,817/08.

**Incandescent Lamps:** W. NERNST and L. STOCKEM [Nernst glowers] 15,915/06; WESTINGHOUSE METAL FILAMENT LAMP Co. (Westinghouse Metallfaden Glühlampen Fabrik) [Squirted filaments] 14,942/08.

**Instruments and Meters:** W. B. THORPE [Electrolytic meter] 865/08.

**Storage Batteries:** P. SCHREIBER [Concentric cylindrical electrodes] 105/08.

**Switchgear, Fuses, and Fittings:** B.T.-H.Co. and J. E. WOODBRIDGE [Reverse current circuit-breakers] 14,565/05; B.T.-H.Co. and E. B. WEDMORE [Cut-outs comprising fuse and mechanical circuit-breaker with carbon contacts] 14,566/05; A. P. HINSKY [Waterproof fibrous conduits] 16,251/07; G. C. FRICKER [Automatic motor speed controllers] 15,013/08.

**Telephony and Telegraphy:** F. H. VARLEY [Mercury interrupters for Ruhmkorff coils for wireless] 16,461/07.

**Traction:** W. POWLES and E. E. MOORE [Cabin instruments for railway signalling] 15,677/03.

**Miscellaneous:** J. LECOQUE [Magnetic worm gearing] 15,780/06 and 19,552/08; [Magnetic spur gearing] 23,796/08.

## PATENTS.

*Small Prepaid Advertisements with regard to Patents, &c., are inserted on this page, facing our Patent Record, at 1d. per word (minimum 5s.); three insertions for the price of two. Rates for displayed and card advertisements on application.*

*Advertisement matter, accompanied by a remittance, should be addressed to the Kilowatt Publishing Co., Ltd., 203 Temple Chambers, London, E.C.*

**RIGHTS OF PATENT** No. 27,090/12 offered for Sale. Patent refers to **REVERSE CURRENT CIRCUIT-BREAKER** for alternating current, avoiding potential coil, thus ensuring selective action. Particularly important application for absolute **SELECTIVE SECTIONALISING OF FAULTY CABLES** without need of pilot wires between terminals. Further explanation given upon inquiry.—**P. ACKERMAN**, 185 Carlton Street, Toronto, Ontario, Canada.

The Proprietor of the Patents Nos. 24,702 of 1908 and 24,708 of 1908 for "Improvements in and relating to **ELECTRIC FUSIBLE CUT OUTS**" and "Improvements in **SEAL FASTENINGS**," is desirous of entering into arrangements by way of license and otherwise on reasonable terms, for the purpose of exploiting the same and ensuring their full development and practical working in this country. All communications should be addressed in the first instance to:—**Haseltine, Lake & Co.**, Chartered Patent Agents and Consulting Engineers, 28, Southampton Buildings, Chancery Lane, London, W.C.

**CONTINUOUS CURRENT DYNAMO MACHINES.**—The Proprietors of Patent No. 25,167/10 are desirous of working the above invention in Great Britain, and therefore invite communications with a view to the sale of the Patent or the granting of Licences to work the invention on reasonable terms. An illustrated description of the invention may be obtained from **BREWER & SON**, Patent Agents, 33 Chancery Lane, London, W.C.

**REMOVAL.**

**MR. J. G. LORRAIN, M.I.E.E., M.I.Mech.E.,** Chartered Patent Agent, has removed his office from Norfolk House, Norfolk Street, Strand, W.C., to **Staple Inn Buildings, High Holborn, London, W.C.**

**John E. Raworth,**

*Queen Anne's Chambers, Chartered Patent Agent.  
36, Broadway, Westminster, London, S.W.*

## AGENCIES.

**AGENTS** to sell the latest and most unique electric appliance on the market. Write for particulars. Box 2949, **ELECTRICAL ENGINEERING**, Temple Chambers, London, E.C.

**FOR SALE AND WANTED.**

**AN OPPORTUNITY.**—We are closing our Arc Lamp Carbon Department, and we are offering large quantities of **WOTAN FLAME CARBONS**, 50 per cent. and 5 per cent. for cash off the List. **DAVIS ELECTRICAL Co.**, 17 Moor Street, London, W.

**CABLE CASINGS** to compete against any Manufacturers in the World, trade discount on application. Creosoted troughing and timber for underground work, also woodwork of all descriptions. Send 1s. 6d. (export 3d. extra) for the most up-to-date illustrated list (264 pages) of woodwork and timber in the World, to include 4-fold, brass-jointed boxwood rule. Will return money in exchange if not worth 2s. 6d. to you. **JENNINGS & Co.**, 955 Pennywell Road, Bristol.

**ELECTRICAL ENGINEERING BOOKS AT HALF PRICES!!** Books on Electrical, Engineering, Technical, and all other subjects supplied. Sent on approval. State wants. Catalogues Post Free. Books bought. **W. & G. FOYLE**, 121-123, Charing Cross Road, London, W.C.

**GAS RETORT CARBON** for sale. Pitch, Insulating Material, Carbon Electrodes. We supply the trade. **V. DASNIERES**, 21 Water Lane, E.C.

**PLATINUM UTENSILS, SCRAP, LAMP TOPS.**—Best prices given by **DERBY AND Co., LTD.**, 44 Clerkenwell Road, London, E.C. **N.B.**—Platinum Sold.

*For Official Advertisements see p. vi.*

**Important Notice to the Trade and Public**

THE  
**BRITISH THOMSON-HOUSTON CO., LTD.**

hereby give notice that an action has been commenced against

**THE PRESTON ENGINEERING COMPANY LIMITED**

**FOR AN INJUNCTION TO RESTRAIN THE SALE OF TUNGSTEN DRAWN WIRE LAMPS** manufactured in infringement of Letters Patent Nos. 21,513\* of 1906 and 17,722 of 1911 and **FOR DAMAGES.**

The Trade and Public are warned that like proceedings will be taken against any users of or dealers in infringing lamps.

**THE BRITISH THOMSON-HOUSTON CO., LTD.**

Works: Rugby. Registered Offices: 83, Cannon Street, London, E.C.  
Main Lamps and Wiring Supplies Dept.: Mazda House, 77, Upper Thames Street, London, E.C.  
Branches: Sheffield, Manchester, Birmingham, Leeds, Middlesbrough, Newcastle-on-Tyne, Glasgow, Swansea, Cardiff, and Dublin.

### TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

A 4-core Pupin loaded submarine cable adapted also for phantom working, will shortly be laid between Nevin in Carnarvonshire and Howth, about eight miles from Dublin. This cable is primarily intended for the Manchester-Dublin service. It was manufactured by Siemens Bros. & Co., Ltd., of Woolwich. The total length is 64 nauts (nearly 74 miles), and it was made in two lengths of 32 nauts. A fifth core, fifty mils. in diameter, is laid up in the cable for a distance of half a naut at each end of the completed cable for experimental earthing purposes. This core is insulated to 174 mils. in diameter, and is brought out and bound and soldered to the sheath. Each core is made up of strands of equal diameter, with a left-handed lay, giving an overall diameter of 170 mils. and weighing 160 lbs. per naut. The resistance was specified to be not higher than 7452 ohms at 75° F. The dielectric consists of three alternate layers of Chattertons' compound and a spécial gutta-percha having a low leakage and weighing 150 lbs. per naut. Thus the total weight of each core is 310 lbs. and the diameter 0.285 in. The inductive capacity of each core is specified not to exceed 0.33 m.f.d. per naut. The loading coils in each of the four cores are spaced one naut apart. They consist of four similar long and narrow double-wound coils, and when tested with a current of approximately one milliamper, give in the transformer circuit an inductance of about 100 millihenrys, and in the phantom circuit 50 millihenrys. The effective resistances with 800 and 2,000 cycles per second are 7.2 and 15.2 ohms in the transformer circuit, and 3.3 and 7.0 ohms in the phantom circuit. A short distance from the ends of the cable, where the coils are to be inserted, the cores are made solid in gutta-percha, and over this are slipped gutta-percha cones, while the joints are autogenously welded. The armouring is done in the same closing machine, a secondary sheathing being placed over the first, so that they combine to form a single sheathing over the loading coils. The coils themselves are surrounded by a light metallic foil sheathing to prevent moisture being gradually absorbed by the insulation. The specification states that if  $D$  be the distance between any two coils in nauts,  $K$  the wire-to-wire capacity in m.f.d.'s per naut, and  $L$  the inductance per coil in millihenrys, then the product  $DKL$  shall not exceed 21. It was also specified that none of the circuits should have a standard cable equivalent of more than nine miles, excluding losses, which may be eliminated by adding lengths of standard cable to each end of the loaded loop. [The standard cable is one having a loop resistance of 88 ohms per mile, a wire-to-wire capacity for each pair of wires of 0.054 m.f.d.'s per mile, and an insulation resistance of not less than 200 megohms per mile, wire to wire.] It was also specified that the insulation should be not less than 400 and not greater than 2,000 megohms per naut, and actually the tests showed an insulation resistance at 75° F. of between 400 and 600 megohms. During stranding the cores were wormed with wet, fully tanned jute yarn, and the whole was then covered with cotton tape prepared with ozokerit compound, and then with brass tape 0.004 in. thick and 1 in. wide. Another layer of cotton tape was applied over this, and then more jute yarn to receive the sheathing. This consists of fourteen wires of 0.28 in. diameter each, plus one strand of three wires 0.13 in. diameter each of galvanised Ball furnace puddled iron. (This wire has a tensile strength between 23 and 30 tons per sq. in., can be twisted six times in six inches, and gives over ten per cent. elongation in ten inches.) Before being applied, the wires were heated and run through pure hot gas-tar. The length of lay is eighteen inches and is left-handed. Over this there are two coatings of compound and two servings of three-ply tarred jute yarn, laid in opposite directions. The overall diameter of the cable is 2.05 in., and the weight about 12.5 tons per naut. When tested with a current having a frequency of 800 cycles per second, the attenuation constant was found to be 0.01504, and 0.1524 for the transformer circuits, and 0.01510 for the phantom circuit.

Since the introduction of the Horophone in June last, it appears that the Post Office has been putting difficulties in the way of watch and clock makers who desire to use it. In addition to the fee of one guinea now charged by the Post Office to licensees for office expenses, the department is considering charging an annual royalty. Licensees are not being issued until a decision is arrived at, but in the meantime applicants

are being authorised to proceed with the installation of their apparatus, after making a deposit of three guineas, and agreeing to conform to the conditions of the licence when it is issued, or alternatively to dismantle their apparatus if they cannot accept its conditions, when the deposit will be refunded. Mr. F. Hope-Jones (managing director of the Synchronome Co., Ltd.) has written to the Post Office, pointing out that the watch and clock makers of other countries are freely permitted to listen to the international time signals (in the transmission of which the British Empire takes no part), and any attempt to restrict their reception in this country would be detrimental to the science of accurate time measurement, and would put the British watch and clock makers at a disadvantage to their foreign competitors. Mr. Hope-Jones also points out that the international wireless time signals interfere in no way with the Post Office System of telegraphic time signals for the synchronisation of clocks. The Wireless Telegraphy Act of 1904 did not contemplate any such service, and so the Post Office is taking a free hand in the matter. The correctness of the attitude taken up is being contested by Mr. Hope-Jones on behalf of the clock- and watch-making profession.

The Compagnie Française des Câbles Télégraphiques now have three of their West Indian cables down, viz., Mole St. Nicolas-Port au Prince, Puerto Plata-Martinique, and Cayenne-Salinas. The Chio-Tenedos cable was repaired on the 28th ult., and on the 29th ult. the Tenedos-Lemnos cable was put into working order again. The Pernambuco-Para cable was restored on the same day, and on the 1st inst. the Chio-Smyrna cable was repaired. The Pernambuco-Ceara cable was working as usual on Saturday last.

### ELECTRIC TRACTION NOTES

Constructional work on the electrification of the London & South-Western Railway Co.'s suburban lines (ELECTRICAL ENGINEERING, December 12th, 1912, p. 696, June 12th, 1913, p. 345, and August 21st, 1913, p. 480), has recently been started. The generating station is to be at Wimbledon adjacent to the main line. Six 5,000 kw. 11,000-volt 3-phase turbo-alternators will be installed. They will run at 1,500 r.p.m. The steam pressure will be 200 lbs. per sq. in., with 200° F. superheat. There will also be two auxiliary steam turbines driving, through gearing, 400-kw. dynamos for the auxiliary services. The switch-house will contain three floors, and the main oil switches will be electrically controlled from a desk on the first floor, overlooking the engine-room. The feeder cables will be paper-insulated, lead-sheathed, and armoured. They will in most cases be supported on posts beside the line, and will be so arranged as to afford a duplicate supply to every sub-station. Two sizes of converters will be used, the larger having a continuous capacity of 1,875 kilowatts, at Waterloo (4), Clapham Junction (3), Raynes Park (2), Barnes (2), and Twickenham (3), and the smaller, having a continuous capacity of 1,250 kilowatts, at Hampton Court Junction (2), Kingston (2), Sunbury (2), and Isleworth (2). The conductor rail will be laid 16 in. from gauge, and with its contact surface 3 in. above rail level. The resistance of this rail is  $6\frac{1}{2}$  times that of copper, and its weight is 100 lbs. per yard. For the first section of the electrified lines, 84 train units are being provided. Each unit will consist of three compartment type coaches, two motor cars with two motors on one truck, and a trailer. Seating accommodation for 190 passengers is to be provided. Multiple-unit control to give uniform acceleration has been adopted. New running sheds and repair shops will probably be built at Wimbledon, Hampton Court, Fulwell, and Hounslow. It is the intention to commence electric working on the Kingston Roundabout line first, and it is hoped that this line will be in operation before the end of next year. Electric services on the Hampton Court and Shepperton branches and on the Hounslow Loop line will be added as soon afterwards as possible.

International Railphones, Ltd., are installing an equipment of their type "M" system of inductive signalling to moving trains on the Midland Railway. The system was described in ELECTRICAL ENGINEERING, July 11th, 1912, p. 395.

The Highways Committee of the L.C.C. propose to apply for powers next session for the construction of about six miles of tramways at an estimated cost of £225,880. The bulk of it is on the conduit system, but a small portion of a line from Lee Green to Eltham will be a combination of conduit and overhead. Another scheme will be an extension of the line now terminating at Farringdon Street Station to Ludgate Circus.



## LOCAL NOTES

**Bognor: Electric Supply.**—The local company's electricity undertaking was opened last week.

**Dewsbury: Rateable Value System of Charging.**—The Council has adopted the rateable value system of charging for private households on the basis of 15 per cent. and 3d. per unit.

**Halifax: Electric Tariffs.**—As the result of a dispute between the Electricity and Gas Committees regarding tariffs, and the desire on the part of several members of the Council that there should be no competition as regards price between the two departments, what has been termed an arbitration is being held between the two committees with a view to settling upon a definite policy.

**Heywood: Bulk Supply.**—The scheme of the Bury Corporation to supply electricity in bulk in this district, which has been referred to on various occasions in these columns, was the subject of a Board of Trade inquiry last week. The proposal was opposed by the Lancashire Electric Power Co., and one of the reasons for opposing was the allegation that the price proposed to be charged to the Heywood Council is less than that now being charged in Bury. This line of argument was not disputed, counsel for the Bury Corporation stating that even if the Corporation chose to make a loss, it was no business, at any rate, of the Power Company. The Board's decision will be made known at a later date.

**Galashiels: Electric Supply.**—After considering for some time the possibilities of a municipal supply scheme, the Council decided to leave the matter in the hands of private promoters, and Mr. George Balfour has been able to promote the Galashiels & District Electric Supply Co., with a capital of £30,000. The new company will apply for a Provisional Order next session, and a suitable site for a power station has already been secured. The plans for the scheme include 1,400 kilowatts of plant, with building accommodation for 4,000 kw.

**London: Shoreditch: Bulk Supply.**—The proposal, by the County of London Electric Supply Co., to supply the Council with electricity in bulk, has been put upon one side. In reporting to this effect, the Electricity Committee give the following reasons:—(a) That the company stipulates for a higher load factor than the actual load factor found in practice in the Shoreditch system. (b) That the pressure of the proposed supply, i.e., 10,000 volts, would involve extensive transformation plant. (c) The undertaking given by the company as to spare plant and mains is not satisfactory. For these reasons the Committee have come to the conclusion that the proposed bulk supply would be more expensive than that generated at the Council's own works.

**Gillingham: Diesel Engines.**—The Continental makers of the new Diesel engine on order by the Council, have offered to fit it so that it will run on gas tar oil, for an additional cost of £100: but before deciding upon having this done, the Electrical Engineer and Chairman of the Electricity Committee are to inspect the Kingston engines which are fitted for running in this manner.

**Llanelly: Electric Cooking.**—A series of electric cooking demonstrations and lectures have been carried out at Cwmbach Buildings under the auspices of the Llanelly & District Electric Light & Traction Co., Ltd., by arrangement with Messrs. Gillespie & Beales, the sole wholesale agents for the "Tricity" electric cooker. These lectures were given by Mr. F. S. Grogan, of the British Electric Transformer Co., Ltd., the makers of "Tricity" cookers, and his lectures opened on Tuesday afternoon, when there was a good audience of many of the leading ladies in the town. The lectures were given to very attentive audiences during the week, and Mr. Grogan created general interest in bringing forward the claims of electric cooking to be the best, cleanest, and most perfect method, and in demonstrating the excellent results which can be so easily obtained with the minimum of trouble by anyone handling the "Tricity" cooker.

**Macclesfield: Electric Supply.**—The new electricity company of Macclesfield hopes to be in a position to supply electrical energy in February. The first generating unit is a 500-h.p. Diesel set. The directors of the new company are Mr. H. Hirst (Chairman), Mr. M. Railing, Mr. E. G. Byng, and Mr. A. Baron (Managing Director and Engineer-in-Chief). For many years Macclesfield has been on the point of obtaining a supply of electrical energy, but time and again, from various causes, municipal and company schemes have failed to be completed.

**Manchester: Strike of Electrical Wiremen.**—It is stated that some twenty firms have acceded to the men's demands for an extra 1d. per hour, and work has been resumed in each case. According to the *Manchester Evening News* of Monday, about 150 workmen were then out on strike.

**Wimbledon: Cooking Demonstrations.**—A series of demonstrations on electric cooking with "Tricity" cookers is being given this week at 58 Hill Road, Wimbledon, by Mr. F. S. Grogan, of the British Electric Transformer Co. To-day's demonstrations will be at 11.30 a.m. and 7.30 p.m., and Friday's at 3.30 and 7.30 p.m.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

## Generating Stations, Sub-Stations, Mains, &amp;c.

**Darlington.**—An application for a loan of £21,190 was incurred into last week for the electricity undertaking.

**Finchley.**—Loans amounting to £13,500 are to be applied for in connection with mains and services.

**Gillingham.**—A loan of £5,000 for a three years' expenditure on mains and services is to be applied for.

**Grange-over-Sands.**—Mr. R. Burnett, Chief Electrical Engineer to the Barrow Town Council, has been retained as consulting engineer to advise the Council concerning an agreement for electric supply with a private company.

**Harrogate.**—A L.G.B. inquiry has been held concerning a loan of £9,439 for electrical extensions.

**Hayland.**—Mr. A. Barker has submitted a report upon an electric lighting scheme.

**Hornsey.**—New sub-station at Muswell Hill.

**Lurgan.**—Details of a £12,000 electric lighting scheme are now being considered by the Council. Mr. T. W. Bloxam, City Electrical Engineer at Belfast, has reported favourably upon it.

**Maidstone.**—A loan of £4,000 for mains and services extensions is to be applied for.

**Manchester.**—Water-tube boilers, superheaters, economisers, coal chutes, ash conveyor, pipe connections, pneumatic ash handling plant, &c. Chief Electrical Engineer, Dickinson Street. (See advertisement on another page.)

**South Shields.**—A L.G.B. inquiry was held last week concerning a loan of £33,305 for electrical extensions. It is proposed to instal a 2,000-kw. turbine driving tandem generators, together with a new water-tube boiler, economiser, &c.

**Teignmouth.**—Mr. E. M. Lacey has presented a report with regard to an electric lighting scheme for this district. The scheme includes two oil-driven generators and a battery, and the total capital expenditure is put at £20,800.

**Wigan.**—A loan of £8,000 for new turbine and accessories is to be taken up.

**Withernsea.**—A company is to be formed to establish an electric lighting installation.

## Wiring

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Aberdeen.**—Cinematograph theatre, Union Street.

**Barking.**—New secondary school, Longbridge Road.

**Barrow-in-Furness.**—Public baths.

**Belfast.**—Sixty-three blocks of houses. City Surveyor.

**Bradford.**—Electrical installation at Technical College. Director of Education, Town Hall.

**Dundalk.**—Electrical fittings, &c., for the mortuary chapel, St. Patrick's Cemetery. Nov. 11th. Secretary, General Burial Board.

**Ealing.**—New magistrates' court (£7,725).

**London: Hammersmith.**—Cinematograph theatre in King Street.

**Hampstead.**—Golder's Green Hippodrome, close to Tube railway station.

**Stepney.**—New municipal offices.

FOR  
STEAM JOINTS  
USE



JOHN HUDSON & CO.'S SUCCESSORS, Mansell St., London, E.

**L.C.C.**—140 lighting points at Hammersmith Trade School for girls. (See advertisement on another page.)

**Leigh.**—Cinematograph theatre. Architect, Arthur Peel, Leigh.—New secondary school, Windermere Road.

**Manchester.**—Municipal school, Nansen Street, Ardwick. Town Clerk.

**Nelson.**—Rebuilding after fire of Albert Hall and shops, Tickle Street.

**Shipley.**—New public offices (£10,500).

**Stretford.**—Elementary school in Trafford Park. Education Offices, Old Trafford.

#### Miscellaneous

**Bournemouth.**—The Tramways Committee requires ten bogey electric trams. General Manager.

**Dublin.**—The Dublin United Tramways Co. invites tenders for a twelve months' supply of stores, including electrical fittings. Chairman. (See advertisement on another page.)

**Grimsby.**—A supply of metal filament lamps, continuous-current meters, house service fittings is required. Borough Electrical Engineer. Nov. 13th.

**London: St. Pancras.**—The question of superseding the old type of arc lamps in Hampstead Road by up-to-date flame arc lamps is under consideration.

**Hammersmith.**—Arc lamps for fixing on consumers' premises. (See advertisement on another page.)

**West Riding.**—The Yorkshire (West Riding) Tramways Co. requires a twelve months' supply of electrical lamps and fittings. Nov. 21st. General Manager.

### TENDERS RECEIVED AND ACCEPTED

**Huddersfield.**—The tender of Switchgear & Cowans at £2,259 for H.T. switchboard is recommended for acceptance by the Electricity Committee.

### APPOINTMENTS AND PERSONAL NOTES

Mr. A. J. Hodgson has been presented with a silver salver weighing 80 ounces by the directors, staff, and employees of Messrs. Crompton & Co. on his relinquishing the joint management under the scheme of reorganisation.

Sir Joseph Swan, F.R.S., celebrated his eighty-fifth birthday on Oct. 31st.

In consequence of the appointment of Mr. L. Johnston, General Manager and Engineer of the Gloucester Corporation tramways undertaking, to the General Managership of the Southampton Corporation tramways, Mr. F. H. Corson, at present Borough Electrical Engineer, has also been appointed Tramways Manager.

Mr. S. H. Fowler, of Dewsbury, has been appointed Mains Superintendent for the southern district of the Stoke-on-Trent electricity undertaking at a salary of £130, in succession to Mr. E. D. Redfern.

**Electric Light Switching.**—The awards in the recent switching examinations held by A. P. Lundberg & Sons have now been made, and certificates and prizes are about to be dispatched to the successful competitors, who number over one hundred, and whose names appear on an advertisement page. The certificates measure about 17 in. by 13 in., and are very neatly designed. The margin is attractively decorated with diagrammatic representations of the many diversified types of tumbler switches for the convenient control of complicated circuits, which have been so successfully developed by the firm.



The most efficient

**METER**

on the market

**THE "NEW BASTIAN."**

Ask for Prices and Particulars from

THE BASTIAN METER CO., LTD., Kentish Town, N.W.

### MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. George Smith & Sons, of 5 Philpot Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night, was £76 to £76 10s. (last week £78 to £78 10s.).

**Change of Address.**—The Tudor Accumulator Co., Ltd., inform us that, on and after Monday next, the address of their head office will be: 3 Central Buildings, Matthew Parker Street, Westminster, S.W. Their telephone number will remain 2600 Victoria.

**New Telephone Number.**—The Edison & Swan United Electric Light Co., Ltd., Ponders End, Middlesex, have increased their telephone service to six lines, and their new number is Enfield 520.

**Companies to be Struck off Register.**—Unless cause is shown to the contrary, the under-mentioned companies will be struck off the Register of Joint Stock Companies in three months' time:—Electric Power Plants, Ltd.; Solenoids, Ltd.; and Titan Electric Co., Ltd.

**Osram Lamp Patents.**—The action by the Osram Lamp Works, Ltd., against the Yorkshire Incandescent Electric Lamp Co., was concluded on Friday last, when the Yorkshire Co. submitted to an injunction restraining them from infringing the Osram patents for squirted filaments *in perpetuo*. It was stated before Mr. Justice Astbury on Friday that the infringing filaments were obtained by the Yorkshire Co. from Germany, with the assurance of the German manufacturers that there was no infringement of patents. When the Osram Co. brought the action the Yorkshire Co. endeavoured to get the manufacturers of the filaments to demonstrate the process employed in the manufacture. This they refused to do, and the Yorkshire Co. had now entirely abandoned the manufacture of lamps with squirted filaments.

### NEWPORT CORPORATION.

Electricity Department.

#### ARC LAMP REPAIRER.

THE ELECTRICITY COMMITTEE require immediately an ARC LAMP REPAIRER. Must be thoroughly experienced, preferably in Oliver and Exello lamps. Full particulars, enclosing references and stating wages required, to be addressed at once to the undersigned,

A. NICHOLS MOORE,  
Borough Electrical Engineer.

Town Hall,  
Newport, Mon.  
November 5th, 1913.

### JOURNAL OF THE INSTITUTION OF ELECTRICAL ENGINEERS.

Edited by P. F. ROWELL, Secretary.

PART 222. PRICE 5s.

- "High-tension Continuous-current Traction." By L. GRATZ-MULLER.
  - "Single-phase Traction." By M. LATOUR.
  - "Railway Electrification Problems in the U.S.A." By H. PARODI.
  - "Electrification Schemes of the Midi Railway." By J. JULLIAN.
  - "Electrification of the French State Railway." By A. N. MAZEN.
  - "Petrol-electric Motor-vehicles." By J. B. G. DAMOISEAU.
  - Discussion on "Railway Electrification" (Paris Meeting).
  - "Transmission of Electrical Energy by Continuous Current on the Series System" (with discussion). By J. S. HIGHFIELD.
  - "Electric Transmission of Energy by Alternating Currents at Very High Pressures." By M. LEBLANC.
  - "Neon Lighting." By G. CLAUDE.
  - "Mechanical Devices in Telephone Exchanges" (with discussion). By W. SLINGO.
  - "Wireless Telegraphy and Time Signals" (with discussion). By Commandant G. A. FERRIÉ.
  - "Electric Locomotives." By F. LYDALL.
  - "Efficiency of the Polyphase Induction Motor." By J. S. NICHOLSON.
  - "Compensation Apparatus for Telephonic Measurements." By A. K. ERLANG.
- Messrs. E. & F. N. SPON, Ltd., 57, Haymarket, S.W

# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 359 [VOL. IX., No. 46]  
*All rights reserved.*

THURSDAY, NOVEMBER 13, 1913.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES AND TECHNICAL COLLOQUE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

*Other Advertisement Rates on Application.*

#### Latest Time for Receiving

Letters for Insertion, Tuesday first post.

Small Advertisements and Official Announcements, Wednesday first post.

Displayed Advertisements, Tuesday first post.

Corrections in Standing Advertisements, Monday first post.

All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 308-306, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Circling, Fleet, London."

Telephone No.: 5509 Holborn.

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

THE "Engineers' Club" was opened in Manchester last week, and has already a membership of 560. (Page 626.)

We give notes on two pending law suits relating to metal filament lamp patents. In one case the Osram Lamp Works is alleging infringement by Pope's Electric Lamp Co. of its patents relating to squirted filaments, and in the other the B.T.-H. Co. claims that the Preston Engineering Co. has infringed two patents relating to the drawing of tungsten wire. Another important development is the opposition by Siemens Bros. & Co. to the grant of a patent for drawing tungsten wire to the Westinghouse Metallfaden Glühlampenfabrik. (Page 627.)

SIR WILLIAM PREECE, formerly Engineer-in-Chief to the Post Office, died on Wednesday of last week.—Sir Robert Hunter, late solicitor to the Post Office, also passed away last week. (Page 628.)

An electric car equipped with the Edison battery is on view in the Olympia Motor-Car Show, where a number of new electrical engine-starting devices are shown and many forms of car-lighting equipment. (Page 629.)

INFORMATION respecting petrol electric traction is asked for in our Questions and Answers column. (Page 630.)

THE annual report of the Postmaster-General reviews some of the technical developments of the telephone,

telegraph, and wireless services during the past year. Under Telephony and Telegraphy, notes are also given on a new alternating current compensation apparatus for telephone measurements, and the first of a series of lectures on wireless telegraphy by Mr. J. St. V. Pletts. A committee has been appointed to consider State-aided research in telephone and telegraph matters. (Page 632.)

MR. J. W. JACKSON discussed, in a Paper before the Newcastle Section of the Institution of Electrical Engineers, the design of boilers, superheaters, and other details. (Page 631.)

An interesting Paper on electric locomotives, by Mr. F. Lydall, is abstracted in our Electric Traction Notes, and some particulars are given of the difficulties experienced in practice with some forms of side rod drive. A new pattern of pantagraph collector is also described. (Page 633.)

THE sum of £1,500 is to be spent at Rathmines on wiring premises.—The high cost of street lighting at York, mostly gas, is unfavourably compared with electric lighting elsewhere.—Electric heating has been adopted for the pavilion at Llandudno.—A surplus of £521 is shown by the Ilford electricity accounts for last year, and £1,902 at Southport. The proposal of the Manchester Corporation to purchase the Trafford Power & Light Supply Co. is to be opposed by the Stretford Council.—We give the terms of the settlement of the wiremen's dispute in Manchester. (Page 635.)

At the annual meeting of the Edison & Swan United Electric Light Co. on Tuesday, the Company's financial position was explained as being mainly due to the large loss on the rearrangement of the lamp factory in consequence of the new plant necessary to deal with drawn wire filament lamps. (Page 635.)

A PATENT by F. J. Sprague, F. T. Bowles, and G. H. Hill, dealing with the electrical working of water-tight doors, &c., expires during the current week after a full life.—The specifications published by the Patent Office last week include one by the B.T.-H. Co. dealing with the compensation of A.-C. commutator motors, and one by S. G. Brown covering some improvements in his relay for wireless. Notes on several opposition cases, &c., are given. (Page 636.)

THE following plant is required: Southampton, steam turbo-alternator; Wolverhampton, rotary-converter set; Aldershot, cable; generating plant at Dawlish, Rangoon, Ikley, Montevideo, Holmfirth, Elland, and Prince Albert (S.A.). Electric lighting schemes are in contemplation for Ballater, Lurgan, Braintree, and Lytham.—The Postmaster-General proposes to erect a power station in Wiltshire. (Page 637.)

An electric kitchen equipped with apparatus aggre-

gating over 50 kw. is at work at a Brighton hotel. (Page 639.)

A LINE of pipe ventilated motors is described. (Page 639.)

AMONG novelties described in illustrated articles are a field switch, some heating apparatus with alternative contacts for different voltages, a semi-indirect lighting fitting which can be lowered for cleaning, and a new enclosed circuit-breaker. (Page 640.)

RECENT examples of shop-window lighting and electric signs are illustrated, and an installation of over 200 electric clocks at the London Hospital is described. (Page 641.)

SOME further notes are given on the Glasgow Electrical Exhibition, the merits of a particular brand of glassware are discussed, and a screw cap lamp with specially small bulb is illustrated. (Page 642.)

### ARRANGEMENTS FOR THE WEEK

TO-DAY (THURSDAY), NOVEMBER 13TH.

*Institution of Electrical Engineers.*

8 p.m. At Victoria Embankment. Address on "Pressure Rises" (experimentally illustrated), by the President.

FRIDAY, NOVEMBER 14TH.

*Physical Society.*

8 p.m. At Imperial College, London. The agenda includes "On Polarisation and Energy Losses in Dielectrics," by A. W. Ashton.

*Institution of Electrical Engineers.*

8 p.m. At Royal College of Science. Chairman's Address by G. M. Harriss.

MONDAY, NOVEMBER 17TH.

*Electro Harmonic Society.*

8 p.m. Concert (Ladies' Night) at Holborn Restaurant.

TUESDAY, NOVEMBER 18TH.

*Institution of Electrical Engineers: Manchester Section.*

7.30 p.m. At the University. "A Two-rate Tariff System without Time-operated Control," by H. H. Perry.

*Illuminating Engineering Society.*

8 p.m. At Royal Society of Arts. Report on Progress during the Vacation.

### The London Electrical Engineers.

(TO-DAY) THURSDAY, NOVEMBER 13TH.—*C. Company.* Technical Instruction, 7 to 10 p.m.

FRIDAY, NOVEMBER 14TH.—*D. Company.* Technical Instruction, 7 to 10 p.m.

SATURDAY, NOVEMBER 15TH.—*Headquarters* open from 10 a.m. till noon.

MONDAY, NOVEMBER 17TH.—*A. Company.* Technical Instruction, 7 to 10 p.m.

TUESDAY, NOVEMBER 18TH.—*B. Company.* Technical Instruction, 7 to 10 p.m.

WEDNESDAY, NOVEMBER 19TH.—*Recruits only.* Infantry Drill and Technical Instruction, 7 to 10 p.m.

THURSDAY, NOVEMBER 20TH.—*C. Company.* Technical Instruction, 7 to 10 p.m.

FRIDAY, NOVEMBER 21ST.—*D. Company.* Technical Instruction, 7.30 to 10 p.m.

SATURDAY, NOVEMBER 22ND.—*Headquarters* open from 10 a.m. till noon.

### THE ENGINEERS' CLUB, MANCHESTER

AN event in engineering circles in Manchester last week was the opening of the Engineers' Club in Bridgewater Buildings, Albert Square. The club is a social, non-political club for engineers, and that it will fill a "long-felt want" is shown by the fact that no less than 560 members (including some of the most distinguished engineers in the Manchester district) have already joined. A large proportion of these are connected with the electrical industry. The qualification for membership is occupation in the design, superintendence, or direction (technical or commercial) of engineering work in its various branches, and in addition a limited number of members will be admitted who, while not actually possessing these qualifications, are connected more or less intimately with engineering. There is a large and comfortable reading and smoking-room, a large dining-room, two smaller dining-rooms for private functions, a card-room, a billiard-room with two tables, and a lift between the various floors.

The directors entertained the committee of the club and members of the engineering and Manchester Press at luncheon on Thursday, when the chairman, Mr. Daniel Adamson, presided, and the guests included the Deputy Lord Mayor of Manchester and the President of the Manchester Chamber of Commerce. After the luncheon an inspection of the rooms was made, and the excellence and completeness of the arrangements reflect great credit upon the honorary secretary, Mr. E. L. Hill, who is ably assisted by Mr. A. L. Green, the secretary. It is also largely due to Mr. Hill's unflagging energy and zeal that the club has been opened with so large and representative a membership that its success is assured from the outset, and the engineers of Manchester owe him a debt of gratitude.

The inaugural members' dinner was held on Friday evening.

### THE EFFECT OF METAL FILAMENT LAMPS ON THE EYES

SOME time ago (ELECTRICAL ENGINEERING, March 11th, 1909, p. 225) we referred to the alleged damage liable to be done to the eyesight by metal filament lamps owing to ultra-violet rays present in the light emitted by them. Researches were quoted (see also ELECTRICAL ENGINEERING, August 27th, 1908, page 312) showing that the proportion of these rays reaching the eye was infinitesimal, less even than in sunlight, and that the harmful effects that have been experienced were due to the unsuitable use of light sources of high intrinsic brilliancy without proper diffusion of the light, or, in other words, to "glare." Such ultra-violet rays as there may be are nearly all arrested by the glass of the bulb, and their short wave-length renders it difficult for them to penetrate far into the surrounding atmosphere. Indeed, the latter fact introduces considerable difficulties where ultra-violet rays are being produced on purpose. The danger of glare is now fully realised by illuminating engineers, and much ingenuity has been successfully applied to its mitigation. We are prompted to refer again to this subject by the words of a "Birmingham oculist" interviewed by a representative of the *Birmingham Daily Mail* and reproduced in a recent issue of that journal. This gentleman expresses the opinion that "incandescent gas was less hurtful to the eyes than the electric light, on account of the ultra-violet rays of the latter." This implies that gas mantles emit no ultra-violet rays and electric lamps a harmful quantity, whereas the truth is that the glowing gas mantle emits, if anything, more owing to its probable higher temperature, but in neither case is the quantity sufficient to be harmful. The subject is viewed from a different standpoint by M. Luckiesh in an article in the *Electrical World* (New York). This author deals with the theory that fatigue of the eye is purely a matter of energy absorbed and converted into heat, and analysing the absorption of the different rays in the various media of the eye, he shows that the higher the temperature of the radiating body, and consequently the larger the proportion of high frequency rays present, the more is the energy absorbed before it reaches the retina. This would actually imply that the retina is better protected from ultra-violet than from infra-red rays, so that it may be that excess of infra-red rays is, after all, more harmful than excess of ultra-violet, in that for the same visual effect a larger amount of energy reaches the retina to be absorbed by it.

**The British Standard Meter Specification.**—In a Paper read last night before the Birmingham Local Section of the Institution of Electrical Engineers, Mr. S. H. Holden referred to the British Standard Specification (No. 37) for consumers' electric supply meters published in 1907, and while recognising the advantages of such a specification, urged that there were several points as to which it now required amendment. He wishes to extend the number of standard sizes in both directions, and to insist on cases of cast-iron or pressed steel. Modifications are also recommended in the clauses dealing with terminal boxes, labels, cyclometer dials and testing dials, and he asks that the allowable loss of pressure in the main circuit at full load be lowered from 2 volts to values ranging from 0.75 to 0.075 volt, according to the size of the meter, and the allowable watts lost in the pressure coil be altered from "4 watts for each hundred volts" to 2 watts for single-phase meters and 7 watts for continuous-current meters under 650 volts. Starting currents he would specify at  $\frac{1}{2}$  per cent. of full load with a minimum of 0.05 amperes in the case of continuous-current ampere-hour meters. Accuracy, he thinks, should be within 2 per cent. from 1/20 to full load, with a lower limit of not less than half an ampere in the case of continuous-current ampere-hour meters. A little more definiteness of phraseology is asked for in the clauses relating to the effect of variations in supply voltage, and the inclusion of provisions relating to variation in wave form. In conclusion, he calls upon the Institution to urge the Engineering Standards Committee to publish as soon as possible a revised specification, and that with a view to its wider use and circulation the price should be reduced to one shilling per copy in order that manufacturers may be able to include copies with their tenders. He also considers it desirable that some distinguishing mark be placed upon meters which are sold as complying with the British Standard Specification.



## METAL FILAMENT LAMP PATENTS

HERE are two important patent lawsuits pending in connection with metal filament lamps, and although these will probably not come on for hearing until next year, yet some particulars as to the matters in dispute may be of interest to our readers. The British Thomson-Houston Co., Ltd., are bringing an action against the Preston Engineering Co., Ltd., alleging infringement of Patents Nos. 21,513\*/06 and 17,722/11.

Patent No. 21,513/06 was taken out by the B.T.H. Co., to whom it was communicated by the General Electric Co. of America. During September of last year the B.T.H. Co. sought leave to amend the original specification. There was some opposition to the proposed amendments (ELECTRICAL ENGINEERING, Dec. 19th, 1912, p. 703), but the Comptroller allowed the claims to be amended so that they now read thus:—(1) The method of working tungsten, which consists in subjecting the metal in a coherent form to the action of heat while it is being hammered, rolled, or drawn. (2) The method of working tungsten which consists in heating the metal by means of an electric current while it is being hammered, rolled, or drawn. (3) In a method of working tungsten as claimed in the preceding claims, protecting the coherent metal against oxidation during the working operation by means of a coating of metal which may be subsequently removed, or by conducting the operation in a vacuum or a reducing, or inert, atmosphere. (4) Incandescent electric lamp filaments of tungsten manufactured by working the coherent metal, substantially as hereinbefore described.

Patent No. 17,722/11 is in the name of J. T. H. Dempster, of Schenectady, U.S.A. It deals with the hot drawing of tungsten wires and the use of a lubricant. A lubricating solution of the consistency of cream is used. Previous to drawing, the wire is heated to a red heat and then passed through the solution, which may be of finely divided graphite held in suspension in water or oil, known as "aqua-dag" and "oil-dag." In the case of "aqua-dag" a 10 per cent. solution of ammonium sulphide may be added. It is found that the lubricant is thus baked on the wire as a shiny black adherent coating. In addition, the wire may again be passed through a lubricating bath just previous to the actual drawing. There are four claims reading thus:—(1) In wire drawing, the method of lubricating the wire, which consists in providing it with an adherent coating of graphite. (2) In wire drawing, the method of lubricating the wire, which consists in applying to the wire an adherent coating of graphite by a baking or burning operation. (3) The method of lubricating wire, which consists in bringing the wire while heated into contact with a carbonaceous lubricant, before it passes to the wire-drawing die. (4) The improved method of lubricating tungsten wire, which consists in baking or burning on the wire a carbonaceous or graphite coating which remains on the wire after it has passed through the die, substantially as hereinbefore described.

The second of the lawsuits is an action by the Osram Lamp Works, Ltd., against Pope's Electric Lamp Co., Ltd., alleging infringement of Patents Nos. 23,899\*/04 and 18,622/06. These were the patents on which the action against the "Z" Electric Lamp Co., Ltd., was brought (ELECTRICAL ENGINEERING, Vol. VIII., 1912, pp. 218, 229, 243, 255, and 274).

The celebrated Patent No. 23,899\*/04, by Dr. A. Just and F. Hanaman, of Vienna, was amended in 1909 (ELECTRICAL ENGINEERING, Sept. 9th, 1909, p. 779, Vol. V.). It describes a process of manufacturing filaments of pure tungsten by mixing finely divided tungsten or tungsten compounds such as tungstite, tungstic acid, or tungstic sulphide with an organic binding medium such as collodion, or a solution of cellulose in chloride of zinc or cupreous ammonia oxide. The filaments squirted from the resulting paste are then carbonised (in some cases after denitration), and the carbon is then removed by passing current through the filament and raising it to a high temperature in an atmosphere of steam and hydrogen. The carbon is oxidised to form carbonic oxide, and a filament of pure tungsten is left. The filaments are then rendered uniform by submitting them to the action of current in an atmosphere of volatile tungsten compounds in the presence of a large quantity of hydrogen, whereby the tungsten deposited equalises the filaments. The two amended claims left are as follows:—(1) Incandescing bodies for incandescent electric lamps, consisting of tungsten manufactured substantially as and in the manner hereinbefore described. (2) Process for the manufacture of incandescing bodies in accordance with Claim 1, characterised by the fact that the tungsten or compounds of this metal are mixed with organic binding media, formed and carbonised, whereupon the carbon is removed chemically substantially as described.

Patent 18,622/06, taken out by P. M. Justice for the Deutsche Gasglühlicht Akt.-Ges., may be summarised as follows:—To remove the carbon from the carbonised filaments produced by the method above described, the carbon, instead of being oxidised, is carried away in the form of a compound, not with oxygen but with nitrogen and hydrogen. The carbonised filament is caused

to incandesce in an atmosphere of ammonia (or a mixture of hydrogen and nitrogen), and the carbon is carried away in the form of cyanogen and hydrocyanic acid. This method, the patent says, is easier to carry out than the steam-hydrogen method, and there is no danger of the tungsten filament being attacked. There is one claim to this patent, which reads:—A method of producing incandescence bodies for electric glow lamps from (common) heat-resisting metals, such as molybdenum, tungsten, vanadium, or tantalum, in which filaments pressed from the powdered metal, with an addition of organic binding materials, are heated in an atmosphere containing both nitrogen and hydrogen but no oxygen, for the purpose of removing the carbon in a gaseous form whilst retaining the metals in the metallic state.

Another interesting matter in connection with metal filament lamp patents is the opposition to the grant of Patent No. 3,162/13 to the Westinghouse Metallfaden Glühlampenfabrik, which has been entered by Siemens Bros. & Co. The case will probably not be decided for some time. Particulars of the patent which is opposed were published in ELECTRICAL ENGINEERING, September 18th, page 532. There are two claims, the first of which reads thus:—In the method of making sheets, rods, wires, filaments, and the like of tungsten or molybdenum or alloys thereof, by the mechanical treatment of ingots of such metals or alloys containing suitable proportions of one or more auxiliary ductile metals, such as nickel, copper or iron, removing such auxiliary metals after the ingots have been mechanically worked to render them sufficiently tough, but in any case before the bodies produced therefrom have assumed their final shapes or dimensions, and then further mechanically working the remaining pure metal by hammering, rolling, or drawing until the bodies of the desired shape or dimensions are obtained, substantially as described. The second claim is for bodies so produced.

In the particulars of opposition, Messrs. Siemens cite four patents as, in their view, anticipating Patent No. 3,162/13. They also say that the invention is not sufficiently or clearly described. The patents cited are No. 3,174/07 by Siemens & Halske, No. 23,335/06 by W. C. Arsem (Schenectady, U.S.A.), No. 19,932/08 by Siemens & Halske, and No. 1,162/11 by Dr. H. G. Moller, of Charlottenburg. The claim in No. 3,174/07 by Siemens & Halske is for subjecting the powdered metal or mixture to be used for the filaments to great pressure, so as to form a solid body, and after that subjecting this body to a strong heat by the passage of a current through it in a vacuum or indifferent atmosphere. There are four claims to Patent No. 23,335/06 by W. C. Arsem (Schenectady, U.S.A.). The first is for a process of manufacture consisting in mixing the metal with a less refractory one, and heating so as to fuse the latter, and then treating the mixture remaining so as to leave a coherent conductor of the refractory metal. The second claim is for alloying a refractory metal with the principal metal having a lower vapourising point, shaping the alloy into wires, and then heating in a vacuum or inert atmosphere to remove the conductor with the lower vapourising point, and leaving the coherent conductor. The third claim is for alloying copper with tungsten. The fourth claim is for the filaments so produced. The claim in Patent No. 19,932/08 by A. G. Bloxam, to whom it was communicated by Siemens & Halske, is for a filament of tungsten or its alloys produced by mechanically working an intimate union of a difficultly fusible metal with an auxiliary metal which is afterwards to be expelled, which process consists in heating tungsten with nickel until a homogeneous solid ductile mass is obtained, then mechanically working the mass, and finally partially or wholly expelling the nickel by passing current through the mass. The claim in Patent No. 1,162/11 by Dr. H. G. Moller, is for the removal of the greater part of an auxiliary metal from the wire before it is arranged on the filament supporting frame, so that with the small residual percentage (not more than 1 per cent.) of the auxiliary metal, the wire, although non-ductile, is sufficiently fusible for mounting on the frame.

**Eggs Fried on Ice.**—To attract attention at a recent exhibition in America a novel advertising scheme successfully adopted by one of the exhibitors, we learn from the *Electrical World* (New York), was to fry eggs in an aluminium dish on a block of ice between two and three inches thick by means of eddy currents induced by an auto-transformer hidden in a box under the ice.

**The Italian Electrotechnical Association.**—The seventeenth annual congress of the Italian Electrotechnical Association, which was postponed owing to the General Elections, will be held in Rome on November 15th and 16th. Prof. Lori will read a Paper on the Norwegian electrolytic nitrogen industry, and Prof. Mengarini will give an experimental lecture on luminescence. Visits to works have also been arranged.

## OBITUARY

WILLIAM HENRY PREECE.

THE death last Thursday of Sir William Preece, K.C.B., F.R.S., at Penrhos, his Carnarvonshire home, removes a venerable and famous pioneer from the field of electrical thought and action. Sir William was seventy-nine years old, and in latter years, as age increased its hold upon him, his appearances at electrical engineering functions became less frequent. The last time that many of our readers saw him was at the meeting of the Institution of Electrical Engineers on May 16th, 1912, when he presided at the presentation of a bust of Lord Kelvin. Another recent appearance was at the opening of the Olympia Electrical Exhibition of 1911. To the end, however, his interest in electrical matters remained keen, and in a quiet way he assisted in charitable and other movements in the interests of the electrical industry. He was President of the Electrical Trades Benevolent Institution.

Sir William Preece had always interested himself in other branches of electrical engineering, and although it was only in 1899 that he retired from the position of Engineer-in-Chief and Electrician to the Post Office, and in 1904 that he finally severed his active connection with the Department, he had had for many years previously a large consulting practice as Consulting Engineer, which he had developed since the earliest days of the industry, and in which he was assisted by his two sons. Some of the first electricity supply works were designed by Sir William Preece. When the late Major Cardew retired from the Board of Trade in 1899, he joined Sir William Preece and Mr. A. H. Preece and Mr. Llewellyn Preece, and the firm of Preece and Cardew (now Preece, Cardew & Snell) was established. Sir William was always popular as a lecturer and an after-dinner speaker, and had an impressive manner and a gift of felicity of expression which stood him in good stead. The work for which he is most famous, of course, was that performed during the fifty years of his service with the Post Office and the telegraph companies. He joined the Electric & International Telegraph Co. in 1853, and was with the L. & S.W. Railway in 1860. In 1870, when the telegraphs were transferred to the State, he was given a post as Divisional Engineer, in 1877 was appointed Electrician (Mr. Edward Graves being then Engineer-in-Chief). Subsequently he was given the title Electrician and Assistant Engineer-in-Chief, and on Mr. Graves' death in 1892 he was appointed Engineer-in-Chief and Electrician. Throughout the whole of this time he was a prolific lecturer and writer of Papers on a great variety of electrical and other scientific matters, as well as those connected with the subject of his profession, and his abilities were recognised by his election as President of the Institution of Civil Engineers in 1898, and of the Institution of Electrical Engineers in 1893 and in 1880, when it was still the Society of Telegraph Engineers. He was made a Fellow of the Royal Society in 1881, and was a frequent speaker before the British Association and other scientific bodies. The "Text-book of Telegraphy," which he wrote in conjunction with Sir J. Sivewright, is a classic, and his "Manual of Telephony," written with Mr. A. J. Stubbs, was for many years the one standard work on this subject, superseding an earlier book on the telephone written in conjunction with M. Julius Maier. Sir William Preece was always proud of having brought over the first telephone to this country in 1877, and it was never known whether it was by his advice or in opposition to it that the instrument was considered by the Department to be only a philosophical toy, and its commercial application left to private enterprise.

To detail all the subjects of his Papers on telegraphy would be to recount the history of its development. He played a prominent part in the establishment of the first London-Paris telephone in 1891. It is well known that he was deeply interested in the possibilities of wireless communication, and has been called by some the father of wireless telegraphy. He experimented himself in conductive and inductive wireless telegraphy between two earthed lines on a considerable scale, and in 1892, after experiments across the Solent and elsewhere, he was able to send messages by this method between Lavernock, near Cardiff, and Flat Holm, across the Bristol Channel, and between Oban and the Isle of Mull. It was largely due to Preece's influence that Mr. Marconi was enthusiastically received here, and that he received encouragement from the Post Office.

Mention has already been made of Preece's connection with the London & South Western Railway; several useful railway signalling instruments are due to his early work.

Throughout his career Preece was the typical engineer of the latter part of the nineteenth century. His great pride was that he "had sat at the feet of Faraday," to use a favourite expression of his own, for he acted as assistant to him for some time at the Laboratory of the Royal Institution. His attention and interest were always more closely devoted to the practical than to the theoretical side of engineering, and during his earlier days as Electrician to the Post Office he was sometimes criticised for not attaching sufficient importance to Oliver Heaviside's mathematical investigations with regard to the propagation of telegraphic and telephonic currents.

Preece was made C.B. in 1894, and K.C.B. in 1899.

It now only remains to add that his earlier training was at King's College, London; but his original home was Wales, and he was of Welsh descent, the son of Mr. R. M. Preece, of Bryn Helen, Carnarvon, where he was born on February 15th, 1834.

Sir William Preece's remains were interred on Tuesday at Llanbeblig Parish Church, near Carnarvon, and a memorial service was held on the same day at St. Margaret's, Westminster. Our readers will be glad to hear his second son, Mr. Llewellyn Preece, who has been seriously ill for some time and was operated upon for appendicitis about a fortnight ago, is now well on the road to complete recovery.

## ROBERT HUNTER.

Another old Post Office servant passed away last week in Sir Robert Hunter, who had only recently relinquished the post of Solicitor to the Post Office, which he had held for over thirty years. His work brought him into contact with many branches of Post Office work, and he came particularly before the eye of the public recently in connection with the transfer of the National Telephone Co.'s undertaking to the Post Office, and the much-discussed Marconi contract.

**School and Library Lighting.**—In view of the attention now being attracted to the question of school lighting, Mr. D. H. Ogley, of the Royal Technical Institute, Salford, has sent us a copy of a Paper dealing with the subject which he presented at a Conference some short time ago. In general, Mr. Ogley reaches the same conclusions as the Committee of the Illuminating Engineering Society, referred to in *ELECTRICAL ENGINEERING*, July 31st, p. 440, although his Paper was published some time before that report made its appearance. He deplores the damage done to the eyesight by unsuitable lighting, and gives the minimum illumination required for reading and writing as 2 foot-candles, while for drawing and distinguishing fine detail he regards from 2 to 5 foot-candles as necessary, according to conditions. He also emphasises that exposed light sources of great intrinsic brilliancy should be avoided by proper shading. With inverted or indirect lighting, he finds the absence of shadows rather wearisome, objects appear to be flat, tiring the eye in the effort to perceive them correctly. A certain amount of direct lighting should be added. The possibility of reflection from blackboards, desks and paper with highly glazed surfaces, should also be avoided, and absence of flickering or variation in the light is important. Dealing with the latter question, however, Mr. Ogley commits an error in stating that metal filament lamps are more affected by variations in voltage than carbon lamps, as their positive temperature-coefficient renders the contrary the case. He also slightly exaggerates the evil of ultra-violet rays, a subject which is dealt with elsewhere in this issue.

**Shock Due to Defective Hand-Lamp.**—An inquest was held on Nov. 5th regarding the death of Thomas Bradley, a locomotive engine-driver, at the oil, grease, and candle works of Mawson, Clark & Co., of High Dunston. While effecting some repairs Bradley received a 250-volt shock from an unearthed hand-lamp. No first-aid men were present and artificial respiration was not resorted to, as it should have been.

**Damages for Defective Repairs.**—In the Shoreditch County Court on Tuesday last, before Judge Cluer, a claim was made by Mrs. E. Benkert against the Harman Allen Manufacturing Co. for £26, the cost of fitting two new field coils by Anderson & Anderson to a 1½-h.p. motor. Judgment was given for £5 15s. 6d. with costs. It appears that the Harman Co. estimated to fit two new impregnated field coils to the motor for £3 19s. 6d. The coils, however, soon burnt out, but the Harman Co. disclaimed liability, as they said the motor was in a damp situation, and the work was not guaranteed. In giving judgment as above, however, Judge Cluer said that although there might not be a specific guarantee, everybody knew that it was understood that the work would last a reasonable time if properly carried out.

## ELECTRICITY AND MOTOR CARS

## Some Notes on the Olympia Show

THE Automobile Exhibition now being held by the Society of Motor Manufacturers and Traders at Olympia fully upholds its reputation, and is one of the finest displays of motor carriages that has ever been brought together. Its only fault is that the size of the building prevents all the cars being shown that might be, and does not afford enough accommodation for all the people desirous of seeing them. It is particularly the electrical features that we wish to treat of here, and it may be said at the outset that there is more of electrical interest than there has been in recent years, showing that the applications of electricity to automobile engineering are on the increase, especially as regards what may be termed auxiliary services, and in particular in the direction of electrical engine starters.

## An Edison Battery Car.

Regarding electric traction *per se*, there is but one example—the Arrol-Johnston coupé with the Edison battery—while the lead traction battery is again, as it has been for some years, unrepresented. It is also notable that examples of electric transmission gear are entirely absent, but in considering these facts it must be remembered that the exhibition is limited to private passenger cars, while the field in which the greatest progress is being made both with accumulator and “petrol-electric” traction is that of heavier commercial vehicles. How far the Edison battery will modify this remains yet to be seen.

The Coupé equipped with the Edison battery, shown by the Arrol-Johnston Co., is a car of the same type as that which completed a run from Dumfries to London last summer (see ELECTRICAL ENGINEERING, June 5th, page 320). It has a handsome closed body driven from inside, and is propelled by a single enclosed motor mounted about the centre of the chassis, and driving through worm gear on to the back axle. The motor has a cast-steel carcass and laminated pole pieces, and is said to be rated at 35 amperes at 60 volts “normal load,” and to be capable of 300 per cent. overload for  $\frac{1}{4}$  hour and 100 per cent. for one hour. It runs at speeds up to 1,200 to 1,400 r.p.m. The control is as simple as possible, plain series resistances are used for the first few steps. As there is only one motor with a single commutator, series parallel control cannot be made use of, nor is there any alteration in the grouping of the cells, which are kept permanently in series. The characteristic of the motor, however, enables quite steep hills to be taken on the top controller notch, so that the resistances are rarely in circuit except at starting. The controller is of the drum type, and is operated by a lever conveniently placed under the steering wheel. It is interlocked with the main switch, and the latter can be locked open, when it can only be released by a Yale key. The battery is composed of 60 cells stowed partly under the forward bonnet and partly in the rear of the vehicle, so that the lines of the body are in no way spoilt. We are told that the battery is rated at 120 ampere hours at 65 volts, and we understand that in ordinary running a distance of 35 to 60 miles can be covered on one charge, according to circumstances. A Sangamo ampere-hour meter shows the condition of the battery at any time. The weight of the vehicle complete is about 27 cwt. The chassis weight is given at 17 cwt., or about 2 cwt. heavier than the Arrol-Johnston 15-h.p. petrol chassis, and we are given to understand that from 9 to 10 cwt. is the actual weight of the battery. Those unfamiliar with the construction and working of the Edison alkaline nickel-iron battery may be referred to detailed articles which appeared in ELECTRICAL ENGINEERING, Oct. 12th, 1911, Exhibition supplement, page 67, and May 19th, 1910, page 319, and to Messrs. Watson and Mitchell's Paper read last summer before the I.M.E.A. (ELECTRICAL ENGINEERING, June 26th, page 377).

Although as already remarked there is not an example of electrical transmission gear, attention should be called to an application of electricity in gear changing of a novel nature shown on the latest type of Cadillac cars. Here there are two separate bevel gears of different ratio in the back axle, and the change from one to the other is controlled electrically. This is not done by magnetic clutches, as we have seen it stated, but the actual shifting of the necessary striking rods is done by a pedal, while solenoid controlled locks select which rod is to be actuated.

## Electrical Engine Starters.

Perhaps the most interesting feature of the exhibition from the electrical point of view is the greatly increased number of electrical engine starters on view. Last year there were only two or three examples, but now we find not only a

considerable proportion of the cars in the body of the hall fitted with these devices, but several systems exemplified in the accessories section in the gallery. A few cars even dispense with the ordinary starting handle altogether. The compressed air starter has not made anything like the same progress, and very few examples are to be seen. A number of the foremost makers, including such prominent firms as Napier and Rolls-Royce, are entirely without these fittings on their cars, and in some cases their application is somewhat tentative, as if makers were yet undecided whether a self-starter is a refinement or a complication. The problem is not as easy a one as it might appear; there is a tendency to overtax the battery if of the ordinary size used for lighting, and the mechanical connection and disconnection of the starting motor to the engine calls for some ingenuity. In some cases, the same electrical machine is made to do duty as a lighting dynamo as well as a starting motor, but the general tendency on the whole is to keep the machines entirely separate, with a view to greater reliability and simpler switchgear, even at the expense of some increase in weight. In one notable case, however, weight is saved by making the starting motor armature an integral part of the flywheel.

The pioneers of electrical starters, as far as their introduction into this country is concerned, were the Cadillac Co., and the Delco starter on their cars is practically the same as that shown last year, but has been simplified by the substitution of a brush-lifting arrangement instead of a change-over switch to put the dynamo or motor armature winding into action respectively. It will be remembered that this set belongs to the class in which the same machine acts as starting motor and charging dynamo, but separate armature windings and commutators are used for the two purposes. The drive is by a pinion on to teeth cut in the engine flywheel, and the whole machine slides sideways into engagement with this while the starting pedal is pressed, returning to its engagement with its drive for dynamo purposes at the other end of its shaft when the pedal is released. The appropriate electrical connections are interlocked, so that the motor starts to move slowly round before the pinion goes into gear, thus facilitating its engagement. The Delco starter is also in use on the Lanchester cars.

Another electrical starter of American origin is that of the Westinghouse Co. shown on the Hupmobile stand. Here a clutch is inserted between the motor and the driving pinion with the double purpose of enabling the motor to get away before taking up its load, so as not to draw too big a current rush from the battery and of facilitating engagement of the pinion. In this set an entirely separate machine is used for charging the battery.

An ingenious arrangement for engaging the pinion with the teeth on the flywheel is adopted in the new Brodt starter, shown in the gallery, where the starting of the little motor draws the pinion sideways into engagement by the action of a helical sleeve cam. By this means the pinion is quite free at the moment of engagement, as the drive is only taken up when the cam is at the end of its travel and the teeth fully engaged. The system is thus very free from mechanical complication, and the only manipulation required is the switching on of the motor. As soon as the engine gets away, the gear springs out automatically. The motor in this case is plain series wound, and, of course, a separate charging dynamo is used. In the Rushmore set (shown on the Seabrook and other stands as well as in the gallery), which is also an example of pinion drive on to the flywheel from a motor used only for this purpose, the whole armature—shaft, pinion and all—slides sideways. It is held out of gear by a spring when not in use, but the switching on of the motor pulls the armature sideways into the position of strongest field and engages the gear. As soon as the engine gets away, the pull between the armature drops and the gear springs out, nor does it tend to re-engage, as the current taken to spin the motor light is insufficient to draw the gear in.

As we have already seen to some extent, the attempt to make the same machine suitable for both starting motor and charging dynamo introduces several problems. The difficulty of making a machine fulfil both conditions with the same winding is met in the Scott starting system (shown on the Crossley stand), by allowing it to drive as a motor through a 20 to 1 epicyclic reduction gear as well as a chain. When the engine gets away, the brake on the epicyclic gear is released and the whole goes round solid, allowing the engine to drive the dynamo at a suitable speed. The set, which was exhibited last year, was referred to in ELECTRICAL ENGINEERING, Nov. 21st, 1912, page 651. A chain drive is also used on the White starter, which also embodies a combined motor and dynamo, and is one of those appearing for the second time. Some of the Vauxhall cars are fitted with Tattersall's patent “T.A.T.” starter, also shown in the gallery by Imperial Motor Industries. This appears to be well thought out in detail, and is also of the combination class employing a main chain drive to a single machine, which works through an epicyclic gear when used as a starting motor. The epicyclic gear is magnetically actuated, and the whole operation is controlled by pressing one button on the dashboard.

The new C.A.V. starter of Vandervell & Co. is shown on a

number of cars, including Daimler, Austin, Darracq, and Humber, as well as on their own stand in the gallery. This is different from all three that we have described hitherto, in that a friction drive is employed. The motor is rigidly attached to the chassis, but drives through an extended shaft with two universal joints. The friction pulley is pressed into contact with the flywheel mechanically by a pedal before the motor is switched on. Friction drive is also employed on the Bosch starter fitted to one of the De Dion cars, which drives on the inside of an extension of the flywheel rim.

Many of the arrangements described above can be easily fitted to any completed car, but an example of a starting gear forming an integral part of the chassis is shown in the S.E.V. system on one of the Delahaye cars. Here the motor drives on to a worm gear inside the gear-box, so that the engine is started with the clutch engaged and the gear out, and a free-wheel arrangement comes into action as soon as the engine gets away.

Perhaps the most interesting new departure in the way of electrical starters is the "U.S.L." starter (of the United States Lighting & Heating Co.) on the Sheffield-Simplex cars. Here the questions of the extra weight of the starting and of its gearing are boldly solved by making the armature form the flywheel itself. This is constructed to overhang a fixed field magnet system of eight radial poles, and carries a large commutator. The machine is used as a lighting dynamo as well as a starting motor.

### Electric Car Lighting.

The year's progress in car lighting equipments has been considerable, not so much in the introduction of new patterns of apparatus, but in the conversion of the novelty into standard practice. Following the introduction of the metal filament lamp, motor-car lighting has quite come to its own. Practically every car in the show is now fitted with electric light, and the use of small dynamos to keep the accumulators charged is almost universal. We have not the space to describe all the numerous sets shown in detail. There are no very striking novelties in principle, but the details of the machines, switchboards, fittings, wiring material, &c., are much improved, and several new firms have taken up this class of work. Again, it is noticeable that firms which formerly made only one size of equipment now have several on the market to cover all requirements. Car manufacturers are also making better provision for the accommodation of the machines, which figure now more as part of the chassis design than as afterthoughts.

One of the newest systems is that of the Bosch Magneto Co., where a special dynamo gives a suitable voltage over a very large range of speed in conjunction with a voltage regulator and cut-out in the switch-box, and here it may be remarked that, on the whole, electrical cut-in and cut-out arrangements are more used than mechanical devices for the same purpose. The C.A.V. system, in which a free-wheel arrangement allows the dynamo to run as a motor when the driving speed is too low, is well to the fore, and among other systems shown which have already been described in our columns may be mentioned the Blériot, Broit, Lucas, Lodge, Trier and Martin, Mira and Rotax-Leitner. The new Lithanode system employs a ballast resistance to regulate the voltage, and another new-comer is the French S.E.V. system with magnetic cut-out, seen on the Delahaye cars. Several systems in which the dynamo is combined with the starting motor have already been mentioned.

### Ignition and Accessories.

There is little novelty in ignition devices. Accumulated experience has rendered the high-tension magneto so reliable that its use is now practically universal and the provision of an alternative battery and coil equipment is now rarely regarded as necessary. Electric horns are also very largely used, and the fine work in the construction of the diminutive motor in the famous Klaxon horn is worth examination. Numerous other small electrical accessories such as special terminals, pocket voltmeters, signalling apparatus from the inside to the driver, &c., &c., are on view, and confirm one's impression that the keynote of the exhibition is completeness and improvement in well-thought-out detail.

**Italian Supply Companies.**—The *Board of Trade Journal*, quoting from a German source, states that of the twenty-eight Italian electric supply undertakings, only two in 1912, compared with three in 1911, paid no dividend, whilst fourteen paid the same dividend, nine paid more, and only three less dividend than in 1911. The average increase of dividend was from 6.56 to 6.69 per cent., or 0.13 per cent.

**Electric Baths.**—The L.C.C. has been recommended to apply to Parliament next session for powers to control electric baths establishments. This matter, it will be remembered, assumed importance in connection with the death of a solicitor in an establishment in Cavendish Place, London (*ELECTRICAL ENGINEERING*, Vol. VIII., Nov. 14th, 1912, page 658), when the evidence went to show that the treatment was administered by a non-technical person.

## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS :** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS :** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,364.

How is the electrical equipment connected in a petrol-electric car, the engine being 40 horse-power, the dynamo being compound wound with interpoles, and the motor being series wound with interpoles. Show in the diagram how two different speeds are obtained by the shunt and series resistances and the reverse control, and state what efficiency of transmission should be expected.—"ELECT. EQUIP."

(Replies must be received not later than first post, Nov. 20th.)

### ANSWERS TO No. 1,362.

No reply worthy of an award has been received.

**Explosion in New York Generating Station.**—The explosion which occurred on October 22nd in the Livingston generating station of the Richmond Light and Railroad Co. (of Staten Island, New York), in which seven men were killed and three injured, already referred to in *ELECTRICAL ENGINEERING*, we now learn from the American technical journals, originated in a 330 h.p. vertical water-tube boiler. A 60 ft. hole was torn in the roof of the boiler house, and a large part of the breeching carried away, so that the remaining boilers were cut off from the stack. An old railway generating station has been put into commission again. The building has now been repaired, but we understand that Staten Island was without light for five nights.

**Imperial College of Science and Technology.**—A well-bound booklet of 48 pages has recently been produced, dealing with the manifold departments now comprised in the Imperial College of Science and Technology at South Kensington. Courses on biology, chemistry, geology, mathematics and mechanics, and physics, are held at the Royal College of Science, while metallurgy and mining are taught at the Royal School of Mines, and civil, mechanical, and electrical engineering are concentrated in the City and Guilds (Engineering) College. The booklet points out that the Governors now award annually 12 entrance scholarships in science, six to be held at the Royal College of Science and six at the City and Guilds (Engineering) College. The booklet then proceeds to set forth the main features of the courses, the requisite training for different engineering branches, and it gives some idea as to the openings offered at home and abroad, together with their monetary value. In this respect at the present time the mining and metallurgical industries are particularly attractive. The comprehensive courses in civil and mechanical engineering of the City and Guilds (Engineering) College are well known, as is the course in electrical engineering under Professor T. Mather. In addition to the full course of three or four years, advanced specialised lectures are given by leading exponents, and there are extensive facilities for those wishing to carry out original work. The booklet should prove of assistance to those seeking a career in the engineering or allied professions, and to demonstrate the importance of the work being carried on at the Colleges. The Rector, Sir Alfred Keogh, or the Secretary, Mr. A. Crow, will be pleased to arrange for anybody to be shown over the buildings by appointment.



**REALLY  
RELIABLE  
REMOTE  
CONTROL**

**INSIST ON  
'IGRANIC'**

**AUTOMATIC  
SWITCHGEAR  
IGRANIC ELECTRIC CO. L<sup>TD</sup>.  
LONDON and BEDFORD**

### STEAM BOILER WORKING

A PAPER entitled "Steam Boiler Working in Electrical Power Stations" was read by Mr. J. W. Jackson before the Newcastle Section of the Institution of Electrical Engineers at Newcastle on Monday, and will be read at Middlesbrough to-morrow. The Paper is divided into three sections. The first deals chiefly with superheaters, the second with boiler furnaces, the third with stoking gear.

The author points out that an important consideration in the case of boilers for electric power stations is the liveliness of the boiler for dealing with variations in the load. In this connection the water-tube boiler takes only about thirty minutes to raise steam at full working pressure from cold water, whereas with the big cylindrical type of boilers several hours are required, while the ordinary Lancashire type of boiler does not permit of forcing to the same degree as the water-tube boiler. In connection with superheaters, modern competition appears to have called for a superheater of smaller area, but placed in a much hotter portion of the furnace, with the result that the tubes are overheated, and therefore have only a short life and are difficult to keep in position. The superheaters designed ten years ago are free from these objections. In this case the whole of the gases pass through the superheater after having passed the water tubes. To reduce the superheat some of the gases are bypassed. The more modern superheater does not usually vary the path of the gases at all, but shunts more of the saturated steam past the superheater. This calls for a smaller quantity of steam passing through the superheater, with the result that a lesser degree of heat is transmitted to the steam, thereby allowing the superheater-tube temperature to rise so high that corrosion or oxidation occurs inside and outside the tube. It is usually fixed between the main water tubes of the boiler, with the result that "sooting" of the boiler becomes a difficult matter, and soot may clog up portions of the path of the gases. The more generous superheater, fixed beyond the first bank of tubes, being of larger size because of the lower temperature of the gases, is much less sensitive to the fouling of the passages by soot. Higher superheat is required now than formerly, with steam temperatures, possibly up to 900° F., at the turbine stop valves. The author does not think that there is any disadvantage in making superheaters with bent tubes providing that the water can gravitate to a header, but there is always a considerable risk if the superheater has to be blown out before the boiler can be put on load. The superheater should therefore be kept well above the boiler water line, and, in operation, should be considered a portion of the main steam-pipe. Another trouble with the modern superheater is that owing to its comparatively small surface a drop in pressure from 10 to 15 lb. per sq. in., compared with 5 to 7 lb. in the older superheater, takes place at the normal full-load rate of working. With regard to the position of the main steam drums, if these are parallel to the path of the gases, then the front should be at a higher level than the back, while if they are at right angles to the flow of the gases, then the front drum should be elevated and the back drum lowered in comparison with the centre drum, as in practice there is often a difference in water level at normal load of about 12 in. between the front and back drums. Priming will by this means be reduced, and as a result the corrosion in the top parts of the steam drums and superheater tubes, which is possibly due to the comparatively small steam space available in the drums. By painting the internal surfaces of boilers and tubes where possible with bitumastic paint corrosion is easily prevented.

In connection with his remarks on boiler furnaces the author deals with the subject of combustion and the design of the various parts. A good furnace is one that allows plenty of room for combustion, and in which the fire is surrounded as much as is necessary with refractory lining, so as to permit of the high temperature being obtained through complete combustion before the flame or hot gases are allowed to come into contact with the heating surfaces, and that is almost the only value, but a very important one, that fire-

bricks have in the furnace. With regard to the surface combustion furnaces of Professor Bone and Dr. Nicholson, the latter may possibly be of greater commercial importance on account of the ability to use commercial boilers after the gas paths have been rearranged, whereas the former requires specially cleaned gas from a gas-producer plant. Although from 2 to 4 per cent. of the total power developed by the boiler is required to drive the auxiliaries such as the fan, &c., it is claimed that boilers working in commercial practice are giving over 90 per cent. thermal efficiency, and an evaporation per sq. ft. of heating surface of 35 lb.

After outlining the progress made in the design of mechanical strikers and pointing out that different designs are required with different fuels if the best results are to be obtained, the Paper concludes with a description of the suction ash handling plant, described in *ELECTRICAL ENGINEERING*, March 7th, p. 113, and July 25th, 1912, p. 421, Vol. VIII.

### TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

The Annual Report of the Postmaster-General for the year ended March 31st last gives a good deal of statistical information regarding the telegraphs and telephones. With regard to engineering developments, it is reported that the underground telegraph line from London to St. Margaret's Bay and Abbot's Cliff, the landing place of the French and Belgian cables, is nearly completed, and provision has been made for an extension from Canterbury to Dumpton Gap during 1913-14. Part of a line from London to the landing places of German and Dutch cables on the east coast has been laid between London and Chelmsford, and provision has been made for its extension to Ipswich and for a cable to be drawn in during 1913-14. The use of phantom circuits has been extended where possible. Morse circuits superposed on trunk telephone circuits have been provided, for example, between Aberdeen and Dundee and between Dundee and Newcastle, and have proved satisfactory. As, however, many telephone trunk circuits are being made junction circuits, and as superposition on junctions is not at present practicable on account of engineering difficulties, the field for extension of phantom circuits is being so far reduced. The system of testing telegraph and telephone circuits has been reorganised with a view to the more prompt localisation and clearing of faults, and to prevent delay, special "speaking" circuits have been formed between some of the larger towns (by superposition and otherwise) for the use of testing officers. Multiplex working by means of the Baudot type of instrument is being extended in the service with the Continent, with satisfactory results. In the section devoted to wireless telegraphy reference is made to the International Conference and to the inquiry into the Marconi contract, which was being conducted at the end of the period under review. It is mentioned that the number of radio-telegrams dealt with at the Post Office Coast Stations during the year was 51,109 (43,650 inwards, 7,459 outwards), as compared with 44,507 last year, and that during the year 729 new licences, covering 869 stations, were granted for the purpose of experiments, while 45 licences for experimental stations were cancelled or expired. In 23 cases permission to conduct temporary experiments was given by letter. On the 31st of March last there were in existence 942 licences for the purpose of experiments, as compared with 258 on the 31st of March, 1912. The number of licences in operation on the 31st of March last for wireless telegraphy on board ships registered in the United Kingdom was 105, covering 646 ships, as compared with 72 licences, covering 450 ships on the 31st of March, 1912. The Post Office is taking over the War Office station in Guernsey, which will be rebuilt and used for communication with the Bolt Head station when the Channel Islands cable is interrupted. In the telephone section, the result of the arbitration proceedings in connection with the purchase

of the National Telephone Co.'s plant is recapitulated. The only systems of telephonic communication in the British Isles which are not at present worked by the Postmaster-General are those worked by the States of Guernsey and the Corporations of Hull and Portsmouth. In the case of Guernsey negotiations have been in progress with the States for the renewal of their licence for a period of fourteen years. The Hull Corporation are anxious to obtain a renewal of their licence and are, we understand, prepared to purchase the system taken over from the National Telephone Company in the Hull area as a condition of such renewal. Negotiations on the subject were proceeding at the end of the year. In the case of Portsmouth the existing licence to the Corporation does not expire until 1926; but the Corporation do not desire to carry on the system in competition with the Post Office, and negotiations have been in progress with a view to its purchase by the Post Office. In the course of the year, exchanges equipped with automatic telephone plant were opened at Epsom and at the General Post Office, London, and are giving a satisfactory service. The work of providing automatic exchanges at Newport (Monmouthshire), Darlington and Hereford is in progress, and the installation of similar equipment in other important centres is contemplated. A type of automatic equipment which may be suitable for use in small isolated centres is to be tried at Chepstow. A new telephone exchange, known as the "Park" Exchange, has been opened at Notting Hill, and new exchanges are in course of erection near the British Museum and Victoria Station and at Greenwich. Sites have also been acquired for other exchanges in London. A start has been made with the building of a new central telephone exchange at Leeds, and considerable progress has been made with the extension of the Edinburgh Central Exchange. Arrangements are almost complete for the institution of a telephone service between London and Basle, Geneva, and Lausanne. Negotiations are proceeding with the Dutch Administration for the joint provision of a direct Anglo-Dutch Telephone Cable. The possibility of affording telephonic communication between Germany and this country is under consideration.

A Paper by Mr. A. K. Erlang, entitled "New Alternating-current Compensation Apparatus for Telephonic Measurements," has been accepted by the Institution of Electrical Engineers and published in the current *Journal*. The apparatus has been in considerable use at the laboratory of the Copenhagen Telephone Co., and consists of two calibrated slide wires of about 50 ohms resistance each and calibrated with a central zero. These wires are connected at their ends through a self-induction of about 0.01 henry and 3 ohms, and a 3-ohm non-inductive resistance. The junctions of the inductances and resistances are connected through the primary of an air-core transformer and an alternator. The mutual inductance between the primary and secondary of the transformer is adjustable by moving the position of one of the coils. A telephone receiver and sliding contacts on the slide wires, together with a junction board, are provided. The apparatus under test is connected through the telephone to the slide wires. For impedance measurements, the unknown impedance is con-

nected with a known resistance in series with the secondary coil, and by compensation the pressure across the resistance and the impedance is determined, and the corresponding vectors may be obtained from a scale constructed for the pressure along the slide wires depending on the known constants of the circuits. Thus the attenuation and wave-length constants may be found. Slight modifications in the circuits may be made for the purpose of different tests, including tests on microphones.

The first of the series of Advanced Lectures on Wireless Telegraphy which Mr. J. St. Vincent Pletts, A.C.G.I. (Chief of the Patents Dept. Marconi's Wireless Telegraph Co., Ltd.), is giving at the City & Guilds (Engineering) College to a large number of engineers and past and present students, was delivered on Thursday evening last. Mr. Pletts commenced by considering the oscillations set up by the discharge of a condenser through resistance and inductance, and the ethereal radiations thereby resulting. He considered the mathematics of the circuit, and developed the formula,  $C = V \sqrt{K/L} \sin t \sqrt{LK} e^{-\delta t}$ , where  $C$  is the current at any time,  $V$  the voltage,  $K$  the capacity in farads,  $L$  the inductance in henrys, and  $e$  the base of the natural logarithms,  $\delta$  the logarithmic decrement, and  $f$  the frequency. He showed also that  $\lambda = 2\pi \sqrt{LK}$ , where  $\lambda$  is the wave length in metres,  $L$  the inductance in electromagnetic units, and  $K$  the capacity in electrostatic units. Although, he said, it was usual to reckon the waves useful until they had died away to 100th part of the maximum, yet in actual practice they were not useful when they had died away to one-tenth. He then dealt with the development of the simple circuit considered by the inclusion of a spark gap which acts as an automatic switch, and showed how by opening the plates of the condenser and considering the inductance produced by the straight wires, we ultimately get to the simple aerial. He then showed how, considering one charge, the line of force spreads out through the ether back to the corresponding negative charge on the other side of the gap, and as the charges travel backwards and forwards from the gap the lines are radiated into space. Finally he showed how the potential along an aerial must be distributed according to an odd number of wave lengths, as there is always a node at the earth and an antinode or point of maximum potential at the top. He illustrated this by a hanging chain held in the hand which could be made to give one, two or three nodes, whereas a simple pendulum can swing from one point only. This, he pointed out, was analogous to an "oscillator," in which the inductance and capacity were concentrated, while the chain was analogous to the case where the inductance and capacity were distributed. With the chain, however, the nodes are not equidistant, as is the case in a simple aerial. We may mention that the next lecture will be given to-day, at 5 p.m., and will deal with development of wireless telegraphy, long-distance difficulties, atmospherics, and absorption.

Mr. A. A. Campbell Swinton has accepted the position of President of the newly-formed Wireless Society of London (ELECTRICAL ENGINEERING, September 25th, p. 547). The

## An Error of One-fifth per cent.

Extract from Board of Trade Laboratory Certificate for Wattmeter No. 598.

Scale Reading.	Power Factor.	10 Amp. Range.	5 Amp. Range.
1.100	1.0	.99 <sub>8</sub>	.99 <sub>8</sub>
.800	1.0	.99 <sub>9</sub>	.99 <sub>9</sub>
.400	1.0	.99 <sub>8</sub>	.99 <sub>7</sub>
.550	0.5 lag.	.99 <sub>8</sub>	.99 <sub>3</sub>
.550	0.5 lead.	.99 <sub>3</sub>	.99 <sub>3</sub>

To obtain true Watts the Scale Reading must be multiplied by  $\kappa$

Board of Trade or National Physical Laboratory Certificates can be supplied with any Wattmeter to clients' order.

**KELVIN BOTTOMLEY & BAIRD, LTD.,** 18 Cambridge Street, GLASGOW.



10-ampere  
Portable  
A.C. Wattmeter.

Vice-Presidents now include Mr. W. Duddell, Dr. Silvanus Thompson, Dr. J. Erskine-Murray, Mr. Charles Bright, Mr. F. Hope-Jones, and Mr. Russell Clarke. It is expected that the society will have 500 members by the end of the year.

It is announced that Marconi's Wireless Telegraph Co. has inaugurated the duplex system of working between Canada and Ireland.

The Committee recently appointed by the Postmaster-General to consider how far and by what methods the State should make provision for research work in the science of wireless telegraphy, and whether any organisation which may be established should include problems connected with ordinary telegraphy and telephony, is to be constituted as follows:—The Right Hon. C. E. H. Hobhouse, M.P. (Chairman); Lord Parker of Waddington; Sir Joseph Larmor, F.R.S.; Sir Henry Norman; Dr. R. T. Glazebrook, F.R.S.; Mr. W. Duddell, F.R.S.; Mr. R. Wilkins, C.B.; Rear-Admiral E. F. B. Charlton; Commander J. K. Im Thurn; Sir Alexander King, K.C.B.; Mr. W. Slingo; Commander F. Loring; Major the Hon. H. C. Guest. Its offices will be 6 Catherine Street, Strand, W.C.

The land lines in San Domingo have been repaired, and telegrams for San Domingo, Curaçao, and Venezuela can again be accepted under normal conditions.—The Ceara-Maranhaur cable was repaired on the 10th inst.—Telegrams in code can once more be accepted for Bulgaria.

### ELECTRIC TRACTION NOTES

A long and interesting paper on "Electric Locomotives," by Mr. F. Lydall, has been accepted by the Institution of Electrical Engineers and published in their *Journal*. The author first gives particulars of 28 designs of locomotives in use and under construction, showing the great diversity in present practice, and then proceeds to discuss the style of construction best suited to different classes of service, paying particular attention to capital cost, maintenance expenses, effect on the track, liability of skidding, and good look-out position for the driver. After a full discussion of these points, the author makes the following tentative recommendations:—A shunting locomotive may be of the double bogie design with a total weight of about 60 tons, equipped with four standard geared motors with an aggregate capacity of about 600 h.p. on the one-hour rating. It should be of the steeple type, with central driver's compartment and sloping ends. Freight locomotives may also be of the double-bogie steeple type, as the maximum speed is not required to exceed 45 miles per hour. It will be equipped with four geared motors with an aggregate capacity of about 1,200 h.p. on the one-hour rating. For local passenger locomotives with speeds up to 65 miles per hour, it is advisable that leading and trailing radial axles, or single-axle trucks, should be provided. For the driving axles several alternatives suggest themselves. For purposes of adhesion, two driving axles carrying 16 tons per axle should be sufficient. These two axles might perhaps be driven by two pairs of geared motors, each pair geared to a single gear-wheel. If the large number of motors were objected to, the alternative would be to dispense with gearing altogether and to drive by means of connecting rods. A single motor of 1,100 h.p. could easily be built with an armature of this size, and could be connected to the driving axles through the intermediary of a jack shaft. Or it would be possible to use two 550-h.p. motors running at a comparatively low speed, both coupled to a central jack shaft between the driving axles. An express passenger locomotive should have leading and trailing two-axle bogies, and three driving axles. To permit of high speeds being attained, the driving wheels should have a diameter of not less than about 60 in. The equipment may then consist of two 1,200-h.p. motors, probably mounted in the body of the locomotive and driving together on to a jack shaft between the central and one of the outer driving axles. A possible alternative is to connect the two motor axles to the central driving axles by Scotch yokes.

An article in the *Railway Gazette* deals with some troubles which have been experienced on the Wiesenthal Railway. The difficulties are of a different character from those experienced on the Loetschberg line, and are solely concerned with the single-phase locomotives. The trouble, however, has nothing to do with the merits or demerits of single-phase traction as compared with other forms, but is due to mechanical difficulties in the connection between the motor and the wheels. The ten original 2-6-2 locomotives have two elevated motors which work on to a jack shaft by connecting rods on both sides of the locomotive. It will readily be

seen that use of rods at both ends of the motor shaft entails strict parallelism of all six shafts, and that any play and any twisting of the jackshaft through the irregularity of the turning movement can produce great stresses in the rodding. As a matter of fact this was the case, and abnormal wear making the situation still worse took place. The trouble is to some extent avoided in the two locomotives subsequently constructed by a kind of guide frame connection at the lower end of V connecting rods from the motors. This allows of sufficient play to enable the jackshaft to be dispensed with and the drive to be taken on the centre wheel. The ten original locomotives are being altered on these lines. It is said that somewhat similar troubles have been experienced on the Dessau-Bitterfeld Railway.

Some particulars of the most recent design of roller trolley and pantograph, which has been adopted for use on several heavy traction high-pressure D.C. lines in America, is given in the *Electric Railway Journal*. The roller is mounted on a pantograph frame, and weighs, complete with spindle, 28 lb. The wearing surface is a tube of non-arc-ing brass, supported on a wooden roller. The height of the trolley wire above the head of the rail varies from 14 ft. 6 in. to 22 ft., yet, owing to the pantograph construction, the pressure of the roller against the wire is kept practically constant at about 84 lb. The average mileage of the rollers is 55,000. The cost of manufacture on a large scale is \$6.62 each.

A meeting of the Metropolitan Association of Electric Tramways Managers, was held recently at the Municipal and County Club, Whitehall Court, at which Messrs. Ullmann and Coveney were re-elected Chairman and Vice-Chairman respectively, and Mr. T. B. Goodyer was re-elected Hon. Secretary.

A dispute has arisen between the Sunderland District Tramways Co. and the Newcastle-on-Tyne Electric Supply Co. in regard to the price to be paid for electric current, and as there is a disputed bill amounting to £1,800, the power company some time ago threatened to cut off the supply. In the Chancery Division recently the Tramways Company asked for an injunction to prevent this pending the trial of the action, and after some discussion it was agreed to adjourn matters for a week.

A comprehensive tramway scheme for linking up all the villages between Barnsley and Mexborough is likely to come before Parliament next session. The consulting engineers to the scheme are Mr. Stephen Sellon and Mr. J. B. Hamilton, General Manager of the Leeds Corporation Tramways.

The consent of the Board of Trade to the running of trailer cars on the L.C.C. Merton circular route which was given for three months on June 7th, has now been extended "for the present" without any definite limit.

The scheme for linking up North and South Shields by means of an electric railway under the Tyne has once again been revived, this time at the suggestion of some American promoters. It is probable that Parliamentary powers will be sought next session. A Bill was passed in 1902, but the powers lapsed.

The negotiations between the Oxford Corporation and the National Electric Construction Co. with regard to the tramways scheme have not borne fruit, and the proposal of the Company to make use of petrol-electric tramcars has been rejected by the Corporation after a very full debate. The question of issuing a writ against the Company for the recovery of the liquidated damages under the various Acts is yet to come for consideration.

**Waste.**—The inaugural address of Mr. W. B. Woodhouse to the Yorkshire Local Section of the Institution of Electrical Engineers, delivered last Thursday, pointed out once more the wastefulness of burning coal in the ordinary way and the advantages of process of power production which at the same time rendered valuable by-products available. An example of co-operation between an electric supply company and industrial processes of this nature was presented by the coke ovens of the Old Silkstone Collieries, which now worked in conjunction with the Yorkshire Electric Power Co. In this case the surplus gas produced was 2,000 kw., which was distributed to the power customers of the Company. He also referred to the advantages of electricity for domestic purposes, and said that in the future distribution of energy, electricity must take a predominant part, but its progress was not solely controlled by engineering problems, but one must also consider the legislative and financial conditions under which the supply of electricity must be developed. The first step must be to obtain a better understanding between State departments, municipalities and power companies. Like Mr. Vernier, in his address at Newcastle, Mr. Woodhouse thought that there might be financial cooperation between power companies and municipalities.

# THE LONDON ELECTRIC WIRE COMPANY

Telegrams: "ELECTRIC LONDON." **AND SMITHS LTD.** Telephone No. 3105 London Wall.

Offices and Warehouse:  
PLAYHOUSE YARD, GOLDEN LANE, LONDON, E.C.

Works: { CHURCH ROAD WORKS, LEYTON, E.  
ANACONDA WORKS, SALFORD.

MANUFACTURERS OF EVERY DESCRIPTION OF CABLES AND WIRES FOR ELECTRICAL PURPOSES.

**DYNAMO WIRES** Strips and Compressed Strands. **INSTRUMENT WIRES**, Silk and Cotton Covered.

**EUREKA, PLATINOID** and other High Resistance Wires. **ENAMEL** Insulated Wires.

**FLEXIBLES.** **INSULATING VARNISH.** **BRUSHES.** **FUSE WIRES.** **JOINTING MATERIAL.**

**HIGH CONDUCTIVITY COPPER WIRE.**  
**SPECIAL TROLLEY WIRE.**

**SILICIUM BRONZE & PHOSPHOR BRONZE WIRE.**  
**ALUMINIUM WIRE.**

**MICA** BRITISH MICA CO., LD.  
Contractors to  
H.M. Government,  
Lebanon Road Works,  
Wandsworth, S.W.  
Tel.—405 P.O. Putney.  
Tele.—"Micamint," London.

Plate Tubes,  
Rings, &c., in  
**MICANITE**

**GLASS TUBES  
AND RODS**  
FOR ELECTRICAL PURPOSES  
GUILBERT-MARTIN  
9, Edmund Place, LONDON, E.C.

The Micanite & Insulators Co., Ltd

WALTHAMSTOW,  
London, E.

FOR **FIBRE**  
SHEETS, RODS  
AND  
TUBES.

**ELECTRICAL PORCELAIN**

OF  
HIGHEST QUALITY

APPLY TO  
**JAMES MACINTYRE & CO., LTD.,**  
BURSLEM.

**CRYSELCO  
ELECTRIC  
LAMPS.**  
KEMPSTON WORKS, BEDFORD.  
Telegrams: "Cryselco," Kempston.  
Telephone: 477 Bedford.

**F. WIGGINS & SONS,**  
FOR **MICA** INSULATION  
102, 103 & 104, MINORIES, LONDON.

## Over 30 years' manufacturing — experience is behind — SILVERTOWN Electrical Plant

The India Rubber, Gutta Percha & Telegraph Works Co., Ltd. (The SILVERTOWN Company) were the first to manufacture Gramme machines in England, and have had considerable experience in the construction of Dynamos, Motors, Balancers, Boosters, Motor Generators, Rotary Converters, Petrol-Electric Plant for Private House, Hotel and Ship Lighting and Power, Switchboards, &c.

The **SILVERTOWN** Company

have executed many important contracts for British and Foreign Governments and Corporations.

### SILVERTOWN MACHINES

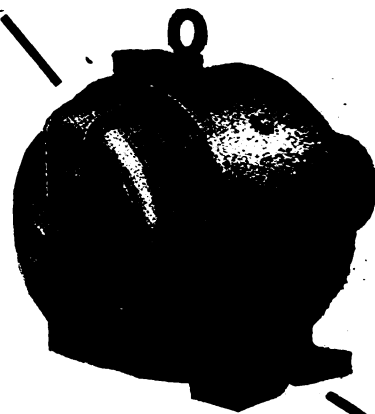
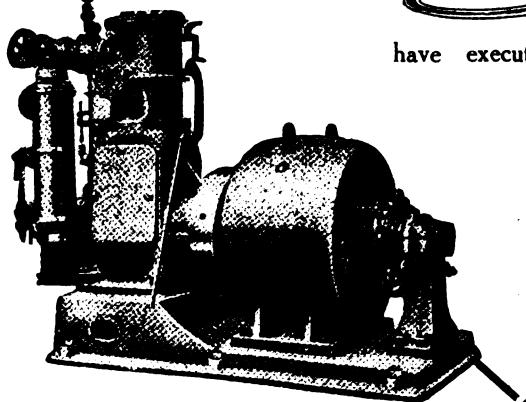
are noted for efficiency and a high standard of workmanship and finish.

ESTIMATES ON APPLICATION.

The India Rubber, Gutta Percha and  
Telegraph Works Co., Ltd.

HEAD OFFICES:  
106, CANNON STREET,  
LONDON, E.C.

WORKS:  
SILVERTOWN,  
LONDON, E.





## LOCAL NOTES

**Aberdeen: Lighting of Infirmary.**—Some dissatisfaction is being expressed in the local papers at the alleged attempt of the Corporation with regard to an application by the Aberdeen Royal Infirmary for a supply of electrical energy for driving laundry machines. The Infirmary has its own electric power plant but, in order to avoid extending it, applied to the Corporation for the necessary current to drive the new laundry machines. Although the terms proposed by the Corporation have not been made public, it is suggested that they practically impose upon the Infirmary the necessity of scrapping the existing plant and taking all power from the Corporation.

**Bispham: New Power Station.**—The Council's station was formally put into operation last week. The equipment consists of National gas-engine driven sets. The Consulting Engineer was Mr. J. W. Speight.

**Derby: Opening of New Showrooms.**—A large new show-room where there is a fine display of fittings for lighting, heating and cooking, has been opened by the Electricity Department at Victoria Buildings, London Road. This show-room will also act as a central bureau for information, and be the headquarters of the Canvassing Department.

**Ilford: Electricity Accounts.**—The accounts for the year to March 31st show a surplus of £521, as compared with £1,602 in the previous twelve months. The decrease in the net profit is due to (1) extra expenditure on coal due to the coal strike; (2) reduction in price of current for traction, which accounted for £250; (3) loss of revenue due to limitation of supply for several days in consequence of the fire at the Works in September, 1912. The interest and loan charges are also £300 more than in the previous twelve months. From the end of the December quarter current is to be supplied for domestic purposes at 12½ per cent. on the rateable value of private houses plus ½d. per unit for all energy consumed.

**London: Hammersmith: Additional Coal Storage.**—Arrangements are being made for increasing the coal storage at the electricity works to a capacity of 6,000 tons.

**Llandudno: Electric Heating.**—It has been decided to install electric heating and ventilating plant in the Pavilion.

**Manchester: Wiremen's Strike.**—We are officially informed that at a joint meeting of the employers and operative electricians, held at the employers' board-room on November 4th, an agreement was come to granting the men out on strike ½d. per hour extra on condition that in future six months' notice be given before any change in the terms of employment can be made. We gave particulars of the reasons for the strike on p. 609 of our issue for October 30th.

**Purchase of Trafford Power Co.**—The proposal of the Manchester Corporation to purchase the Trafford Power & Light Co., as already announced in these columns, is to be opposed by the Stretford District Council.

**Market Weighton: Electric Supply.**—Mr. C. Pullan, Electrical Engineer, of Bradford, has approached the Council with a view to instituting an electric supply scheme.

**Rathmines: Electric Wiring.**—A sum of £1,500 is to be set aside from the recent loan of £11,000 for wiring consumers' premises.

**Sedbergh: Electric Supply.**—Mr. C. Pullan, Electrical Engineer of Bradford, has approached the Council with a view to instituting an electric supply scheme.

**Southport: Electricity Accounts.**—The past year's working on the electricity undertaking shows a net profit of £1,902, which is £249 less than in the previous twelve months. The number of units sold to the Corporation tramways was less by 32,150, and to the Tramways Co. by 13,545.

**Taunton: Supply to Small Houses.**—A number of workmen's dwellings recently erected by the Taunton Corporation have been fitted for electric lighting. The rent of 4s. per week includes the necessary supply of electricity for lighting one lamp in the living room.

**Wisbech: Electric Lighting.**—A Board of Trade inquiry is to be held regarding the site selected by the Wisbech Electric Light & Power Co. for the erection of its generating station.

**York: Cost of Street Lighting.**—As an argument in favour of extending public electric lighting, attention was called at the last meeting of the Corporation to the fact that in York, which is at present largely lighted by gas, the cost per mile of street lighting is considerably higher than in Yarmouth, where there is a much larger proportion of electric lighting.

## APPOINTMENTS AND PERSONAL NOTES

Mr. P. J. Boucher, who has for some three years acted as Traction Lamp Expert to Messrs. Siemens Bros. Dynamo Works, Ltd., has been appointed to a similar position with Messrs. Edison & Swan United Electric Light Co., Ltd., in London.

An electrical engineer is required for taking charge of light installation work, also maintenance, estimating capacity and knowledge of motor-car lighting systems. (See advertisement on another page.)

Mr. L. B. Hogarth, Borough Electrical Engineer, Morecambe, has been appointed to a similar position at Whitehaven at a salary of £250, in succession to Mr. B. Sankey recently resigned.

Mr. W. W. Firth has been appointed Mains Superintendent at Dewsbury in succession to Mr. H. Fowles at a salary of £2 rising to £2 5s. per week.

Two foremen electricians are required by the Bombay Government to act as technical instructors. Director-General of Stores, India Office, S.W.

## COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &amp;c.

**Edison & Swan United Electric Light Co.**—After providing for interest on both classes of debenture stock, and depreciation upon freehold properties and plant, there was a loss of £4,753 on the year's working to June 30th. After providing for various depreciations there is a credit balance in the net revenue account of £1,026, which is carried forward. This unfortunate result is attributed mainly to the fact that the sales of metal filament lamps last winter were to a large extent suspended in consequence of the difficulties between the owners of the drawn wire patents. This matter, however, has now been adjusted. The directors have made a careful valuation of the whole of the lamp stocks, and various other assets, and in order to write off obsolete plant and stocks, &c., a sum of £48,013 has been required. In order to meet this, the reserve fund, amounting to £45,000, together with an amount of £3,013 from the sum brought forward from last year, has been allocated for the purpose of leaving the credit balance of £1,036 already mentioned. The South Benwell Lamp Works have been closed down, and all lamp manufacture concentrated at Ponders End. The premises in College Hill, used as a showroom and stores, will also be closed down when the new premises in Queen Victoria Street are ready for occupation.

At the annual general meeting on Tuesday, Mr. C. J. Ford (Chairman of the Company) said that although on the face of it the balance sheet was very disappointing, when all the circumstances were considered the results were not so bad as they appeared to be. About eight years ago a sum approximating £30,000 was spent upon plant for manufacturing pressed filament lamps, but that type of lamp was superseded by the drawn-wire filament, and this development necessitated the expenditure of a large additional sum of money upon new plant. Shortly afterwards there was a threat of litigation for alleged infringement of patents, which suspended the sale of lamps until an amicable arrangement was come to. There had recently been effected very large economies in expenditure with no loss of efficiency, and it was anticipated that the removal of the stores and clerical staff from the city to the works would also bring about a further reduction in expenditure.

**Royal Society of Arts.**—Among the papers to be read at the Royal Society of Arts Wednesday evening meetings during the session is "Applications of Electricity to Agriculture and Life," by T. Thorne Baker. Two juvenile lectures will be given on Wednesdays, Jan. 7th and 14th, at 5 p.m., by Mr. R. P. Howgrave-Graham on "Electric Vibrations and Wireless Telegraphy."

## THE RECORD ELECTRICAL Co., Ltd.

LONDON OFFICE:  
CAXTON HOUSE,  
WESTMINSTER, S.W.  
Telephone:  
3087 Victoria.

ON SCALE  
INSTRUMENTS.

RECORD'S PATENT.

Telegrams & Cablegrams:  
"Infusion,  
London."

WORKS:  
BROADHEATH,  
MANCHESTER.

Telephone:  
164 Altrincham.

Telegrams & Cablegrams:  
"Infusion,  
Altrincham."

Write for Prices & Particulars.

# "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

## Specifications Published November 6th, 1913

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

**Names in italics indicate communicators of inventions from abroad.**

20,849/12. **A.C. Commutator Motor.** B.T.-H.Co. (*A.E.G.*). The stator exciting and working windings and the rotor working winding are in series, but the first is also connected in parallel with a compensator (choking coil). A point in the winding of this is connected to a point in the winding of the supply transformer, so that the impedances of the rotor and stator circuits are equalised. Three figures.

23,669/12. **Synchronous Running of Motors.** W. E. LAKE (*Soc. Anon. du Temple, France*). The control is on the principle described in Patent 28,711/11, in which it is proposed to control a motor at a distance by placing it on the diagonal of a Wheatstone bridge. According to the present invention, two shafts, one at a transmitting and one at a receiving station, may be started and stopped simultaneously or driven at the same speed. The two shafts carry two commutator rings, and a commutator for putting the controlling resistances into circuit. The resistances of the commutators form part of a bridge, the diagonals of which comprise the dynamo field magnets, which are set in motion as soon as there is any angular displacement between the two shafts so as to vary the resistance couples and establish synchronism. Five figures.

24,043/12. **Relays for Wireless.** S. G. BROWN. One contact is made as a point of platinum, iridium, or osmium, &c., while the other is of carbon in a crystalline or disc form. The contact pressure is adjusted by a spring strip suspension, and, in addition, by small solenoids whose cores are continuations of the contact levers. The axis of the levers is as close as possible to the contact points, and the support is effected by a spring or knife edge. Five figures.

2,591/13. **Speed Control of Motor-cars, &c.** J. H. HOLMES. To prevent excessive speed, the sparking plugs are short-circuited by a centrifugal governor. At the same time, or earlier, warning signals are given to the driver. Five figures.

4,090/13. **Small Transformers.** VEDOVELLI, PRIESTLEY ET CIE. The carcass of the transformer carrying the two windings is surrounded with a removable mould, into which softened insulating material is forced by a powerful hydraulic press. Six figures.

12,710/13. **Protection of A.C. Motors.** G. ELLISON. Fuses are introduced in any two rotor circuits so that the rotor circuit is interrupted on a mechanical or electrical overload.

13,315/13. **A.C. Electro-Magnets.** OTIS ELEVATOR CO. (*Otis Elevator Ges., Germany*). The invention disclosed provides for the utilisation of residual magnetism to prevent the armature vibrating. The current coil is wound on a core having low residual magnetism. The armature is made of similar material, but the yoke is made of an iron having a high residual magnetism. The armature and core are provided with metal sheathings to act as dampers. Five figures.

## Specifications Published To-day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free.

Summaries of some of the more important of these patents will appear in our next issue.

**Arc Lamps:** SIEMENS DYNAMO WORKS (*Siemens-Schuckert*), 12,575/13.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** B.T.-H.Co. (*G.E.Co., U.S.A.*) [Condensation products for impregnating solutions, &c.] 24,255/12; OLMSTED [Pressure regulation] 1,207/13.

**Dynamos, Motors, and Transformers:** FREEMAN [D.C.] 21,415/12; STAUNTON [Magneto] 28,469/12; SIEMENS DYNAMO WORKS (*Siemens-Schuckert*) 13,435/13; BROLT, LTD., BROOKS, and HOLT, 15,585/13.

**Electrometallurgy and Electrochemistry:** VON RECKLINGHAUSEN, HELBRONNER, and HENRI [Sterilising water] 24,625/12; PERREUR-LOYD [Electrolytic production of copper] 6,897/13.

**Heating and Cooking:** DUTERTRE and JACQUEL [Lamp radiator] 23,748/12; BERRY [Kettles] 23,861/12.

**Ignition:** KITCHELL [Timing] 13,241/13.

**Instruments and Meters:** BERRY [Indicating alteration in current in a circuit] 23,940/12; SAREL [Testing conductor resistance] 26,639/12; H. ARON ELEKTRICITÄTSZÄHLERFABRIK [Commutators] 16,753/13.

**Storage Batteries:** JOEL [Cases] 24,443/12; [Electrodes] 2,269/13.

**Switchgear, Fuses, and Fittings:** LAKE (*Gebr. Jaeger*) [Incandescent-lamp holders] 24,154/12; VASSBERG [Reversing switches for ratchet feeding gear] 24,550/12; RAILING and COLLINGS

[Lamp holders] 27,503/12; JACKSON [Tube couplings] 28,929/12; HUBBELL [Incandescent-lamp sockets] 3,656/13; GAMBRELL [Contact makers for resistance boxes, &c.] 4,862/13; DESPESSAILLES [Cut-outs with multiple safety fuses] 11,850/13; GOODWIN and VANDERVELL [Push-buttons for motor-car electric horns] 14,942/13.

**Telephony and Telegraphy:** BRUCE [Impulse transmitter] 24,409/12; GIRARDEAU [Alternators for wireless] 25,356/12; SIEMENS & HALSKE [Telegraph system unaffected by H.P. static discharges] 3,432/13; BALSILLIE [Wireless receivers] 15,674/13.

**Traction:** THOMAS and THOMAS TRANSMISSION [Power transmission] 24,618/12.

**Miscellaneous:** NEUBURGER [Pocket signalling lamp] 23,887/12; IRWIN [Electro-dynamometers] 27,343/12; HAWDON [Primary batteries] 27,351/12; KLAHN [Gyroscope for use with non-magnetic compass, &c.] 29,082/12; SPERRY [Gyroscopes] 2,294/13; CAHUITWERKE NÜRNBERG [Mine igniting machine] 14,870/13; DE LA RIBOISIÈRE [Automobile door sashes, &c.] 15,648/13.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Electrometallurgy and Electrochemistry:** JOHNSON [Reduction of zinc ores] 27,881/12; A.E.G. [Discharge tube with incandescent cathode and enclosed vapour-forming body] 22,816/13.

**Instruments and Meters:** SZILARD [Electrometers] 20,008/13.

**Switchgear:** A.E.G. [Live parts are immersed in oil or embedded in a fusible insulating material] 23,348/13.

**Telephony and Telegraphy:** ABRAHAM [Wireless telegraph receivers] 23,113/13; SIEMENS & HALSKE [Automatic selecting device for telephone systems] 23,336/13.

## Opposition Entered to Grant of Patents

18,654/12. **Winding Clocks.** C. H. DAVIES. The spring has one end free pressing against the internal wall of a spring drum, which is connected to the clock movement. It is wound up by a motor-driven worm wheel.

25,606/12. **Time Elements for Circuit-Breakers.** J. G. STATTER. Adjusting the distance between the sucker faces.

3,162/13. **Metal Filaments.** WESTINGHOUSE METALLFÄDEN GLÜHLAMPENFABRIK. Siemens Bros. are opposing the grant of this patent. See page 627 for fuller particulars.

## Grant of Patent Allowed

1,178/12. **Imitation Candles.** E. J. WILSON and the CANDO-LITE Co. The grant has been allowed in spite of the opposition.

## Amendment to Specification

14,653/12. **Sea-Water Temperature Annunciator.** A. McNAB. As a result of the extended investigation under Section 8 of the Act, a reference to Specification No. 9,695/13 has been inserted.

## Expiring and Expired Patents

The following Patent expires during the current week, after a *life of fourteen years*—

22,732 of November 14th, 1899. **Watertight Doors, Fire Shutters, &c.** H. H. LEIGH. (*F. J. Sprague, F. T. Bowles, and G. H. Hill, U.S.A.*) Watertight bulkhead doors for ships are operated by an electric motor whose shaft passes through the bulkhead. The motor-shaft may be worked manually from either side of the bulkhead. Remote control is provided.

The following are the more important Patents that have become void through non-payment of renewal fees.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** R. H. MARTIN [Slipping belt dynamo gear for train lighting] 16,590/06; C. M. GRAHAM [Insulator] 15,341/08.

**Incandescent Lamps:** B. T. H. Co. (*G. E. Co., U.S.A.*) [Production of thorium filaments] 14,972/05 and 14,972A/05.

**Switchgear, Fuses and Fittings:** B. T. H. Co., E. B. WEDMORE and W. P. HAMLYN [Reverse current circuit-breaker] 16,615/07; H. S. MARTIN [Adjustable resistance composed of flaky materials under adjustable pressure] 16,968/07.

**Telephony and Telegraphy:** W. P. THOMPSON (*Ges. für Drahtlose Telegr.*) [Wireless telegraphy for trains] 16,696/08; A. G. HELLYAR and JOHNSON SECRET WIRELESS TELEGRAPH and TELEPHONE TESTING SYNDICATE [Receivers] 16,747/06.

**Traction:** W. R. SYKES and C. J. COOKE [D.C. track circuit signalling] 15,590/08; C. P. STONE [Electro-magnetic railway carriage door lock controlled by axle-driven dynamo] 15,705/08; H. BUCKELL and A. R. MULLEY [Automatic railway signalling for single tracks] 15,868/08.

**Miscellaneous:** G. W. LUNDBERG and A. G. HOLMBERG [Magnetic separators] 16,675/07; E. C. R. MARKS (*W. N. McComb, U.S.A.*) [Illuminated sign using thermo-flashers] 15,469/08; B. E. D. KILBURN (*E. Oesterle, U.S.A.*) [Magnetic separators] 15,646/08; W. PATERSON [Thermostat for controlling temperature of superheated steam] 15,788/08; A. M. and J. M. AUBERT [Controlling gas valves] 15,861/08.

## PATENTS.

*Small Prepaid Advertisements with regard to Patents, &c., are inserted on this page, facing our Patent Record, at 1d. per word (minimum 5s.); three insertions for the price of two. Rates for displayed and card advertisements on application.*

*Advertisement matter, accompanied by a remittance, should be addressed to the Kilowatt Publishing Co., Ltd., 203 Temple Chambers, London, E.C.*

**RIGHTS OF PATENT** No. 27,090/12 offered for Sale. Patent refers to **REVERSE CURRENT CIRCUIT-BREAKER** for alternating current, avoiding potential coil, thus ensuring selective action. Particularly important application for absolute **SELECTIVE SECTIONALISING OF FAULTY CABLES** without need of pilot wires between terminals. Further explanation given upon inquiry.—**P. ACKERMAN**, 185 Carlton Street, Toronto, Ontario, Canada.

The Proprietor of the Patents Nos. 24,702 of 1908 and 24,708 of 1908 for "Improvements in and relating to **ELECTRIC FUSIBLE CUT OUTS**" and "Improvements in **SEAL FASTENINGS**," is desirous of entering into arrangements by way of license and otherwise on reasonable terms, for the purpose of exploiting the same and ensuring their full development and practical working in this country. All communications should be addressed in the first instance to:—**Haseltine, Lake & Co.**, Chartered Patent Agents and Consulting Engineers, 28, Southampton Buildings, Chancery Lane, London, W.C.

**CONTINUOUS CURRENT DYNAMO MACHINES**—The Proprietors of Patent No. 25,167/10 are desirous of working the above invention in Great Britain, and therefore invite communications with a view to the sale of the Patent or the granting of Licences to work the invention on reasonable terms. An illustrated description of the invention may be obtained from **BREWER & SON**, Patent Agents, 33 Chancery Lane, London, W.C.

**PATENTS**—The proprietor of British Patents Nos. 27,798 of 1910, 25,012 of 1910, 3,747 of 1911, and 4,397 of 1911, entitled Improvements in or relating to **COLLECTORS AND CONDUCTORS** for overhead conductor and railless **ELECTRIC TRACTION SYSTEMS**, desires to enter into arrangements by way of license or otherwise on reasonable terms for the purpose of developing and practically working the same in this country. Inquiries should be addressed to **W. P. THOMPSON & Co.**, Chartered Patent Agents, 285 High Holborn, London, W.C.

Improvements relating to **FLEXIBLE ELECTRICAL CONNECTION DEVICES**. No. 24,587 of 1907.

The Patentee is desirous of arranging by license or otherwise on reasonable terms for the manufacture and commercial development of the Invention in this Country. **HERBERT HADDAN & Co.**, Patent Agents, 31 and 32 Bedford Street, Strand, London, W.C.

## John E. Raworth,

Queen Anne's Chambers, Chartered Patent Agent.  
30, Broadway, Westminster, London, S.W.

### EVERY INSTALLATION ENGINEER

Should join his Trade Protection Organisation,  
**THE**

## ELECTRICAL CONTRACTORS' ASSOCIATION

(Incorporated).

*Inquiries cordially invited by the Secretary,*

**L. G. TATE,**

20, Bucklersbury, LONDON, E.C.

## REMOVAL.

**MR. J. G. LORRAIN, M.I.E.E.,**  
M.I.Mech.E., Chartered Patent  
Agent, has removed his office from Norfolk House, Norfolk  
Street, Strand, W.C., to  
**Staple Inn Buildings, High Holborn, London, W.C.**

## CAPPER PASS & SON, Ltd.,

Bedminster Smelting Works, BRISTOL

**SELLERS OF**  
**ANTIMONIAL LEAD OF ALL GRADES.**

**BUYERS OF**  
**LEAD ASHES & LEAD RESIDUES FROM ACCUMULATORS.**

Telegrams: "PASS, BRISTOL."

Telephone: 8476 & 8476.

For instructions on Cleaning and Polishing  
Electrical Fittings and Electric Cookers, read

### CANNING'S HANDBOOK ON

**POLISHING, ELECTRO-PLATING & LACQUERING.**

Fully Illustrated. Price 2s. 3d. post free. Abroad, 2s. 6d.

**W. CANNING & CO., BIRMINGHAM.**

LONDON: 18/20, ST. JOHN'S SQ., CLERKENWELL, E.C.

MENTION BOOK 224.

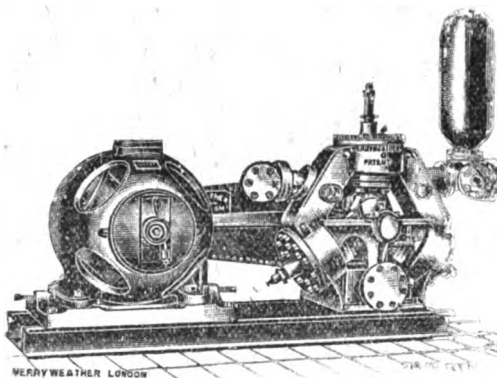
## THE "HATFIELD" PUMP

Merryweather's Patents.

**SPECIALLY SUITABLE FOR DEEP SUCTION LIFTS.**

The Radcliffe Motor Hatfield pumped continuously from 8.48 a.m. till 8.30 p.m., a run of nearly 12 hours at the East Lancashire Paper Mills fire.

The same machine pumped for 3½ hours with four jets and a 26 foot lift at the Charlton Mills fire.



## THE PERFECT PUMP

FOR

**ELECTRIC DRIVING**  
**MANSION WATER SUPPLY**  
**COUNTRY WATERWORKS**  
**SHALLOW WELLS**

**DEEP WELLS**  
**AUGMENTING PRESSURE IN**  
**FIRE MAINS**  
**FILLING RESERVOIRS, &c., &c.**

Write for Illustrated Pamphlet, 193 P.

**MERRYWEATHER & SONS**

Fire Engine Works, Greenwich, S.E., London.

### KAYE'S LATEST PATENT SERRATED STEEL

## SEAMLESS OIL CAN

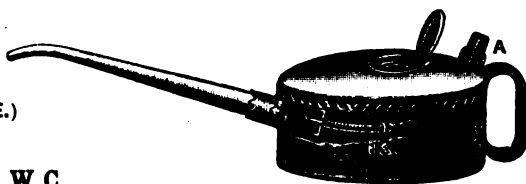
Sole Makers

**JOSH. KAYE & SONS LTD.**

(Managing Director: W. K. KAYE, M.I.Mech.E.)

**Lock Works, LEEDS,**

And 93, High Holborn, London, W.C.



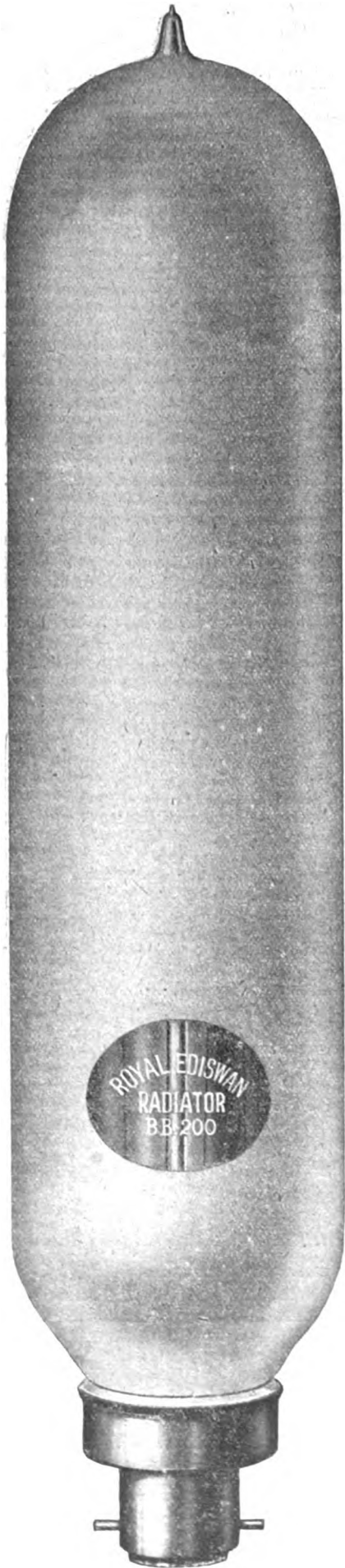
FITTED WITH

**A New Patent Thumb Button**  
**and Patent Seamless Spout.**

**Also in Copper or Brass for**  
**Electrical Purposes.**

Contractors to H.M. Navy, War Department,  
Home Office, and Indian State Railways.

WHEN CORRESPONDING WITH ADVERTISERS. PLEASE MENTION "ELECTRICAL ENGINEERING."



# ROYAL EDISON SWAN

## Luminous RADIATOR LAMPS

The Radiator Lamp which has long life, and its perfect finish and neat appearance enhances the value of a radiator.

**MAKE PROVISION EARLY  
FOR THE  
COMING WINTER SEASON**  
with the Lamp that is  
**INCREASINGLY POPULAR**

Note the prices of the standard  
250 watt. lamp:

**100 to 130 volts. 3/6 each**  
**200 to 260 volts. 3/9 each**

*Subject to the usual Trade discount.*

**THE  
EDISON & SWAN  
UNITED ELECTRIC LIGHT CO., LTD.,  
Ponders End, Middlesex.**

Telephone: 520 Enfield (6 lines).

London Showrooms: 36, QUEEN STREET & 11, COLLEGE HILL, E.C.

Branches at Bristol, Birmingham, Cardiff, Dundee, Dublin, Glasgow, Hull, Leeds, Liverpool, Manchester, Nottingham, Newcastle, & Australia.

*When corresponding with Advertisers, please mention "Electrical Engineering."*



## ELECTRICAL ENGINEERING TRADE SECTION

## CATALOGUES, PAMPHLETS, &amp;c., RECEIVED

**TERMINAL BOXES.**—W. T. Henley's Telegraph Works Co., Ltd. (13 & 14 Blomfield Street, E.C.), have compiled an extremely interesting list of over 100 pages describing and illustrating their numerous types of terminal boxes for all classes of cable. The illustrations are excellent, and show perfectly the construction of the boxes, their dimensions, and the manner of using them. Almost every conceivable kind of box is included, and there are several new types. Prominent among these are sealing boxes for single cables up to 1,000 volts, right-angle terminal boxes for pressures up to 20,000 volts (which should prove particularly useful), outside terminal boxes in which the tails as well as the cable enter on the under side, and there are also some new designs of colliery cable terminal boxes and potheads for telephone cable. Several miscellaneous types designed from time to time for various customers are also illustrated. The mains engineer will find the list extremely useful.

**FITTINGS FOR OFFICE, STREET, AND SHOP LIGHTING.**—The new catalogue just issued by the Wardle Engineering Co., Ltd. (196 Deansgate, Manchester), should be in the hands of every electric light contractor. The company's lanterns for shop-front and street lighting are well known and largely used, and the catalogue shows the large number of different sizes and designs which are now obtainable. On the other hand, the "Inverlite" fitting, an effective but at the same time inexpensive and elegant fitting for semi-indirect lighting of offices, shops, &c., is a more recent addition to the firm's specialities, and we can safely predict for it an equal popularity. A feature of the catalogue is the excellent illustrations, which give a perfectly accurate representation of the actual fittings, including the new "Inverlite" pattern and a cheap and useful model bearing the name "Vestelite," designed for entrance halls, shop interiors, &c.

**HEATERS AND RADIATORS.**—Several new patterns are included in the new season's heating catalogue recently issued by the Edison and Swan United Electric Light Co., Ltd. (Ponders' End, Middlesex). The list embraces numbers of radiators of the luminous heat type, many convectors and radio-convectors on the Dowsing-Huntley system, and quartzalite glowing heaters made under Bastian patents.

*Readers desiring copies of catalogues or pamphlets should apply to the firms in question, referring to the notice in "Electrical Engineering."*

**ELECTRIC HEATERS.**—The Bastian Electric Heating Syndicate, Ltd. (185 Wardour Street, W.), have sent us a copy of a post-card which they are preparing for circulation throughout the trade reproducing an effective picture of a little girl making toast at a glowing radiator. This is also the subject of a showcard, 18 ins. by 14 ins., which they are prepared to send to contractors and others interested.

**ASBESTOS WOVEN NET RESISTANCES.**—A leaflet from the Schniewindt Electric Co. (40 and 41 Staniforth Street, Birmingham) draws attention to the woven net resistances made by this firm for resistance work of every description. In inviting inquiries, the company offers to send samples of its work on application.

**HEATING AND COOKING APPARATUS.**—Another leaflet by the above firm gives prices of a complete range of "Triumph" electrically-heated, polished aluminium water boilers and stewing pots. The former range embraces sizes from  $\frac{1}{2}$  pint to 4 pints' capacity, and the latter from 1 pint to 10 pints.

**PIPE-CUTTING PLIERS.**—A useful appliance for contractors, wiremen, fitters, and others, sold by the Schniewindt Company, is a light pair of pipe-cutting pliers. An easily replaceable protected cutting wheel is used.

**WATER METERS.**—An illustrated pamphlet from Siemens Brothers & Co., Ltd. (Woolwich), gives particulars of a new modification of the Siemens disc type water meter, which is specially suitable for the measurement of boiler feed water. Owing to the use of specially made graphite carbon for the rubbing and sliding parts, further lubrication of the moving parts, even with the highest temperatures, is unnecessary. We are requested to state that all inquiries for this apparatus should be addressed to the Electric Appliances Department (Caxton House, Westminster, S.W.).

**METAL FILAMENT LAMPS.**—Among the most recent advertising matter produced by the Edison and Swan United Electric Light Co., Ltd. (Ponders' End, Middlesex), is an ingenious coloured folding card price-list, on the outside of which is de-

picted a country house illuminated with Royal Ediswan drawn-wire lamps. On opening the card a representation of the Ponders' End factory is seen, and a large Ediswan metal filament lamp comes up through the roof of the central building. Another interesting card is a picture postcard of the refacing of Buckingham Palace by the aid of Ediswan metal filament lamps.

**FITTINGS.**—A new section list, covering "three Benjamin Trouble Savers," has been issued by the Benjamin Electric, Ltd. (117 Victoria Street, S.W.). Included are the "Bengrip" adaptor and "Benco" lampholders (described and illustrated in ELECTRICAL ENGINEERING, Oct. 2nd, p. 554), and the Benjamin "Wireless" adaptors, which are complete with all internal connections. These well-known specialities have been referred to in our columns on several occasions.

**TECHNICAL BOOKS.**—We have received the October number of the quarterly list of new books and new editions added to Messrs. H. K. Lewis's Medical and Scientific Circulating Library (136 Gower Street, W.C.). Several engineering and electrical books are included, as well as many other branches of science and technics. Short notes are given on the most important works, and the list should be useful to those wishing to see what has appeared during the last few months on any subject that they are interested in.

**MECHANICAL STOKERS AND FORCED DRAUGHT.**—Catalogues from Meldrums, Ltd. (Timperley, near Manchester), deal with the "Meldrum" improved forced draught furnace from the points of view of fuel economy, increased boiler steaming, and smoke prevention. Other lists deal with the "Koker" and "Sprinkler" types of mechanical stokers for forced, induced, or natural draught working, according to the quality of the coal, local conditions, &c.

**INSULATING MATERIAL.**—A folder is to hand from Carson and Evans (3 Fenchurch Buildings, E.C.) quoting some actual opinions of users regarding the insulating material named "Carvanite," which this firm introduced not long ago. Its mechanical properties are said to be better than those of ebonite and vulcanite, and its insulating properties quite as good.

**THE UNITED STATES NEW TARIFF.**—A pamphlet giving the United States duty rate on every article mentioned in the old United States Customs tariff, and comparing this in a parallel column with the duty under the current tariff, has been issued by R. F. Downing & Co. (17 and 18 Garlick Hill, E.C.), who will send a copy to interested persons who apply in writing.

**CORRESPONDENCE INSTRUCTION.**—We have received a series of pamphlets outlining the methods adopted by the Engineer Specialists' Institute which has recently been established at 12 to 14 Red Lion Court, Fleet Street, to carry on correspondence instruction in electrical engineering and other subjects.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

## Generating Stations, Sub-Stations, Mains, &amp;c.

**Aldershot.**—350 yards three-core, paper-insulated cable. Borough Electrical Engineer. November 18th.

**Ballater.**—The Council has now decided to give Messrs. T. C. Smith & Co. facilities in connection with their proposed electric lighting scheme, and also to place street lighting in their hands. A local company is to be formed to carry out the scheme.

**Braintree.**—A report has been received from a consulting engineer with regard to an electric supply scheme.

**Bristol.**—A proposal to extend the supply mains to Warminster has been acceded to by that Council.

**Dawlish.**—The Dawlish Electric Light & Power Co. has decided to make considerable extensions to its generating plant, and also to the distributing system.

**Elland.**—A Local Government Board inquiry was held last week concerning a loan of £1,000 for electrical extensions.

**Holmfirth.**—An application has been made to the Local Government Board for a loan in connection with the electric supply scheme.

**Ilkley.**—A loan of £18,000 for plant extensions is to be applied for.

**Lurgan.**—The £12,000 scheme, referred to in our last issue, has been provisionally adopted by the Council.

**Lytham.**—The Council obtained an electric lighting order as long as ten years ago. This was, however, revoked.

but a new one subsequently granted, and it has been decided to proceed with the scheme.

**Rangoon.**—The Rangoon Electric Tramway & Supply Co. is issuing new capital in order to extend its plant.

**South Africa.**—According to the *British & South African Export Gazette*, the Prince Albert Council will shortly be in the market for a £10,000 electrical plant.

**Southampton.**—Steam turbo-alternator. Borough Electrical Engineer. (See advertisement on another page.)

**Wiltshire.**—According to the *Morning Post*, the Postmaster-General proposes to erect an electric power station on the Beckhampton Downs, near Devizes.

**Wolverhampton.**—One 1,000-kw. rotary-converter set. Borough Electrical Engineer. November 24th.

### Wiring

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Belfast.**—Art Gallery. Town Clerk.

**Doncaster.**—Cinematograph theatre, High Street.

**Finchley.**—New fire station.

**Leigh (Lancs.).**—Additions to technical school. Town Clerk.

**London.**—Club house (£15,000) in Dean Street, Soho. Union of Hotel, Club and Restaurant Workers.

**L.C.C.**—240 points at the Lancaster Road elementary school, Notting Hill. (See advertisement on another page.)

**Wandsworth.**—New swimming bath, Elmfield Road, Balham.

**Middlesbrough.**—Additions to Broomlands Hospital. Architects, R. Lofthouse & Sons, 129 Albert Road.

**Perth.**—New Academy.

**Rainhill.**—Electric wiring and fittings for new ward at County Asylum. Clerk.

**Sale.**—New municipal offices (£10,000).

**Sheffield.**—Sanatorium (£37,000).

**Stalybridge.**—Public baths.

**Swansea.**—Electrical installation at new club, Alexandra Road. Consulting Engineer, H. K. Benson, Metal Exchange.

**Wigan.**—Alterations and additions to Pemberton Hospital. Borough Electrical Engineer.

### Miscellaneous

**Antwerp.**—Two electric passenger lifts at the Industrial School. Further particulars, 73 Basinghall Street.

**Australia.**—Track feed boxes, track resistances, impedance bonds, track relay and relay boxes for Melbourne Suburban Railways. Consulting Engineers, Messrs. Merz & McLellan, 32 Victoria Street, S.W. (See advertisement on another page.)

**London: G.P.O.**—The Postmaster-General has indicated that he is prepared to consider applications from companies willing to tender for the construction of three high-power wireless stations forming part of the Imperial wireless chain.

Tenderers must be in the position of demonstrating the efficiency of their systems for continuous communication by day and night over a distance of not less than 2,000 miles. Communications should be made with the Secretary of the Post Office before November 21st, stating the earliest date on which a demonstration can be given.

**Montevideo.**—The capital of the United Electric Tramways of Montevideo is being increased in order to equip two sub-stations and to carry out other works.

**North Eastern Railway Co.**—Twelve months' supply of electric lamps, wires, cables, fittings, and arc-lamp carbons.

**Russia.**—The Central Administration of Posts and Telegraphs recommends the installation of a large number of wireless telegraph stations in their programme for 1914.

**Electric Cooking at Wimbledon.**—Great credit is due to Mr. H. Tomlinson Lee, the Borough Electrical Engineer, for the excellent organisation of the Electrical Exhibition which took place last week in premises on the main road, which were temporarily converted into a lecture-hall and show-room adjoining. In the former, in conjunction with Messrs. Gillespie & Beales, of Amberley House, Norfolk Street, Strand, W.C., a series of cooking lectures and demonstrations with "Tricity" cookers was given by Mr. F. S. Grogan, of the British Electric Transformer Co., Ltd., who delighted his audiences with all they saw and heard. These lectures, owing to the excellent local publicity, were crowded to overflow on the first day, and it is estimated that during the week nearly three thousand people attended, or about one-twentieth of the population. In the show-room adjoining, with the co-operation of the local contractors, a fine display was made, and a large business resulted in cookers and radiators.

## TENDERS RECEIVED AND ACCEPTED

**Ipswich.**—A contract has been placed with Messrs. Chamberlain & Hookham for meters of 10 amperes and upwards.

**Metropolitan Railway Co.**—A contract has been placed with the Edison & Swan United Electric Light Co. for a twelve months' supply of incandescent lamps.

**Manchester.**—The following tenders have been accepted:—Electric lighting of Municipal School of Domestic Economy, W. P. Theermann & Co.; cable, Johnson & Phillips; H.T. switchgear, Ferranti, Ltd.; lamps, British Thomson-Houston Co., Brush Electrical Engineering Co., and Siemens Bros. Dynamo Works.

**South Africa.**—We understand that the East Land Proprietary Mines have placed an order with a Paisley firm for an electric winding plant, capable of winding eight tons of ore from a depth of 4,500 feet at a speed of 3,000 feet per minute. The "Ward-Leonard" system will be fitted.

## MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. G. Smith & Son, of 5 Philpott Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night was £73 to £73 10s. (last week, £76 to £76 10s.).

**Partnership Dissolved.**—The partnership between A. Evans and E. G. Todd (Clive & Co.), electrical engineers, of Sutton Coldfield, has been dissolved.

**Bankruptcies.**—The last date for receiving proofs in the bankruptcy of J. W. Garsden, Electrical Engineer, 5 Hope Terrace, Dukes Brow, Blackburn, is November 22nd.

**Liquidations.**—Ozonair, Ltd., is to be wound up voluntarily. Mr. T. S. Wederell, Balfour House, Finsbury Pavement, E.C., is liquidator.

## NEW COMPANIES

**ELECTRIC LIGHTING AND ENGINEERING CO.**—Capital, £3,000. To take over a business carried on by J. O. Rhodes with the above title at 145 Duke Street, Liverpool.

**FULLER ACCUMULATOR CO.**—Registered by Tarry, Sherlock & King, 17 Serjeants' Inn, E.C. Capital, £65,000. Electrical and general engineers. To establish agreements with G. Fuller, G. J. A. Fuller, and L. Fuller, and with J. C. Fuller & Son, Ltd.

## What the Public Wants

Booklets describing in simple language the various applications of electricity.

Part I. "Electric Lighting" (Price 1d., by post 2d.).

Part II. "Electric Cooking and Heating, and other Domestic Uses of Electricity" (Price 2d., by post 3d.).

Part III. "Works Driving" (Price 2d., by post 3d.).

Prices for quantities on application to the  
**KILOWATT PUBLISHING CO., LTD.,**  
TEMPLE CHAMBERS, LONDON, E.C.

## AN ELECTRIC KITCHEN AT BRIGHTON

WE reproduce here a photograph (kindly sent us by Mr. J. Christie, Engineer and Manager, Brighton Corporation Electricity Dept.) of the electric kitchen which has recently been equipped at the Old Ship Hotel, King's Road, Brighton, as a part of a general renovation and re-furnishing.

This equipment consists of the following items:—One range of four ovens, each measuring inside 24 in. by 20½ in. by 20½ in., with hot cupboards separately heated above the ovens; each oven has a consumption of 5 kw., and the hot cupboards approximately 2 kw. each. One grill, 36 in. by 12 in., with a hot cupboard above, the grill taking 7 kw., and the hot cupboard above 1 kw. The fish fryer consists of two oval pans measuring 18 in. by 12 in. each fitted with a draining rack, and having a maximum consumption 2½ kw. One hot-plate for boiling purposes, 4 ft. by 2 ft. 2 in., containing four 12-in. boiling rings, each with a consumption of 2.5 kw. Two large vegetable steamers with consumption of 10 kw. The kitchen is entirely new, having been built specially for electric cooking. The work has been carried out under the direction of the Corporation Electricity Department, and Messrs. Page & Miles, of 60 Western Road, Brighton, supplied and fitted the apparatus, which was manufactured by the Jackson Electric Stove Co., Ltd., 38 Blandford Street, Baker Street, London, W.

The equipment is now doing the whole of the work of the hotel, including banquets, and has been in daily use for

flame-proof covers, and it is only continuous-current machines that call for special treatment. In those situations where motors must be protected from the atmosphere, two alternatives present themselves—(a) total enclosure, and (b) pipe-ventilation. Total enclosure is a very costly form of pro-

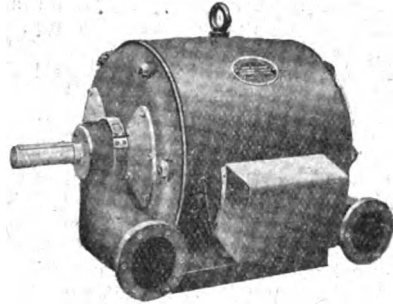


FIG. 1.—60-H.P. THREE-PHASE SQUIRREL-CAGE PIPE-VENTILATED MOTOR.

tection and cannot be applied to large motors of reasonable dimensions. Pipe ventilation is the cheaper alternative for small motors, and the only solution for large ones. In the past, trouble has been experienced with some designs of pipe-ventilated motors on account of the fact that a lower pressure exists inside the motor than outside, and in consequence oil has been sucked from the bearings into the



ELECTRIC KITCHEN AT THE OLD SHIP HOTEL, BRIGHTON.

some weeks, and the results obtained, both as regards quality of the food cooked, simplicity of operation, and low cost of working with electricity at 1d. per unit, already surpass the claims which were made by the Electricity Department when the question was discussed by the Directors. Mr. Hindle (the manager of the hotel) and his board are to be congratulated on their pluck and enterprise in fitting up their new kitchen on such an elaborate scale and there is little doubt but that their confidence in this new method of cooking will be amply repaid by the satisfaction of their patrons.

## PIPE-VENTILATED MOTORS

ELECTRIC motors are frequently called upon to work in situations where the surrounding atmosphere is far from favourable to the insulation, to the commutation, and to the brush gear, or where it is imperative that they should be protected from explosive gas or dust. Moisture is the chief source of danger to the insulation in many industries, such as laundries, paper mills, and dye works. In others a fine dust has to be eliminated from the air ventilating the heating parts of the motor. A typical example, for instance, of this class of industry lies in a cement works, where the dust is held so finely in suspension in the atmosphere that no practical filter can remove it, and it would "sand-blast" the windings to destruction in a very short time. Explosive dust is often encountered in collieries, washeries, and screening plants, and in flour mills. In these latter cases, however, where the motor must needs be specially enclosed to prevent explosion, induction motors are exempt from special measures, except that the slip-rings need to be enclosed in

interior of the machines. In a new line of pipe-ventilated motors which has been designed by the General Electric Co., Ltd. (67 Queen Victoria Street, E.C.), special attention has been paid to this point. The motors have been designed specially for pipe-ventilated work, and represent the latest

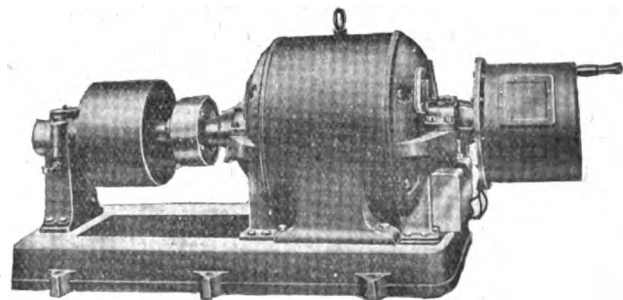


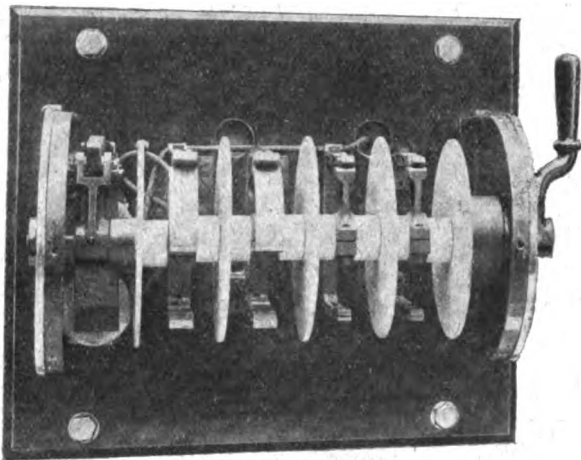
FIG. 2.—250 H.P., THREE-PHASE SLIP RING PIPE-VENTILATED MOTOR.

practice in this direction. Considerable interest attaches to the construction of the bearings of these motors. To avoid the suction of oil, which has been previously mentioned, the bearing is completely separate from the casing, a special bracket being provided. A clear space of air surrounds the shaft where it enters the bearing, so that no suction of oil can possibly take place. The slip-rings of motors with wound rotors are specially designed to exclude dust, great care being exercised at those points where the short-circuiting bar passes

through the slip-ring cover in order to make the protection against dust thoroughly effective. The success which has attended the design of these motors is evidenced by the fact that one firm of cement makers has placed two successive repeat orders for the complete electrification of cement works after the first mill had been in operation for a considerable period. To this one firm alone over 7,000 h.p. of pipe-ventilated motors, together with dust-tight liquid starters and other gear, has been supplied by the General Electric Co.

### FIELD SWITCHES

THE accompanying illustration shows a new pattern of field switch, which A. Reyrolle & Co., Ltd., are fitting to power station generator panels. The switch is of a double-pole type fitted with contacts for a discharge resistance. As will be seen, it is made in the form of a drum controller with a dust-proof cover. The electromagnetic device at the bottom end of the drum is so arranged as to interlock the field switch with the main switch. With this arrangement it is impossible to open the field switch unless the main

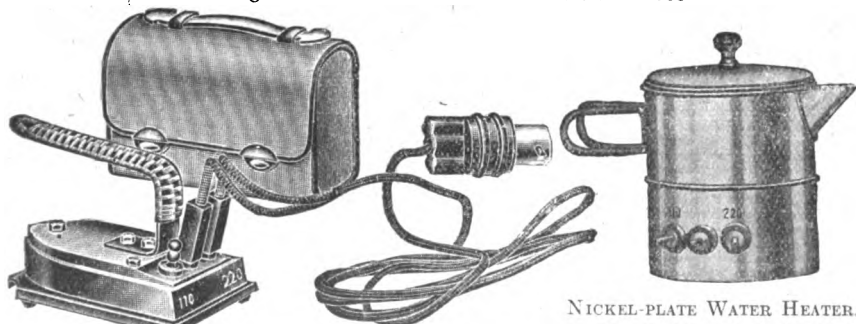


AUTOMATIC FIELD SWITCH WITH COVER REMOVED.

switch is also open. Moreover, the field switch will trip out automatically in the event of the main switch operating. The latter operation is important, as generators are now often fitted with Merz-Price protection, which automatically trips out the main switches in the event of a fault occurring in the winding, thus isolating the faulty generator from the busbars, but it is necessary also to open the field circuit automatically in order to reduce the damage to the machine. For this purpose the field switch is made to trip out automatically immediately after the main switch.

### UNIVERSAL VOLTAGE SUPPLIES

THE Supply Department of the British Westinghouse Electric & Manufacturing Co. (14 Long Milgate, Manchester, and 179 Wardour Street, London, W.) are introducing some useful and interesting electric irons, kettles, coffee-jugs, and other similar heating apparatus which are suitable for any standard voltage between 100 and 250 volts. Three



3 LB. IRON FOR TRAVELLERS.

NICKEL-PLATE WATER HEATER.

terminals are provided which can thus be used as pairs in three different ways and take pressures of about 110, 220 or 150 volts. Some designs, two of which are illustrated here, are particularly adapted for the use of travellers, and they are provided both with an ordinary plug and a lampholder adapter, so that current may be taken from anywhere. The iron illustrated is a 3 lb. iron and goes, together with the plug, adapter and flex, into a neat leather travelling case,

and the water heater is also a compact little piece of apparatus, and inexpensive although it is well finished. The two models shown are fitted with wicker handles, are heavily nickel-plated, and altogether present an extremely elegant appearance.

### SEMI-INDIRECT LIGHTING

AS may be seen by the illustrations, Figs. 1 and 2, here given, the semi-indirect lighting fitting, known as the "Saturn," just put on the market by the Electrical Engineering & Equipment Co., Ltd. (109-111 New Oxford Street, W.), has a number of good points. The bowl and reflector are both fitted with the company's automatic raising and lowering

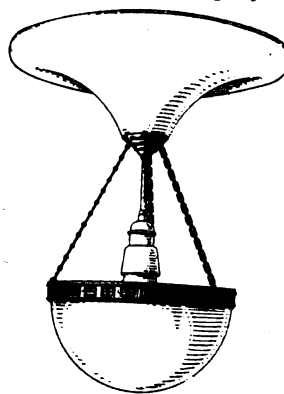


FIG. 1.—"SATURN" SEMI-INDIRECT LIGHTING FITTING IN USE.

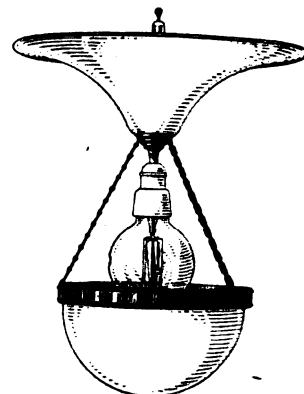
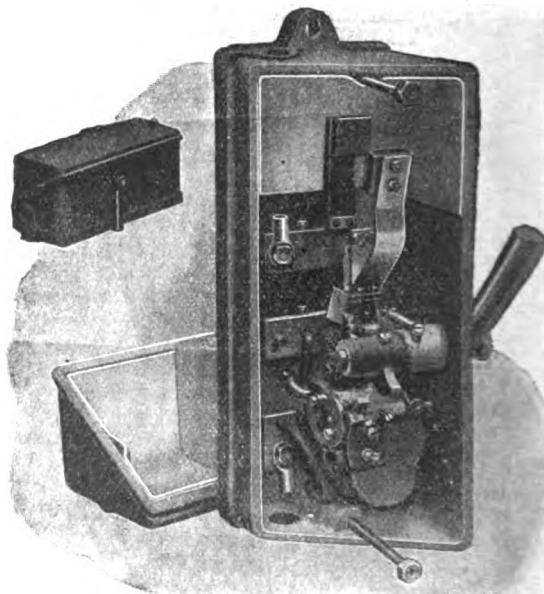


FIG. 2.—"SATURN" SEMI-INDIRECT LIGHTING FITTING LOWERED FOR CLEANING.

gear, similar to that used in its arc lamp contact gears, so that cleaning is facilitated. The possibility of lowering the reflector on the centre stem also makes the erection of the fitting very simple. As the centre stem does not pass through the bottom of the bowl, no black spot immediately under the fitting is produced.

### A NEW CIRCUIT-BREAKER

AFTER numerous experiments, a new design of loose-handle circuit-breaker has been evolved by Switchgear & Cowans, Ltd. (Springfield Lane, Salford). It is known as the "Watchman," and is built entirely on the metal mica prin-



"WATCHMAN" ENCLOSED CIRCUIT-BREAKER

ciple, and enclosed in a strong cast-iron case, which may be sealed. Bow-shaped laminated copper brushes, renewable auxiliary contacts, and carbon breaks are provided. If instantaneous action is not desired, then by the application of Statler's Patent Timelag an adjustable time element may be provided. These breakers are stocked in two sizes, 30 amperes and 150 amperes, drilled for 7/8 in. conduit, and ready for immediate delivery.



## SHOP WINDOW LIGHTING

IN order that the illumination on the displayed goods should bring out their qualities and attract the attention of passers-by to the fullest extent, it is advisable that shop windows should be lighted in a similar way as is the stage of a theatre. Exposed lamps should not be used there except when they



WINDOW IN NORWICH LIGHTED WITH THE AID OF PRISMATIC GLASS REFLECTORS.

form an essential part of a particular scene, and their use in such cases serves to remind one of the greater comfort and restfulness of concealed light sources. Window lighting, to be effective in the highest degree, should be accomplished by means of lamps so placed that their direct rays cannot shine into the eyes of the observer while he is looking in the window. In this way emphasis is placed upon the goods displayed, and not upon the lamps which light them, because these are concealed. A successful method of window lighting along these lines is that designed by the British Thomson-Houston Co. (77 Upper Thames Street, E.C.). In this system Mazda electric lamps are fixed in a single row along the front edge of the window where the ceiling and plate-glass meet. Reflectors are, of course, necessary to project the light downward and back into the window. X-ray silvered glass or Holophane prismatic glass reflectors are generally used for this purpose. A recent window lighting installation on this system is that of Messrs. Chamberlins (drapers), of Norwich, illustrated here. The units employed here consist of Mazda lamps in prismatic glass reflectors fixed along the top front edge of the window, and concealed by means of a narrow curtain running the whole length of the window.

## AN ELECTRIC CLOCK INSTALLATION

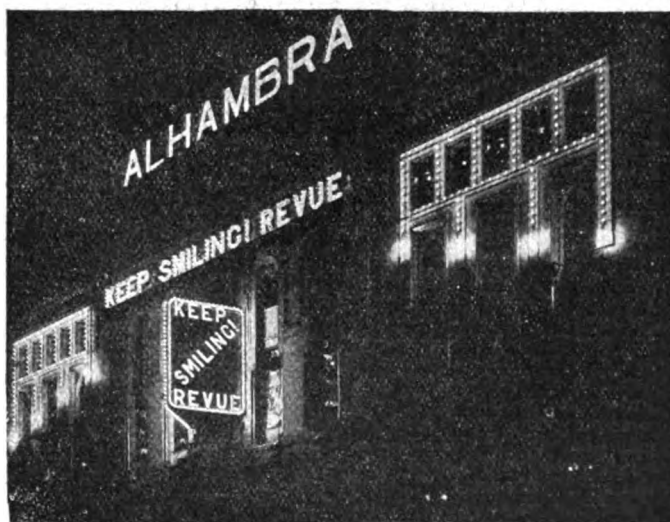
THE London Hospital used to be provided with no less than 192 eight-day clocks of every variety, but considerable difficulty was experienced in keeping these all accurately in time together, hence the decision to equip the Institution with the "Synchronome" system of electrical time service.

In this system the dials are merely clock faces, the ordinary works being dispensed with in favour of one wheel and an electro-magnet, by means of which the hands of all of them are advanced one half-minute at a time in perfect synchronism. The controlling pendulum or electrical time transmitter which operates them is entirely automatic in its action, and is synchronised every hour from Greenwich. It sends out electrical impulses every half-minute to the dials, upwards of 200 of which have been fixed in the great Hospital buildings, the Medical College, Nurses' Homes, &c. The occasion of starting this time service was marked by a little ceremony of inauguration on November 3rd, when the Governors of the Hospital gathered round the controlling pendulum in the telephone exchange room at the entrance hall to see the first time signal arrive at 4 p.m., and to hear Mr. F. Hope-Jones, the inventor of the system, briefly describe the installation. On the completion of the installation the clocks throughout the Institution had been set to 4 o'clock, and the pendulum was held to one side by means of an electro-magnet controlled from Greenwich Observatory. Precisely at 4 o'clock the pendulum was released and sent out its first impulse

to the 200 dials, advancing them half a minute. Theoretically the installation should continue to go for all time, untouched by human hands except for the charging of the battery for half an hour once a month. Many precautions are taken to prevent accidents, and even the possibility of severance of the line wire during building alterations has been provided against by means of a device designed by Mr. H. Tuffrey, the Contractors' Manager, which, upon a disconnection or other irregularity in the line, immediately cuts the faulty section out of the circuit without the loss of a single half-minute impulse. The method of synchronisation is worthy of mention. According to whether the minute hand is before the sixtieth minute or on or after it, so the Greenwich signal is directed through one of two electro-magnets whose functions are to put a small weight on a tray on the pendulum rod if the clock is slow, or take it off if fast. The work has been carried out in its entirety by The Synchronome Co., Ltd., of 32 and 34 Clerkenwell Road, under the supervision of Mr. Oatley, Surveyor of the Hospital, who has introduced into this installation a special waterproof type of dial for the wards, inserted in the walls.

## A MAZDA SIGN

ONE of the most brilliantly effective efforts in the direction of electric signs which are now so popular in theatre-land is the exterior lighting of The Alhambra. About 1,800 20-watt 100-volt Mazda lamps are employed for this purpose. The installation on the Leicester Square frontage consists of two signs, one flat and one projecting, advertising the "Keep Smiling" Revue. Above these is the word "Alhambra," in glaring letters about 86 in. high. The windows on either side of the entrance are outlined with Mazda lamps. There are also some smaller signs on the other side of the building. Mazda lamps are also used inside The Alhambra. The lamps were supplied, and the installation was designed, by the British Thomson-Houston Co., Ltd., but a great deal of



MAZDA SIGN AT THE ALHAMBRA.

credit for the effectiveness and excellent workmanship of the central projecting sign is due to Electric Installations, Ltd., who changed the wording from "8d. a Mile" to "Keep Smiling."

**Benjamin Steel Reflectors.**—The Benjamin Electric, Ltd. (117 Victoria Street, S.W.), announce that after considerable experimental work they have developed a special interior surface which will in future be applied to all Benjamin steel reflectors. This surface is obtained by a transparent coating which forms a simple protective surface over the aluminium reflecting medium, which allows all reflectors so treated to be cleaned very easily, and this surface will be referred to as the "Ezekleen" reflecting surface. The ordinary aluminium surface shows depreciation in efficiency after a short service, due to the dirt particles, which it is impossible to remove as they go into the pores of the aluminium, but with the "Ezekleen" reflecting surface this disadvantage is overcome. This adds further to their extreme usefulness for factory and all industrial lighting, as it increases their utility and efficiency at no extra cost to the consumer.

## THE GLASGOW ELECTRICAL EXHIBITION

WE are now able to illustrate the well-arranged Siemens stand, already described in our columns, and to give a few notes on stands not mentioned in our first and second notices.

The British Westinghouse Electric & Manufacturing Co., Ltd., have a comprehensive selection of lamps and cooking and heating apparatus. A Westinghouse horizontal gas engine is shown direct coupled to a continuous-current generator, and a novelty is the "Dim-a-Lite" attachment for use in conjunction with incandescent lamps. The Western Electric Co., Ltd., show specimens of electric lighting, power, and telephone cables, with suitable joint-boxes and requisites for aerial and underground systems. A specimen of an 800-pair telephone cable is splayed out in the form of a tree, and the latest types of telephones are shown, including mining instruments conforming with the



Home Office requirements. At the stand of Electric Control, Ltd., are to be seen in operation several types of automatic controllers, including push-button and car-switch types of lift controllers, also controllers for automatically starting and stopping air compressors, hydraulic pumps, &c. There is also a complete arrangement of automatic gear in connection with a plate-edge planer as installed in shipyards and steel mills. Thomas Keesnor & Co. show an elevator controller for use with car-switch and push-button lifts, also a small service controller for use with service lifts. A special feature is the new automatic motor starter with single-pole main switch. The strong qualities of the Mazda lamps are demonstrated at the stand of Fraser & Borthwick by means of a motor-driven vibrating machine. The exhibit of McNaughten & Watson includes a collection of bakery machines, including whisk and dough-mixing machines driven by electric motors. Another item is the electrically-driven "Perfect" dairy cream separator. There are also on view a band sawing machine, meat-cutting machinery, drills, and fans, all electrically driven.

## THE EDISWAN SCREW-CAP LAMP

THE Edison & Swan United Electric Light Co., Ltd., have recently introduced a miniature form of drawn-wire metal filament lamp in cone-shaped bulb for voltages from 100 to 125, in sizes from 10 to 40 watts. This is a lamp in large demand abroad, having a bulb of small dimensions, only 4 in. overall length and 1½ in. diameter; consequently a much larger number can be shipped per standard case. For this reason this lamp has been much sought after by exporters, because it effects a saving in freight.



## ALBA GLASS

ALBA, as most of our readers know, is a white, translucent glass of special composition. It is used in the form of reflecting bowls for semi-indirect lighting, and in the form of balls and globes for direct lighting. Apart from its very beautiful appearance, the chief characteristics of Alba glass are its high reflecting efficiency, low absorption, and excellent diffusion.

A brief *résumé* of the chief points of difference between Alba and the many other kinds of white glassware which are still in use will be of interest. It was realised some years ago that, of the various kinds of glass globes and reflectors in use, none was entirely satisfactory. Most absorbed too much light; many possessed the serious demerit of "selective absorption," that is, they did not absorb to an equal extent the various rays radiated by the light source. Another defect was imperfect light diffusion. These criticisms apply to the numerous opal, alabaster, and opalescent glasses still on the market. Opal glass is a milk-white glass consisting of a single layer. It absorbs a great deal of light, and owing to its selective absorption takes on a slight, but very undesirable, reddish tint. Alabaster glass usually consists of a layer of clear glass with a thin layer of opal glass inside. This is sometimes called poly-case glass. It does not absorb so much light as ordinary opal glass, but gives a more pronounced reddish tint to the light, for the simple reason that it is not so dense as opal glass, and the light source is more easily seen. Opalescent glass is a single layer of glass somewhat similar to alabaster in appearance, but less dense, so that the colour effects are even worse. The manufacturers of Alba set themselves the task of producing a glass which should have none of the defects mentioned above. After considerable investigation and experiment they were successful, and the result is Alba. Alba glass is sufficiently dense to screen the light source completely; it absorbs only a negligible amount of light, and that not selectively; and it diffuses the light perfectly, so that the whole surface is uniformly brilliant. The result is produced by numerous small particles held in suspension in the glass. These suspended particles break up the light rays and give a high degree of diffusion with the minimum of absorption. In Alba bowls and globes for interior lighting, the glass is pressed into form, and the suspended particles are concentrated,

giving the glass a denser appearance than is the case with the Alba street-lighting balls, which are blown. The latter are extensively used throughout the United States and Canada for ornamental street lighting, and several installations have recently been made in London.

We have just received from The British Thomson-Houston Co., Ltd. (Mazda House, 77 Upper Thames Street, E.C.), a copy of a new folder (No. 82336) which describes, illustrates and prices various forms and sizes of Alba glassware. This folder is particularly well illustrated and gives an excellent idea of the beauty of the various designs of Alba bowls, spheres and globes. All who are interested in illumination should make a point of writing for a copy of this folder (contractors can have quantities overprinted with their name and address), or, better still, visiting the Company's new showroom at Mazda House and personally inspecting samples of what undoubtedly represents one of the greatest recent developments in lighting glassware.

## PATENT LOUD SPEAKING TELEPHONES

COMPLETE INSTALLATIONS FOR

**WARSHIPS, MERCANTILE VESSELS,  
MINES, POWER STATIONS, Etc.**

Adopted by the British Admiralty, Foreign Governments, the Leading Shipping Companies, and as used in many Electrical Generating Stations.

**ALFRED GRAHAM & CO.,**

ELECTRICAL ENGINEERS AND CONTRACTORS,  
ST. ANDREW'S WORKS, CROFTON PARK, LONDON.

# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 360 [VOL. IX., No. 47]  
*All rights reserved.*

THURSDAY, NOVEMBER 20, 1913.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES and TECHNICAL COLLEGE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

*Other Advertisement Rates on Application.*

#### *Latest Time for Receiving*

Letters for Insertion, *Tuesday first post.*

Small Advertisements and Official Announcements, *Wednesday first post.*

Displayed Advertisements, *Tuesday first post.*

Corrections in Standing Advertisements, *Monday first post.*

All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 308-306, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Oiroing, Fleet, London."

Telephone No.: 5509 Holborn.

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

A BRADFORD weaving shed, in which a crossshaft system of group driving is employed, and electricity used for lighting, cooking, ventilating fans, &c., is in successful operation. (Page 645.)

A RECENT paper by Messrs. I. Langmuir and J. A. Orange, read in America, discusses the nitrogen-filled half-watt incandescent lamp from several points of view. (Page 646.)

MR. DUDELL's address to the Institution of Electrical Engineers on Thursday last, on pressure rises, dealt with a subject that synchronises with some notes which we publish on special precautions recently adopted on the Brighton supply system for prevention of damage due to this cause. Mr. Duddell dealt with surges due to resonance switching and arcs, and said that oil switches used for breaking very small currents sometimes arc, though they do not do so with large currents. Mr. Duddell also hinted at the possibility of the presence of hydro-carbon vapours facilitating arcing in cable breakdowns. (Page 647.)

MR. D. H. OGLEY writes regarding the effect of variations of voltage on metal filament lamps. (Page 648.)

A PAPER by Dr. A. Lederer contains illustrations showing the different crystallising effect of alternating and continuous currents on tungsten filaments. (Page 648.)

A TWO-RATE tariff system, in which an automatic switch actuated by the magnitude of the load is em-

ployed, instead of a time-switch, was suggested by Mr. H. H. Perry at a meeting of the Institution of Electrical Engineers at Birmingham. (Page 649.)

A REPORT on electricity undertakings in Germany, in which companies and Local Authorities are jointly interested, is reviewed on page 649.

DURING the week a patent dealing with the Moore tube system of lighting will expire after a full life. Opposition has been entered to the grant of a patent to J. Close for visual mine-shaft signals. Among the specifications published by the Patent Office last week is one by J. G. Balsillie, and one by E. Girardeau dealing with wireless, and one by J. T. Irwin describing an astatic electro-dynamometer. (Page 650.)

POSSIBLE causes of irregularities in the working of an electric lift are discussed in our Questions and Answers Columns. (Page 651.)

OFFICIALS from the Victorian Government Railways will shortly be in London inspecting electric railway systems.—An estimate has been prepared of the cost if the Stirling Corporation purchases and works the local tramway system, instead of the recent offer by a private company being accepted.—The Greenock Corporation is against a suggestion to purchase the local tramways. (Page 652.)

THE Post Office has decided to erect ten additional automatic telephone exchanges in different parts of the country.—Application is being made for prolongation of the "telewriter" patent.—The formula for the radiation decrement of aerials for wireless telegraphy was developed by Mr. J. Pletts in a recent lecture. Among the other matters dealt with was the variation in signals with atmospheric conditions, which subject has been experimentally investigated by Herr Mosler, who finds that the variations noticed may be put down to periodic fluctuations in the conductivity and reflective properties of the upper ionised air strata. (Page 652.)

A LARGE order for cables for the electric traction scheme on the London and South-Western Railway has been executed by Siemens Brothers & Co. (Page 653.)

A REDUCTION gear of very large ratio is described and illustrations are given of novelties in decorative and indirect lighting on page 654.

RUBBER-SHEATHED cables, telephone instruments, crane magnets, and incandescent lamp advertisements, form the subjects of articles on page 656.

EXPENDITURE upon plant and mains is contemplated as follows:—Hereford (£1,000); Basingstoke (£14,000); Wolverhampton (£22,000); Radcliffe (£3,950); Hackney (£56,748); Wallasey (£65,000); Loughborough (£14,000); Bradford (£90,000).—A power station is required by a Cornwall Clay Company; transformers and converting plant at Shoreditch; motors and motor-starters at Birkenhead; an electric pumping plant in New Zealand; H.T. switch panels at Plymouth. (Page 657.)

THE Sunderland Corporation are reducing the charge for heating and cooking from  $\frac{3}{4}$ d. to  $\frac{1}{4}$ d. where the premises are electrically lighted.—The income of the Leeds Electricity Department for the past half-year was 19 per cent. in advance of the corresponding period of last year.—The Weston-super-Mare Council has decided upon a certain amount of public electric lighting in preference to gas.—It is estimated that the Hove Corporation will have to pay £175,000 for the local electric lighting undertaking.—The Lytham Council has decided to promote an electric lighting scheme of its own in preference to taking current from the St. Annes electricity works.—Professor W. M. Thornton has reported on behalf of the Hebburn Council with respect to the recent failures on the 240-volt continuous-current cables into which the Board of Trade is now inquiring. (Page 658.)

### ARRANGEMENTS FOR THE WEEK

FRIDAY, NOVEMBER 21st.

*Institution of Electrical Engineers: Newcastle Section.*

7 p.m. At Hugh Bell School, Middlesbrough. "Steam Boiler Working in Electrical Power Stations," by J. W. Jackson.

TUESDAY, NOVEMBER 25th.

*Institution of Electrical Engineers: Manchester Students' Section.*

7.30 p.m. At Municipal School of Technology. Address by Prof. W. E. Marchant.

WEDNESDAY, NOVEMBER 26th.

*Institution of Electrical Engineers: Birmingham Section.*

7.30 p.m. At University. "The Characteristics of Insulation Resistance," by S. Evershed.

*Institution of Electrical Engineers: Students' Section.*

7.45 p.m. At Victoria Embankment. Address by Dr. C. V. Drysdale.

*Institution of Civil Engineers: Students' Section.*

Visit to Metropolitan Railway Power Station, Neasden.

THURSDAY, NOVEMBER 27th.

*Institution of Electrical Engineers.*

8 p.m. "The Characteristics of Insulation Resistance," by S. Evershed.

FRIDAY, NOVEMBER 28th.

*Physical Society.*

5 p.m. At Imperial College of Science, S. Kensington. The agenda includes the exhibition of a Double-Fibre String Galvanometer," by W. Apthorpe.

### The London Electrical Engineers.

(To-day) THURSDAY, NOVEMBER 20th.—*C. Company.* Technical Instruction, 7 to 10 p.m.

FRIDAY, NOVEMBER 21st.—*D. Company.* Technical Instruction, 7.30 to 10 p.m.

SATURDAY, NOVEMBER 22nd.—*Headquarters* open from 10 a.m. till noon.

MONDAY, NOVEMBER 24th.—*A. Company.* Technical Instruction, 7 to 10 p.m.

TUESDAY, NOVEMBER 25th.—*B. Company.* Technical Instruction, 7 to 10 p.m.

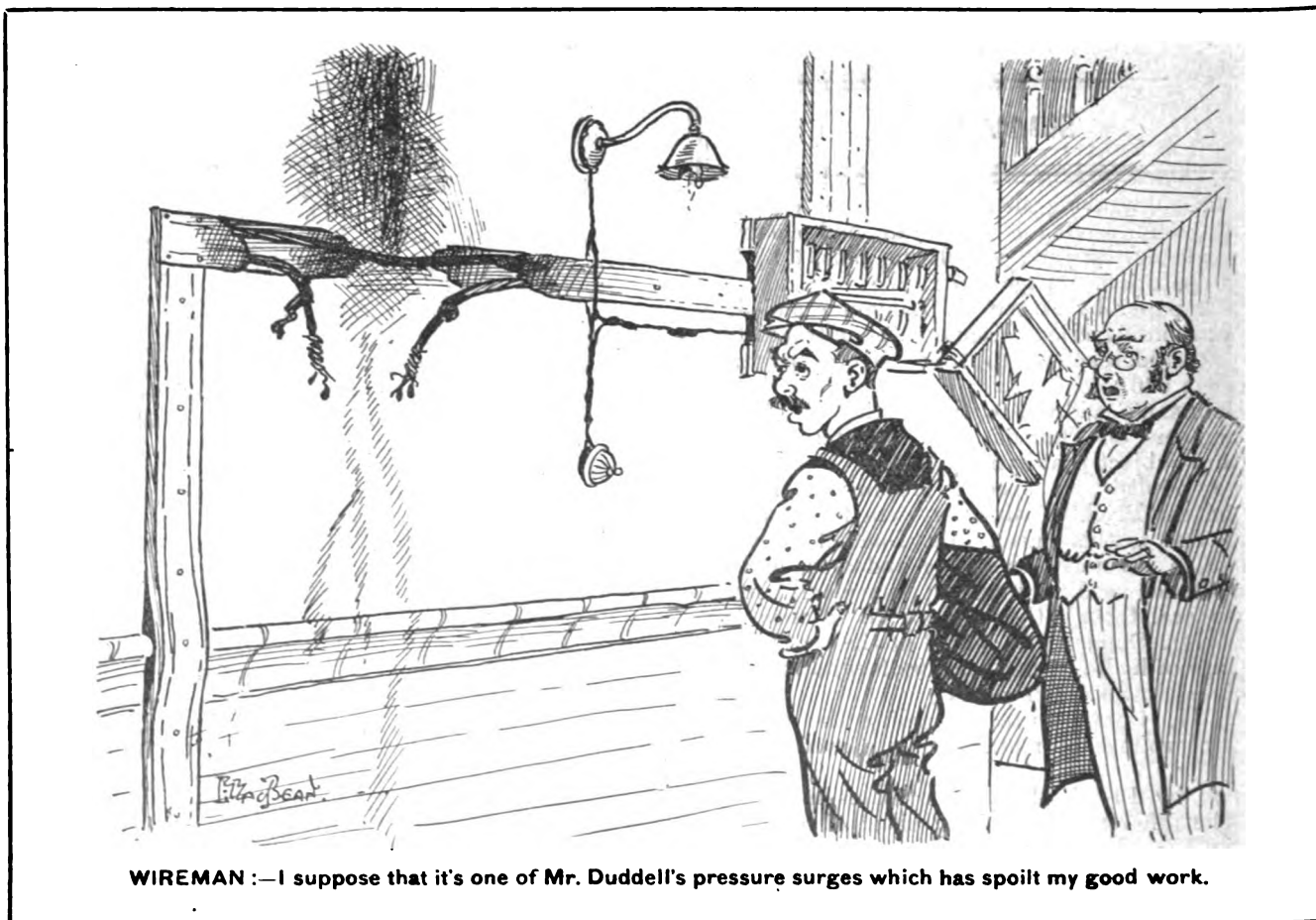
WEDNESDAY, NOVEMBER 26th.—*Recruits only.* Infantry Drill and Technical Instruction, 7 to 10 p.m.

THURSDAY, NOVEMBER 27th.—*C. Company.* Technical Instruction, 7 to 10 p.m.

FRIDAY, NOVEMBER 28th.—*D. Company.* Technical Instruction, 7.30 to 10 p.m.

SATURDAY, NOVEMBER 29th.—*Headquarters* open from 10 a.m. till noon.

**An Electrostatic Oscillograph.**—A Paper by Messrs. H. Ho and S. Koto, read at a recent meeting of the Physical Society, describes an electrostatic oscillograph suitable for recording very high voltages. Two vertical bronze strips pass symmetrically between two parallel metallic plates called "field plates." They are connected at their lower ends by a silk fibre, which passes under an ivory pulley. An extremely small mirror is fixed to the strips. This arrangement constitutes the vibrator, which, mounted on an ebonite frame, is immersed in an oil bath. To the upper extremities of the strips are connected the terminals of a direct-current voltage of about 300. The alternating voltage to be recorded is connected to the "field plates," in parallel with which there are two oil condensers in series. The electrical midpoint of the direct-current battery is connected to a point between the condensers. The turning moment on the strips is proportional to the product of the momentary values of the alternating-current voltage and the direct-current voltage, so that if the latter is constant the deflection of the mirror accurately follows the variation of the former. Oil plays an important part, not only acting as a damping agent and insulator, but increasing the sensitiveness on account of its high dielectric constant. In cases where the voltage is low, but the source of energy is so limited that a sufficient current cannot be taken to actuate the ordinary oscillograph, the electrostatic vibrator may be used by applying the voltage in question to the strips, while the terminals of a high-tension battery, or influence machine, are connected to the "field plates." The instrument may also be used for recording very small currents by replacing the oil condensers by two exactly equal resistances, which are traversed by the current.





## AN ELECTRICALLY-DRIVEN WEAVING SHED

**A**LTHOUGH it is generally difficult to obtain truly comparative costs of the electrical and steam driving of textile mills, yet the continued rapid supersession of steam by electricity gives a true indication of the trend of responsible opinion. At the present time the Electricity Department of the Bradford Corporation alone has 6,590 h.p. in motors for looms, dyeing works, and other textile applications connected to its mains. Compared with some other installations, the weaving shed of John Emsley & Co. (Park Side Mills, Raymond Street, Bradford) does not take much power, but it has a complete electrical equipment, and is arranged for the comfort of the employees. Instead, however, of individual drive, a system of group driving is employed.

The weaving shed, at which some 300 hands are employed, started working about eighteen months ago, and contrary to the usual practice the building consists of only two floors. The size of the upper one, which constitutes the weaving shed, is 77 yds. by 55 yds., providing space for 841 looms for pieces from 45 to 63 in. wide, over half of which are of the Jacquard type. These are arranged in thirteen rows, driven from seven shafts by half-crossed belts. A 20-h.p. enclosed squirrel-cage induction motor, controlled only through a star-delta switch, drives each shaft through a roller-rocker chain running in an oil-bath. These arrangements are shown in the illustrations, Figs. 1 and 2. The normal motor speed is 720 r.p.m., and owing to the liberal rating this is maintained practically constant. The shaft runs at 185 r.p.m., whence the looms are driven at 130 to 160 r.p.m. Between 600 and 650 pieces per week are dealt with. The arrangement of shafting adopted allows of a reduction by about one-third of that required if the more usual plan of erecting it, parallel to the longitudinal axis of the looms, is followed. In addition, it is said that the effective lighting of the looms is more easily carried out, the risk of oil and grease being thrown into the work is reduced, and the operator is given more freedom. With individual drive these advantages are still more effectively attained. The lighting of the looms is carried out by 40-watt half-frosted metal filament lamps in specially designed steel reflectors. The lighting is arranged in four sections, and one switch controls twelve lamps. An interesting accessory of the looms is an arrangement by which each thread is weighted, while in tension, by a metal carrier which, should the thread break, falls and closes the circuit through an electromagnet which effects the transference of the driving belt to the idle pulley.

As soon as a piece is finished, it is taken to an adjoining room on the same floor, known as the piece room, where a search is made for defects. This room, which is 22 yds. by 26 yds. in area, is lighted by four 500 c.p. mercury vapour lamps provided with suitable reflectors to transform a number of the blue rays to red rays. These lamps are run four in series on 230 volts through a mercury vapour rectifier.

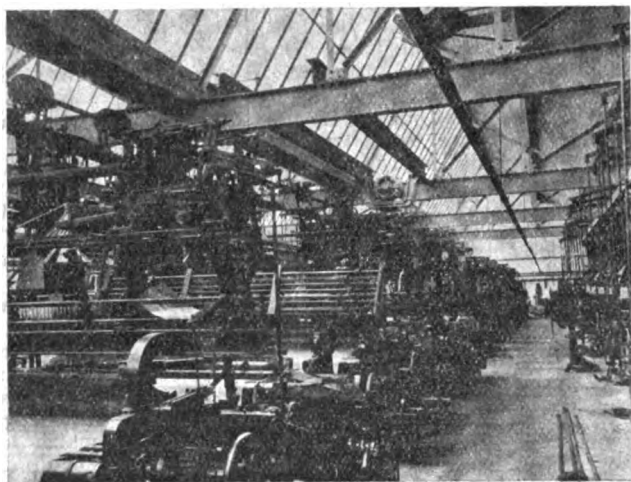


FIG. 1.—VIEW IN WEAVING SHED, SHOWING DRIVING MOTORS AND SHAFTING AT RIGHT ANGLES TO THE LOOMS.

Ample ventilation is obtained by means of fourteen 24 in. reversible fans driven by squirrel-cage motors. Each of these takes about 0.3 h.p., and is started by being switched direct on to the 400-volt three-phase mains. The fans are usually run so as to induce a current of air through the building, but in summer time one half is driven inducing

and the other half forcing, so that a continuous air current is ensured. In summer, therefore, the building is cooled, and in winter the air is warmed by a complete system of steam heating provided by a return fire-tube boiler fitted with induced draught.

A supply at 6,500 volts three-phase 50-cycles is given to two oil-cooled transformers in a separate part of the basement, which, however, is not under the control of the mill authorities. From these transformers a 400-volt three-phase supply is given to the mill. All the motors are supplied at this pressure. They are divided into nine circuits, each with its

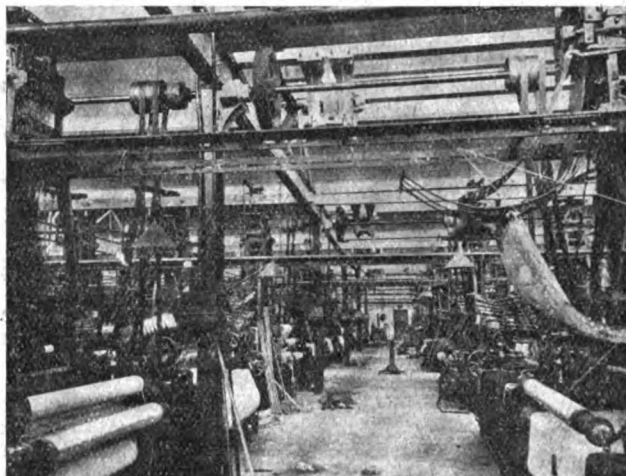


FIG. 2.—VIEW IN WEAVING SHED, SHOWING MOTOR-STARTERS, SUSPENSION OF DRIVING MOTORS, AND GEARING (GEAR CASES REMOVED).

own meter, seven for the weaving shed, one for the warp twisting room, where a 15-h.p. motor suffices for all requirements, and one for the miscellaneous applications. There is only one power switch. This is ironclad, and fitted with overload and no-voltage attachments. By a system of push-buttons it can be opened from a number of points throughout the mill. The lighting is equally balanced across each of the three phases, and is therefore at 230 volts. Separate switches control this, while there are also pilot circuits controlled through another switch. All the wiring is carried in screwed conduit.

The miscellaneous applications of electricity include a goods lift driven by a 5-h.p. motor for transporting material to or from the stock-room and weft cellar in the basement, or the weaving shed on the higher floor. A room has also been set apart to provide a mess-room, but at present it is only used as a kitchen for cooking the employees' food. A 5-kw. oven with hot-plates and grill, and a 4-kw. hot-cupboard divided into two sections, with two heats each, are provided. Hot water is obtained in the summer from two 18-gallon electric urns, but in the winter the hot-water supply is used. A system of inter-communication telephones and electric clocks is also provided.

Most of the looms were previously used in a steam-driven shed, and since the change in the method of driving they have been speeded up by  $7\frac{1}{2}$  to 10 per cent. The demand is just over 100 kw., and about 60,000 units are required per annum for all purposes. The charges for power are £3 per kw. of demand plus  $\frac{1}{4}$ d. per unit less 25 per cent., so that the total power costs are approximately £600 per annum for driving, lighting, cooking, ventilating, &c. The cost of the shed including building and all the equipment, except the looms, was £12,300, the greater part of which was for the building itself. Mr. J. E. Schofield is reading a Paper early next year before the Yorkshire Local Section of the Institution of Electrical Engineers, in which some detailed comparative costs will be given.

We are indebted to J. Emsley & Co., and to Mr. T. Roles, City Electrical Engineer, Bradford, for permission to view the shed and to publish this description.

**Institution of Electrical Engineers.**—At the opening meeting last Thursday the President moved that the guarantors of the building fund be released, as the Institution now had ample funds in hand. The motion was agreed to.

## HALF-WATT LAMPS

A PAPER on high efficiency tungsten lamps, by Messrs. Irving Langmuir and J. A. Orange, of the research laboratory at Schenectady, was read before the American Institute of Electrical Engineers last month. The authors dealt at somewhat greater length than in a previous article (*ELECTRICAL ENGINEERING*, October 9th, p. 567) with the causes of blackening in metal filament lamps and the present position of the half-watt lamp in America.

The early experiments with tungsten lamps containing nitrogen were made with ordinary single-loop filaments of 0.005 and 0.010 in. diameter placed in long heater lamp bulbs. The filament was run at a temperature of 2,850° C. absolute. The efficiencies were 0.65 and 0.56 watts per c.p. respectively, and the lives were about 90 and 300 hours respectively. The bulbs opposite the filaments remained clear, although a slight brown deposit of tungsten nitride collected in the upper part of the bulbs. The candle-power remained about 80 per cent. of the initial during their entire life, failure being due in every case to breakage of the filament after it had decreased considerably in diameter. Similar evacuated lamps gave efficiencies of 0.41 watts per c.p., but the candle-power was reduced to 80 per cent. in about forty minutes, and the filaments burnt out after two to five hours. These results indicated the desirability of using filaments of large diameter, the improvement in efficiency being due to the relatively greater heat loss by convection from small wires. The life of a filament is determined largely by the loss of tungsten by evaporation, and has been found to be dependent on the relative decrease in diameter thus produced. This evaporation in nitrogen is, however, chiefly a diffusion process and probably obeys laws similar to those of conduction or convection of heat from a wire, i.e., for wires of small diameter the actual amount of tungsten evaporated would be nearly independent of the size of the wire. The rate of evaporation per unit area would thus be approximately inversely proportional to the diameter. Thus the relative lives are nearly proportional to the squares of the diameters. This was the reason that means had to be found to increase the effective diameter of the filament without decreasing its resistance. The method of winding the filament into a tightly coiled helix has proved more satisfactory than the use of a tubular filament for general purposes, though special constructions have been adopted with advantage in some cases. With a single-loop filament there is always present the tendency for the current to overheat any parts which become thinner than the rest. The overheating increases the rate of evaporation and rapidly causes failure at these "bright spots." Since tungsten is a relatively soft metal at the working temperature, it will sag too much if the helix is wound on too large a mandril, and in practice it is designed so that the amount of sagging during life will be perceptible, but will not be enough to cause too great a change in the characteristics of the lamp. If any part of the filament should, for any reason, evaporate more rapidly than the rest, this portion will have less mechanical strength than the rest and will sag more rapidly. The helix will therefore open out wherever the filament becomes thin, and this will cause increased heat loss both by convection and radiation, and thus prevent local overheating or spotting. The use of helically wound filaments increases the life of the lamp many times beyond the life that would be obtained with a straight filament running at the same efficiency. This is especially true of the smaller sizes of wire.

In ordinary lamps about 20 per cent. of the energy radiated from the filament is intercepted by the glass and causes heating of the bulb. In the nitrogen lamp there is an additional amount of heat, ranging from 6 to 40 per cent. of the input, carried to the bulb by convection. Most of this heat is convected vertically upwards, and so the relatively small upper area of the bulb tends to become overheated. Unless special precautions are taken, this overheating will cause liberation of enough water vapour to attack the filament and cause blackening of the bulb. Thus if small bulbs are to be used, the filament should be placed in the lower part, while in addition this gives a sufficient surface of glass in the upper part for the deposition of the tungsten nitride. For this reason bulbs are often made with their height considerably greater than their horizontal diameter. By special design of the bulb, satisfactory lamps have been made with bulbs of only one-half to one-third as large a volume as that of evacuated lamps of the same wattage. This means that for bulbs of the same volume the nitrogen lamps give roughly from five to ten times the candle-power of evacuated lamps. The upper parts of the

bulbs are often 100 to 200° C. or more, while the lower parts are sometimes much cooler than this, although closer to the filament. Several special varieties of heat-resistant glass have been used for the bulbs, making considerably smaller ones possible, as well as rendering it easier to get rid of water vapour. Transparent quartz bulbs have been tried, but do not seem to have sufficient advantage over some of the special glasses to offset their present high cost.

For some of the larger size lamps taking from 20 to 30 amperes it has been necessary to devise special types of leading-in wires. Platinum has been discarded entirely, even in the smaller sizes, and generally alloys having the same expansion as the glass are used. In many of the larger lamps the leading-in wires pass through the lower end of the lamp, so that they may be short, but in some cases they are brought in from the top. This requires more care in the construction of the seal if it is exposed to the heat from the convection currents. Deflecting screens are sometimes used.

The authors say that it may be worth while, even if no gain in efficiency over the evacuated lamp results, to use nitrogen in low-current lamps, so as to obtain better colour of the light and higher intrinsic brilliancy. With regard to the upper limit of current, a lamp taking 60 amperes and giving 6,600 c.p. at 0.4 watts per c.p. has been successfully run. As the size of filament, and therefore the current, is increased, a limit in efficiency of 0.2 watts per c.p. is fixed by the melting point of tungsten. However, unless special expedients are employed, the cooling effect of the leads lowers the efficiency inversely as the pressure, but the effect is nearly independent of the size of wire. This is not regarded as being very important for lamps designed for working above 10 volts.

No serious difficulty, say the authors, has been met in making high voltage lamps. In nitrogen at atmospheric pressure there is no tendency toward arcing, even at 250 volts. Many lamps taking 6 or 7 amperes at 110 volts have been made up and run at 0.6 to 0.7 watts per c.p. with a life of over 1,000 hours. The filament temperature is 400-600° C. higher than that of ordinary lamps, while the light approaches nearer to daylight in colour than any other illuminant except the D.-C. arc and the carbon di-oxide Moore tube. The intrinsic brilliancy of the filament is about 1,200 c.p. per sq. cm., compared with about 1,150 c.p. per sq. cm. for ordinary metal filament lamps. The light practically never falls below 75 per cent. of its initial value, and generally the filament fails by fracture, while the light is well above 80 per cent. of its initial value. This decrease is due to the filament sagging and not to deposit on the bulb.

The candle-powers given in the paper were taken in a horizontal direction perpendicular to the filament if that was in the form of a loop, and measurements have shown that with a helically-wound filament the distribution of light in a horizontal plane is almost perfectly uniform. The ratio of mean spherical to maximum (practically mean) horizontal candle-power has been found to average about 84 per cent. for lamps with single loops of helically-coiled wire. Projector lamps in which the maximum light is thrown in a given direction are being designed.

The method of photometry used in the tests was to assume the temperature to be the fundamental variable, and this was determined by colour match with the Lummer-Brodhun photometer. The temperature was defined by the equation  $T_{\text{abs}} = 11,230 \div (7.029 - \log H)$  where  $H$  is the intrinsic brilliancy of the filament in international candle-power per sq. cm. of projected area. A number of temperature standards are made from well-seasoned high-voltage lamps with the anchors tightly pinched into the filaments so as to prevent variable cooling effects. The readings are determined by comparison with the light from a portion of a stout filament (say 10 mil. or 0.025 cm.), which can be accurately measured. As these standard lamps cannot be run at the same temperature as the nitrogen-filled lamps, a special blue glass was found, by means of which a good colour match could be obtained. This glass was made into screens of different intensity. It may be shown theoretically, and is confirmed by experiment that if  $T$  is the temperature of the filament viewed through the screens  $A, B, C$ , &c., and  $T_1$  the temperature of a filament which matches the other, then  $1/T - 1/T_1 = a + b + c$ , &c., where  $a, b, c$ , &c., are the constants of the screens  $A, B, C$ , &c. When the constants are once obtained, a number of standard temperatures ranging from 2,250° C. to 3,600° C. are available.

During the discussion, Mr. J. W. Howell took exception to the statement that ordinary tungsten lamps fail owing to blackening of the bulbs. This was only true, he said, of large lamps. The ordinary 40-watt lamp remained useful until the filament

broke. He had long recognised three kinds of blackening:—(1) Due to evaporation, which advanced uniformly during the life of the lamp; (2) irregular or mottled discolorations, traced to the presence of a residual gas; and (3) discoloration due to water vapour. The effect of this was different on different lamps, as shown by samples exhibited. Replying to the discussion, Dr. Langmuir said that he attributed the greater brilliancy of the inner surfaces of the helix to cross reflection of the light, as the temperature there could only be a few degrees higher than on the outside. At very low pressures uniform blackening deposits could be obtained on the glass, while conversion currents were set up only at higher pressures. He did not think that nitrogen-filled lamps would be made much

smaller than 500 watts, but lamps up to 25,000 or 50,000 c.p. with ultimate efficiencies of 0.3 watt per c.p. could be made. The results of experiments had so far shown that argon was better than nitrogen, and as soon as this gas became available on a commercial scale, it would be substituted. He thought it could be made cheaply on a large scale. The pressure of the nitrogen in the bulb was about two-thirds of an atmosphere, so that it did not exceed one atmosphere when in use. No advantage was indicated by using higher pressures, and in case of fracture of the glass, there would be more likelihood of the broken glass being thrown outwards. The lamps did not flicker on 25-cycle alternating-current circuits.

## PRESSURE RISES

THE subject of Mr. W. Duddell's address to the Institution of Electrical Engineers is well illustrated by some happenings on the Brighton supply system, where special methods have to be taken to meet phenomena of this kind. Before giving our report of Mr. Duddell's address, we will briefly indicate the measures taken at Brighton, information regarding which has just been sent us by Mr. J. Christie (Borough Electrical Engineer).

The matter arose out of a curious mishap last January (see *ELECTRICAL ENGINEERING*, January 9th, p. 25), when the failing of one phase of a circuit-breaker to come out on a bad fault caused the burning out of an earthing resistance, the connection to which became red hot, seared a hole in a lead-covered machine cable and caused another short. Incidentally there were heavy surges on the system. Since this accident the question of earthing the neutral and protecting the high-tension mains against surging has been gone into very thoroughly, with the result that an entirely new earthing resistance capable of carrying 225 amperes has now been provided, the neutrals of the several machines being connected through oil switches to a common "earth" bus main, one machine only at a time. On the high-tension

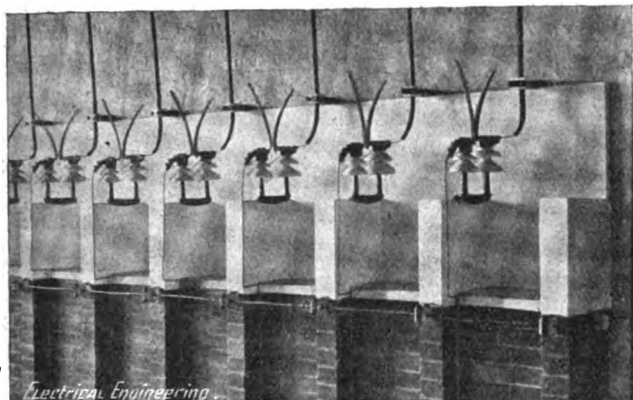
in full in the *Journal* of the Institution of Electrical Engineers on December 1st.

The pressure rises dealt with were those which occur in the normal working of plant, and were divided under three headings, as those due to resonance, switching, and arcs and sparks. In connection with the first, he pointed out that there could hardly ever be resonance with the fundamental, because the capacity current of the cables was much smaller than the short-circuit current of the generators. It often happens, however, that resonance may be obtained with the fifth or higher harmonics if these are present. Although in most modern machines a good wave form is obtained, yet there are numerous old machines, in which the higher harmonics are present, still in use. With a star-connected three-phase machine it is generally said that no third harmonic is present, and this is true as regards the lines, but these harmonics may be present between the lines and earth, so that it is not safe to assume that there is no possibility of resonance. Again, the effect of varying the speed of a generator connected to the mains may cause resonance at particular speeds. A special case not sufficiently referred to in available literature, said Mr. Duddell, is the possibility of resonance due to switching off a motor or rotary at the end of a long line, by tripping the switch in the distant station. Another case which has been known to arise is that of resonance of a thirteenth harmonic in the circuit of an unloaded instrument transformer connected to an earthed star-connected three-phase system. Illustrations of these phenomena, showing how great may be the voltage rises, were experimentally demonstrated.

With regard to switching, the rises due to switching off a self-induction or switching on a capacity are well known, but the action of the switch contacts is often very uncertain, giving varying charging and discharging effects, as was shown by the oscillograms. When switching off an inductive circuit containing iron, there are several sources of loss, eddy currents, hysteresis, &c., which tend to damp out the rises, but if no metal is present then these losses are absent, so that the capacity or self-induction of cables may prove of importance even though their values may be small. Owing to reflection of the pressure waves at the end of a long unloaded line, very great rises may be experienced, but a small load on the end will prevent their occurrence. Another effect is the localisation of pressure on the end coils of machines. The leads from machines to their switches should be as short as possible, as oscillations having a high frequency and steep wave-fronts may be set up. Although they are too small to do much damage, yet, if they persist for any length of time, the insulation on the end turns of the machines may be punctured.

The phenomena of pressure rises resulting from arcs and sparks are rather obscure. The arc has a tendency to "shut the current off with a snap," and so rapidly reduces the current, but all the causes tending to put out the arc are far from being properly known at the present time. In certain cases where capacity and self-induction in parallel with a spark gap can be fed through self-induction, intermittent surges having frequencies as low as one per second may be set up, and these may prove very harmful to the system. The instability of the arc was illustrated by a water analogy. In this water is allowed to flow through a valve held down by an electromagnet against a spiral controlling-spring, and an indicating tube connected to the system shows violent fluctuations in water pressure. If one takes the musical arc and arranges it so that it will just not resonate to a particular note, then if a hydro-carbon vapour be introduced into the arc it will be found that the note can be produced. This may have some bearing on breakdowns of cables laid in bitumen, &c., where hydro-carbon gases are always present. Another important effect which should not be overlooked, is that due to the presence of a magnetic field, which may also cause an arc to resonate at a certain frequency, whereas if such a field is absent no such effect occurs.

It has been said that no pressure rises take place when a circuit is opened by an oil switch, but it has been found that when small currents, for example, the magnetising current of a transformer, are switched off through an oil switch, very great rises may take place, although with larger currents no rises take place at all. This phenomenon has so far not been ex-



SPARK GAPS AND RESISTANCES AT BRIGHTON.

feeders and bus bars the old type of spark arresters have been removed and the latest type of "Brazil" patent horn-break arresters have been installed, each fitted with a carbon resistance in series with the earthed horn which limits the current to less than half an ampere. These gaps are set to jump at 10,000 volts, the pressure between phases being 8,000 volts, with the neutral point earthed. In the earth wire a small transformer is fixed, and whenever the gaps spark across, a relay is energised which rings a bell on the switchboard. Some of the machines are large induction motors of 1,500 h.p., started direct off the high-tension bus bars, and frequently, when these machines are started up, a slight surge takes place which rings the bell, proving that for years the cables and end windings of the machines must have been subjected to considerable stresses which have not hitherto been noticed. This device acts as a most efficient "safety valve" to the whole system, and will doubtless tend to prolong substantially the useful life of the whole plant.

The address by Mr. W. Duddell, F.R.S., last Thursday, was illustrated by numerous experiments, and was given to one of the largest and most enthusiastic audiences that has ever filled the lecture theatre of the Institution. The address will appear

plained. Similar effects are found when a fuse blows, especially if it is a fine one, for then no vapour is formed, and a complete rupture of the circuit may take place within half a cycle. Very complicated surges may take place in these cases. It is also important that there should be no capacity between the switch contacts, as the effect of this is to suppress the arc more quickly, and to give greater pressure rises. An important effect due to short circuits on a transmission line was then shown. A short line in the lecture theatre was fed at 5,000 volts. When suddenly switched on, the pressure rise at the far end was sufficient to bridge a three-eighth inch gap. A model line, consisting of induction coils and capacities slightly larger than they would be in practice, was similarly treated; when a fault was put on at the generator end, a rise in pressure from 200 to 1,000 volts was shown. Very large rises due to periodic short circuiting of the line through a relay connected to different points were also demonstrated. In conclusion Mr. Duddell emphasised that enough was not known as to why big current arcs snapped out, although no pressure rises might result. It was possible that the magnet field in which they were had something to do with the case.

### CRYSTALLISATION EFFECTS IN TUNGSTEN FILAMENTS

IN the course of a Paper on the tungsten lamp and its development, read by Dr. A. Lederer during the summer before the Austro-Hungarian Union of Electricity Works, some interesting particulars were given as to the crystallisation effects produced by continued usage upon tungsten filaments. With pure tungsten filaments, writes Dr. Lederer, a disadvantageous crystallisation phenomenon has been observed to take place, more especially if alternating current

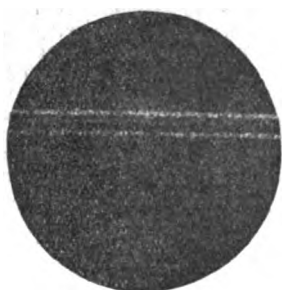


FIG. 1.—SQUIRTED PURE TUNGSTEN FILAMENT BEFORE USE.

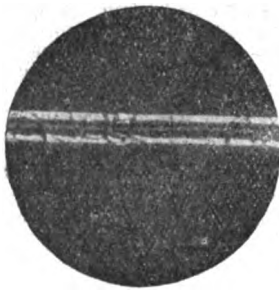


FIG. 2.—THE SAME FILAMENT AFTER 600 HOURS ON ALTERNATING CURRENT.

is employed. It is a well-known fact that it is not necessary in order to crystallise a body that it should be melted or completely dissolved, but mechanical and thermal influences suffice to bring about this modification. In the case of tungsten incandescent filaments which are exposed to very high temperature, crystallisation takes place in a comparatively short time. When used with continuous current the thickenings and wrinkles appear only in a longitudinal direction. When burnt on A.C. the adjacent surfaces, owing



FIG. 3.—PURE TUNGSTEN FILAMENT AFTER 1,000 HOURS ON CONTINUOUS CURRENT.

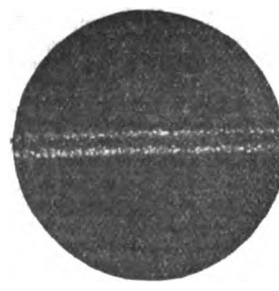


FIG. 4.—TUNGSTEN FILAMENT WITH ADDITION OF RARE EARTH METALS AFTER 1,000 HOURS ON ALTERNATING CURRENT.

to the dynamic influence of the surrounding field, are subjected to a sliding movement, which, if it takes place in a direction perpendicular to the axis of the filament, causes considerable displacement of some parts of the filament, which eventually lead to their being separated. It has been found that this drawback may be avoided by certain additions of compounds of the rare earth metals (see Austrian patent No. 41,247/06, Westinghouse Metallfaden Glühlampenfabrik). With such additions the tungsten incandescent body may be

used equally well with alternating as with continuous current, be it filament or wire. In this connection, an essential improvement of the squirted filaments, with such additions as regards their mechanical structure, may be mentioned, such filaments being quite ductile in the cold state. It is well known that this displacement due to crystallisation also gave considerable trouble in the earlier days of tantalum lamps run on alternating current, and microphotographs of filaments thus affected have been reproduced in *ELECTRICAL ENGINEERING* (Vol. I., pages 109, Jan. 17th, and 153, Jan. 24th, 1907). In order to illustrate the differences in the conduct of various types of filaments, some microphotographs of tungsten filament are given. Fig. 1 represents an ordinary squirted tungsten filament previous to being burnt, and Fig. 2 shows the same after 600 hours on alternating current. Photographs of the same filament after 1,000 hours' burning showed the characteristic displacement of part of the filament referred to above. The effect of continuous current is shown in Fig. 3, which represents a filament after 1,000 hours' burning. Fig. 4 shows a squirted filament with an addition of rare earth metal after 1,000 hours' burning without any detrimental displacement, in spite of alternating current having been used. The effect does not seem to be produced to any extent in wire-drawn filaments, even on alternating current. Microphotographs show a loss of the brightness caused by the drawing and a mottled appearance somewhat similar to Fig. 4, but without any breaking-up effect.

### CORRESPONDENCE

#### SCHOOL LIGHTING.

To the Editor of *ELECTRICAL ENGINEERING*.

SIR,—I have to thank you for the notice of my Paper in *ELECTRICAL ENGINEERING* dated November 13th, 1913, but must quarrel with you over the statement that I am in error in stating that metallic filament lamps are more affected by variations in voltage than are carbon ones. If you will refer to the Paper, you will notice that I was particular in stating that variation would be more pronounced on flickering voltage circuit. By flickering I do not mean permanent pressure change, but the rapid voltage flickers that frequently occur when the station regulator is not working properly. I have experimented largely with all kinds of lamps, and have published elsewhere the fact that the resistance of tantalum, for instance, increases from 15·8-83·0 microhm per cm. cube when the lamp is running, thus making for inherent regulation. I was led to the remark re flickering when testing a large batch of both carbon and metal lamps; the pressure through some cause was varying very rapidly, and the effect was most pronounced in the case of the metal lamps. The flickering has been observed on alternating-current circuits, and it can only be due to the difference in specific heats, that of carbon being roughly 10 times that of tantalum. The time lag in switching on in the case of a carbon lamp is also probably due to the same cause.

Trusting that you will make this matter clear.

Yours, &c.,

D. H. OGLEY.

Royal Technical Institute,  
Salford, Nov. 17th, 1913.

[We are glad to hear of Mr. Ogley's experiments. We are really quite in agreement with him, but we were a little at cross purposes, as we had in mind the slower variations of voltage which undoubtedly affect the carbon lamp more than the metal filament lamp. The question of speed of response, which predominates in the case of the quicker variations referred to by Mr. Ogley, is a different matter.—ED. E. E.]

**Standardisation of Plugs.**—At a Council Meeting of the Incorporated Municipal Electrical Association, on Friday last, the question of the standardisation of two-pin plugs and other small appliances in common use by the general public was brought up for consideration, and a sub-committee was appointed to deal with this matter. Mr. A. C. Cramb, of Croydon, was appointed Hon. Secretary of this Committee.

**Metal Filament Lamp Patents.**—An error occurred in the article on "Metal Filament Lamp Patents" which appeared on page 627 of our last issue. Claims 1 and 2 to Patent No. 21,513\*/06 should read as follows:—(1) The method of working tungsten, which consists in subjecting the metal in a coherent form to the action of heat while it is being operated on or manipulated. (2) The method of working tungsten which consists in heating the coherent metal by means of an electric current while it is being operated on or manipulated.



THE  
PRODUCT OF  
LONG  
SPECIALISATION

INSIST ON  
**IGRANIC**

SWITCHGEAR  
proved by  
experience  
IGRANIC ELECTRIC CO. LTD.  
LONDON and BEDFORD

### A NEW TWO-RATE TARIFF SYSTEM

IN A Paper read before the Birmingham Local Section of the Institution of Electrical Engineers on Tuesday, Mr. H. H. Perry described a proposed two-rate system of charging in which time control is dispensed with and an automatic switch is used to change over from one meter to another, according to the magnitude of the load or the proportion of lighting to power and heating. The construction of the switch is shown in Fig. 1. An ordinary single-pole change-over switch is employed, one arm of which is attracted by the lighting-circuit current. It is freely pivoted about its centre, and a balance weight is provided, the position of which is adjusted to give any proportion of the consumer's lighting between, say, 5 per cent. and 25 per cent. at the low rate.

Auxiliary contacts are provided for maintaining continuity of the circuit when changing over. The switch is normally on the low-rate side, and two of the ordinary stock pattern of meters are employed. The loss in the instrument is about 4 watts for continuous current and 8 to 10 watts for alternating current. In the case of a consumer taking practically all his current for lighting, with no separate circuit, all the current passes through the high-rate meter or the low-rate meter, and the switch is adjusted by the balance weight or by the air-gap, so that all currents less than a given fraction of the maximum current are registered

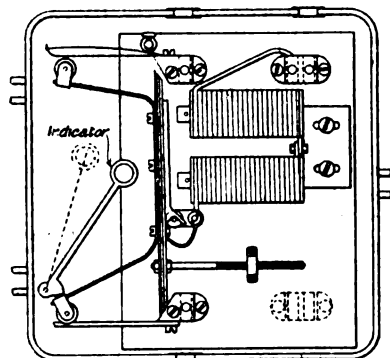


FIG. 1.—GENERAL ARRANGEMENT OF SWITCH.

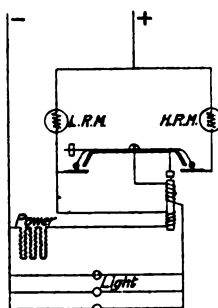


FIG. 2.—CONNECTIONS FOR INDEPENDENT POWER CIRCUIT.

on the low-rate meter. When a separate power circuit is used the connections are arranged so that the low-rate meter will register the whole of the power load, and up to 25 per cent. of that required by the lighting, when the switch is on one side, and when the switch is on the other side the low-rate meter will meter the power only, and the high-rate meter only the lighting. Another arrangement is shown in Fig. 2. So long as the power system is in use, the low-rate meter will meter all power and any desired proportion of the lighting, since the pull of the magnet is neutralised to the required extent. Otherwise the operation is the same as in the last-mentioned arrangement—that is to say, the lighting reverts to the high-rate meter after 5-25 per cent. has been exceeded.

Mr. Perry argues that provided the heating peak, assuming that there is one only, does not coincide with the lighting peak in magnitude and length of time, this arrangement should prove acceptable, as the mere granting of a low flat rate for power by many authorities is an admission that the diversity factor is large enough to allow the coincidence of double peaks to be ignored. It has the advantage of giving to the consumer the facilities for using many useful appliances from the existing lighting circuits at a low rate, and the load so provided should do much to improve the load factor.

In an appendix methods of using the switches in conjunction with one meter with sub-divided coils are suggested.

### JOINTLY-OWNED MUNICIPAL AND COMPANY ELECTRICITY WORKS

FROM time to time, allusions have been made to those electricity works and electric power systems in Germany in which the ownership is vested partly in the hands of the local authorities concerned and partly in companies, both of whom are represented in the management of the concern, and particular interest therefore attaches to a report on the subject by Sir Francis Oppenheimer, Commercial Attaché to his Majesty's Embassy at Berlin, which has just been issued. The report is "No. 685 Miscellaneous Series, Diplomatic and Consular Reports," and may be obtained under this title from Messrs. Wymans & Sons, Ltd., Fetter Lane, London, E.C., for the price of 2d. It explains clearly the various methods employed in Germany for arranging for a joint interest in electric power undertakings by private concerns and public bodies, setting forth the reasons which led to this policy, the advantages to be derived from it, and the mistakes to guard against. Fifteen such undertakings are dealt with. The largest of these is the Rheinisch-Westphälisches Elektrizitätswerke, the total share and debenture capital of which approaches £5,000,000, and in which no less than sixteen Local Authorities have large holdings of shares. The various undertakings supply electric light, power and tramways, several are in mining districts, and, moreover, the possibility is not excluded of arrangements being made in the future for the supply of main railways, as these are gradually electrically equipped.

Comparing the conditions in Germany with those obtaining in this country, there seems to be no reason why, in many cases, similar arrangements could not be arrived at advantageously here, by amalgamations of existing electricity undertakings.

**The Future of Electricity Supply.**—Mr. J. A. Robertson, in his inaugural address to the Scottish Section of the Institution of Electrical Engineers on Tuesday of last week, referred to the tendency towards the concentration of power generation in large central stations, which was largely due to recent improvements in the steam turbine and the development of high-tension multi-phase transmission. He looked to the internal combustion engine for higher efficiency in fuel utilisation, but preferred the producer gas engine to the Diesel engine on account of the dependence of the latter mainly on foreign fuels. It was possible a portion of the heat now wasted in the exhaust might be recovered by means of suitable boilers. With a combination of this kind he thought that the present efficiency of about 15 per cent. might be raised to about 25 per cent. He did not think that the backward state of the power industry was as much due to restrictive legislation or municipal obstruction as was generally supposed. We have to face, he said, the position that these undertakings are already in operation, and the problem of cheap supply for all purposes will not be solved by purchasing a municipal station here or supplying in bulk elsewhere. The question is too big to be dealt with by isolated arrangement, and while co-operation between the various local authorities themselves and between local authorities and power companies may require to be entered into as a temporary expedient, the ultimate solution must come from a scheme dealt with on broad national lines, and would justify the appointment of a commission by the Government to investigate the whole question, with special regard to suitable generating centres, economic radius of supply, standardisation of voltage, and the purchase of existing interests. Passing on to technical matters, he advocated two-wire and not three-wire distribution, commented on the increasing use of central station batteries, the possibilities opened up by the Edison battery for road traction work, and the directions in which heating and cooking plant is improving.

# "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

## Specifications Published November 13th, 1913

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

**Names in italics indicate communicators of inventions from abroad.**  
19,006/12. **Metal Filaments, &c.** H. KAST. Metals and metal oxides are obtained in a minutely divided state by heating the metal salts of the nitro-phenols till the metal or oxide separates itself. The salts may be diluted before heating with indifferent substances, or mixed with oils, fats, tars, &c.

23,861/12. **Kettles.** A. F. BERRY. An internal heating element is arranged to retain some liquid when the kettle is tilted. The element may be made hollow, so as to emit a sound should the liquid fall below a certain amount. It may also be provided so that liquid cannot be poured out unless the heating circuit is opened—this may be effected automatically by tilting the kettle. Nine figures.

23,940/12. **Current Indicator for Heating Apparatus.** A. F. BERRY. An indicator to show whether high or low heat is on consists of a resistance with + temperature coefficient and indicating lamp in series, connected in parallel with a resistance whose value diminishes with mechanical pressure and increasing temperature. The mechanical pressure is obtained from the expansion of the other resistance. Alternatively, the latter resistance may be in shunt to the lamp alone, or the lamp may simply be in parallel, with a constant resistance. Six figures.

25,356/12. **Alternators for Wireless.** E. GIRARDEAU. A resonance alternator for stations using a singing spark has a short-circuit current less than the normal current which the armature can withstand. The construction is similar to that of an induction motor, and the total sectional areas of the field and armature copper are approximately the same, so that the emission of signals is effected by varying the exciting current owing to the reduction of the self-induction of the field winding. One figure.

27,348/12. **Astatic Electro-Dynamometers.** J. T. IRWIN. Two coils on the horizontal axis are connected so that the fluxes oppose. In the resulting radial flux is a coil with its centre on the axis of the two coils, and with its plane vertical and free to rotate about a vertical axis. This coil is wound so that the currents pass the same way up the sides and down the centre. The torque is measured in any well-known way. Four figures.

28,929/12. **Conduit Fittings.** J. H. JACKSON. The movable member of the coupling is made eccentric exteriorly and the socketed fitting formed with the companion interior surface eccentric. Ten figures.

1,207/13. **Pressure Regulation.** A. H. OLMSTEAD. An additional machine is connected across the field winding, or in shunt with a series resistance to it, of the generator (or exciter). The excitation of the additional machine is controlled by an automatic regulator. Two figures.

3,432/13. **Telegraph System Unaffected by Static Discharges.** SIEMENS & HALSKE. High-frequency currents are used in the signalling circuit. This is normally closed and emitted through choking coils. The signalling currents work a special design of vibration relay. One figure.

15,498/13. **Vehicle Brakes.** E. V. HARTFORD. The brakes are worked by a high-speed reversible motor through reduction gear, link-work, counter-shaft, and friction clutch. The braking power is automatically cut off when a predetermined braking effort is exerted. At the same time the motor itself is braked. Four figures.

15,674/13. **Wireless Telegraph Receivers.** J. G. BALSILLIE. A receiver consists of a looped circuit with one leg containing a reactance variometer and an adjustable condenser, while the other contains an adjustable condenser only. Across this condenser is an adjustable oscillation circuit connecting with the detector circuit, which includes an adjustable condenser in parallel with a telephone and in series with a quantity detector. Two oscillation frequencies may be used, one for dots and one for dashes, if the connections are slightly modified, but in each case the group frequency is the same. Three figures.

## Specifications Published To-day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free.

Summaries of some of the more important of these patents will appear in our next issue.

**Arc Lamps:** OKUN, 2,125/13.

**Distributing Systems, &c.:** ROUTIN [System employing motors controlled synchronously from a distance] 13,084/13.

**Dynamos, Motors, and Transformers:** PLAISANT, 26,177/12; SCOTT [Coil winding machines] 3,516/13; HOWORTH (*Ryder*) 9,070/13; A. E. G. [Cooling] 16,391/13; SIEMENS DYNAMO WORKS and TAYLOR, 16,526/13.

**Electrometallurgy and Electrochemistry:** VON RECKLINGHAUSEN, HELBRONNER, and HENRI [Vapour electric apparatus] 13,490/13.

**Heating and Cooking:** SIMPLEX CONDUITS and TAYLOR [Oven] 24,586/12.

**Ignition:** BURTON and YATES, 6,434/13.

**Switchgear, Fuses and Fittings:** PINKERTON and WASON [A.C. and D.C. motor starters] 21,974/12; STERLING TELEPHONE Co. and BELL [Contact breaker for bells, &c.] 24,439/12; B. T.-H. Co., GARTON and WATSON [Regulating mechanism for distributing systems] 27,758/12; COVENTRY and RUSHTON [Conduits] 28,979/12; HIRST and CASH [Indirect lighting shades and reflectors] 29,348/12; B. T.-H. Co. (*G. E. Co., U.S.A.*) [Circuit breakers] 4,945/13; ELEC. & ORDNANCE ACCESSORIES Co. and HOWELL [Fuse-holders] 5,836/13; GWYNN and CLERK [Reflectors] 10,152/13; JAKOBSEN and JENSEN [Combined switches and plug contacts] 14,330/13; LEITNER [Switches] 21,751/13.

**Telephony and Telegraphy:** SIEMENS BROS. & Co. and PETITHORY [Lamp jack strips] 25,237/12; MAJORANA [Wireless telephony] 10,153/13.

**Traction:** FORREST [Motor casings for tramcars, &c.] 26,414/12.

**Miscellaneous:** SOUTH MET. GAS and SOMMERVILLE [Lighting gas burners] 26,156/12; MAJOR and SMITH MAJOR & STEVENS [A.C. solenoids] 26,935/12; FAIRBROTHER (*Vesta Accumulator Co.*) [Adjustable electric lamps] 29,698/12; FOWLER [Signalling disagreement between engine control gear and order telegraph indications] 3,266/13; KRAUS and OPPEN [Electrostatic separators] 6,336/13; NELSON [Mine signalling] 11,166/13; HEDLUND [Transferring pressure from rigid bodies to insulators] 16,262/13; BRUNS [Remote control of valves electromagnetically] 18,526/13; ASH [Rat-traps] 19,496/13.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Dynamos, Motors, and Transformers:** SIEMENS-SCHUCKERT. [Oil-insulated transformers, &c.] 24,117/13; [Geared A.C. motors] 24,126/13; SCHERBIUS [Transformers] 24,212/13 and 24,306/13.

**Electrochemistry:** ROSSI [Electrodes for production of nitric oxide] 23,959/13.

**Ignition:** SIEMENS & HALSKE [Spark plugs] 18,924/13.

**Miscellaneous:** WHITHEAD & Co., A.-G. [Gyroscopic steering for torpedoes] 18,859/13; O'KEENAN [Synchronised electrically controlled clocks] 23,570/13; SIEMENS-SCHUCKERT. [Driving of rotary printing-presses and paper calendaring machines] 24,017/13.

The following Amended Specification may now be obtained.

**Miscellaneous:** A. McNAB [Temperature indicators] 14,653/13.

## Opposition Entered to Grant of Patent

2,546/13. **Visual Mines' Shaft Signals.** J. CLOSE. Visual signals are given by local batteries at the pit bottom and winding-engine house through switches controlled by pull wires or ropes (ELECTRICAL ENGINEERING, Mining Section, Oct. 2nd, p. 559).

## Expiring and Expired Patents

The following Patents expire during the current week, after a life of fourteen years:—

23,476 of Nov. 24th, 1899. **Colour Screens.** A. DUTTON and W. M. GARDNER. The claims cover the use of coloured screens or reflectors, or a combination of the two, so selected as regards colour and tint as to make the light resemble daylight. The addition of a cupric salt to the glass is covered.

23,501 of Nov. 24th, 1899. **Vacuum Tube Lighting.** W. L. WISE (*Moore Electrical Co., U.S.A.*). The tubes are excited directly, or through a transformer, by high-frequency currents having as nearly as possible a flat-topped wave. An alternator to effect this has the rotor and stator teeth so proportioned that the total magnetic flux is approximately always the same. The terminals of the tube are made of metal foil so as to increase the capacity, which may be supplemented by condensers.

The following are the more important Patents that have become void through non-payment of renewal fees.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** SIEMENS BROS. (*Siemens & Halske*) [Fault indicating and signalling between central and sub-stations of distributing system] 15,898/08; B. T.-H. Co. (*G. E. Co., U.S.A.*) [Pressure regulation] 16,299/08.

**Incandescent Lamps:** H. KUZEL [Paste for uniting metal filaments to leading-in wires] 15,462/05.

**Switchgear, Fuses and Fittings:** W. J. DAVY [Thermal circuit breakers] 15,936/08; T. J. and E. RORKE [Mercury switch] 15,949/08; E. GARSIDE [Motor starter] 16,126/08.

**Traction:** A. N. CONNETT [Points for conduit tramways] 15,590/05; E. A. MITCHELL [Surface contact switch] 17,532/07.

**Miscellaneous:** W. L. WISE (*A-G "Magneta," Switzerland*) [Secondary electric clock escapements] 15,460/01; [Master clock escapements] 15,461/01; SIEMENS BROS. (*Siemens & Halske*) [Remote indications of compass readings by bolometer type instruments] 16,979/02; A. SMITH and C. SOUTHALE [Weighing] 16,352/08.

## ANNOUNCEMENTS RELATING TO PATENTS.

*Small Prepaid Advertisements with regard to Patents, &c., are inserted on this page, facing our Patent Record, at 1d. per word (minimum 5s.); three insertions for the price of two. Rates for displayed and card advertisements on application.*

*Advertisement matter, accompanied by a remittance, should be addressed to the Kilowatt Publishing Co., Ltd., 203 Temple Chambers, London, E.C.*

**PATENTS.** "Improvements in or Appertaining to ADDING MACHINES." The Proprietors of THE DUPLEX ADDING MACHINE Co.'s British Patents Nos. 23,890 of 1907, 10,663, 10,664, 10,665, 10,666, and 10,667 of 1908, are desirous of licensing them to British Manufacturers on reasonable terms to ensure their manufacture and development in Great Britain, or of selling the patents outright. For full information address inquiries to W. P. THOMPSON & Co., Chartered Patent Agents, 6 Lord Street, Liverpool.

The Proprietor of the Patents Nos. 24,702 of 1908 and 24,708 of 1908 for "Improvements in and relating to ELECTRIC FUSIBLE CUT OUTS" and "Improvements in SEAL FASTENINGS," is desirous of entering into arrangements by way of license and otherwise on reasonable terms, for the purpose of exploiting the same and ensuring their full development and practical working in this country. All communications should be addressed in the first instance to:—Haseltine, Lake & Co., Chartered Patent Agents and Consulting Engineers, 28, Southampton Buildings, Chancery Lane, London, W.C.

**REMOVAL.**

Mr. J. G. LORRAIN, M.I.E.E., M.I.Mech.E., Chartered Patent Agent, has removed his office from Norfolk House, Norfolk Street, Strand, W.C., to  
**Staple Inn Buildings, High Holborn, London, W.C.**

**John E. Raworth,**

Queen Anne's Chambers, Chartered Patent Agent  
39, Broadway, Westminster, London, S.W.

**QUESTIONS AND ANSWERS  
BY PRACTICAL MEN****RULES.**

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

**QUESTION No. 1,365.**

When a turbine is running, what are the indications of trouble with the blading?—J. O.

(Replies must be received not later than first post, Nov. 20th.)

**ANSWERS TO No. 1,363.**

An Otis elevator designed to lift 2,000 lb. is used for passengers only, and at times, with only two or three persons on, will not travel at more than half speed. At other times, when the car is run down to the limit switch, the potential switch will drop off. A short time ago, whilst the car was on its downward journey (with six persons on), a sudden drop of about two feet was experienced, and on examination the rope was found to have dropped over the side of the drum. What is the cause of slow running? Why did the rope drop off the drum?—C. W. A. (Western Australia).

The first award is given to "L. Y. T.," who writes as follows:—

Without further information as to the method employed for controlling the rate at which the starting resistances are cut out, it is only possible to indicate one or two directions in which the trouble may lie. If there is a series of clapper switches or contactors which cut out sections of the resistance successively as the back E.M.F. of the motor rises or as the current decreases, it is possible that when the lift is lightly loaded the motor starts getting up speed so quickly that some of the contactors or the relays controlling them have no time to act, or due to their bad adjustment, come on in the wrong order, and thus part of the resistance is left in circuit, causing the motor to run at a low speed. Another possible explanation is that when the lift is lightly loaded, the current taken is not sufficient to hold the magnetic brake off. This can probably be remedied by adjusting the spring. The tripping of the potential switch by the limit switch is possibly due to wrong connections. The dropping of the rope off the side of the drum is a serious matter, and is most likely due to the drum being out of line owing to faulty erection or subsequent subsidence.

No other award is made.

**Electricity as a By-Product.**—Under this title a Paper was read at the annual general meeting of the Institution of Municipal Engineers on Nov. 7th, by Mr. R. J. Spencer-Phillips. He showed that with a load factor of about 80 per cent. the total cost of production (excluding management, offices, &c.) of electricity may be about 0.364d. Some instances in support of this figure were cited, and the conclusion reached that, wherever there are mills or factories, in however small a town or district, it would appear sound policy for the local authority to undertake the supply of electricity, and, if possible, by entering into an agreement with the owners, to put down the necessary plant actually in the building itself. There would be then the course open of either installing an up-to-date boiler plant with back-pressure turbines, and selling both electrical energy and low-pressure heating steam, or if, as might well be the case, a mill already had a suitable boiler plant, an arrangement might be agreed upon by which payment is made for the use of the steam between 150 lb. pressure and 30 lb. pressure, or whatever the required range may be. The electrical energy produced by this steam would then be sold, and the steam itself returned to the mill at the required back pressure. The electricity so obtained could be sold at a low figure.

**The Present Outlook in Electrical Engineering.**—Mr. G. Marshall Harriss gave the Chairman's address at the opening meeting of the Dublin Local Section of the Institution of Electrical Engineers on Friday last. Reviewing the progress of the electrical industry in Dublin, he considered it highly satisfactory in spite of the local labour trouble. The Tramway Company, which had been most violently attacked by the strikers, had suffered the least. On the technical side there was nothing sensational to note, but the flexibility and adaptability of electrical methods were being recognised in fresh directions every day. Municipal authorities were standing in the way of expansion, as witness their vigorous and successful opposition of the Power Bills. The electric tramways of the kingdom had not much increase of mileage to show for the past year, but the number of passengers carried had increased by 220 millions, while the number carried by the railways had fallen. There was a tendency towards better and heavier equipment, and the use of phosphor-bronze in place of hand-drawn copper was now common. In the generation station, owing to continued increase in the price of coal, economies hitherto neglected as not worth troubling about were now being carefully studied. Higher steam pressures and greater superheats were being considered, and the speaker viewed with some apprehension the movement in that direction. The gas-fired Bonecourt boiler promised to revolutionise costs in the boiler-house. In spite of elaborate methods of keeping accounts and records, he thought many engineers were working in the dark as to the amount of money spent in the upkeep of machinery. It was difficult to decide as to what extent it was economical to spend money on the upkeep of a particular machine. Records of repair work should be more complete, and he advocated a special repair and depreciation account for each unit. Dealing with the status of the electrical engineering profession, Mr. Harriss considered that the alteration to the Rules of the Institution of Electrical Engineers providing for the graduate class and for the examination of candidates had done a certain amount of good, but the fact remained that, legally, engineering was a trade and not a profession. As engineers we had no standard of qualifications and no legal rights. The medical profession sixty years ago was in precisely the same predicament as the electrical one to-day. The Medical Act of 1858 showed what had been done in their case, and what was necessary to be done for the electrical engineer. The way to raise the status of the engineer was to make his profession recognised by the law, and the Medical Act showed us how to do it.

## ELECTRIC TRACTION NOTES

In connection with the recent proposal to purchase the Stirling electricity and tramways undertakings, the Borough Electrical Engineer, Borough Surveyor and Town Clerk have prepared a report dealing with the proposition that the Corporation should purchase the existing Tramway Company and convert the lines to electric traction, at the same time carrying out certain extensions. The estimated expenditure on the reconstruction and extension work is put at £63,100, to which is added £12,000 as a fair price for the horse tramways undertaking, and £3,000 for the necessary Parliamentary and other expenses, making a total of £78,100. This estimate is based upon current being charged at 1½d. per unit for the first 100,000 units per annum; 1½d. for the second 100,000 units per annum; and 1d. per unit for all over 200,000 units per annum.

A special meeting of the Greenock Corporation has decided against the proposal to purchase the undertaking of the Greenock & Port Glasgow Tramways Co.

According to the *Standard*, some officials of the Victorian Government Railway Department are coming to London to inspect the electric railway system.

## TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

Yesterday's *Times* made the interesting announcement that the Post Office are proposing to extend considerably the utilisation of automatic telephone exchanges. It will be remembered that the initial experiments were carried out on three exchanges, viz., G.P.O. (official switch), Epsom and Hereford. Now it is announced that ten additional exchanges are being equipped for automatic working, and that some will actually be in operation in the course of a few months. The largest of these will be at Leeds, which will be equipped on the Strowger system for 6,800 lines. A 5,000-line automatic exchange is to be equipped at Portsmouth, and the remaining exchanges on the automatic system will be Newport (1,800 lines), Accrington, Darlington, Stockport, Grimsby and Paisley (about 1,000 lines each), Dudley (500 lines), and Chepstow (65 lines).

The petition for extension of life of F. Ritchie's patent No. 24,048/99, which is the chief patent dealing with the telewriter, came on for hearing yesterday before Mr. Justice Warrington, and is still proceeding as we go to press. The petition is brought by the National Telewriter Co., Ltd.

The second of the series of Advanced Lectures on Wireless Telegraphy which Mr. J. St. Vincent Pletts, A.C.G.I. (Chief of the Patents Department, Marconi's Wireless Telegraph Co., Ltd.), is giving at the City and Guilds (Engineering) College, was delivered on Thursday evening last. Mr. Pletts briefly dealt with the early work of Hertz, Branly and Marconi. Nobody quite knows, he said, why such a great benefit is derived from earthing one pole of the Hertz oscillator and elevating the other. Although this allows the wave-length of the oscillator to be increased, yet this would not account for all the advantages obtained. The coherer was originally placed near the spark gap, but it was very liable to damage and had to be protected by an earthed shield. These coherers were very sensitive, and as the resistance varied from about infinity to 30,000 or 40,000 ohms, to obtain maximum sensitiveness the relays should have been wound for the latter figure. There are, however, a number of disadvantages with the simple aerial. Hertz showed that the energy lost per oscillation was  $16\pi^2 Q^2 / 2 \div 3\lambda^3$ , whence Fleming has shown that the rate of loss of energy =  $16\pi^2 l^2 KE \div 3\lambda^3 T$ , and  $E = E_0 e^{-2\pi l / \lambda T}$  where  $E$  = energy in the aerial at any time,  $E_0$  the original energy, and  $\delta = 16\pi^2 l^2 K \div 3\lambda^3$ , which is the radiation decrement. To obtain the total decrement the resistance decrement should be added, but in practice with the Marconi aerial this does not amount to more than one-tenth of the radiation decrement. If it is assumed that the potential is the same throughout the aerial, the capacity is given by  $K = l \div 2 \log. l/r$ , where  $l$  is the length of the aerial, and  $r$  the radius of the wire. Owing to the actual distribution of potential, however, the capacity appears to have  $2/\pi$  times this value, so that the decrement may be written,  $\delta = 16\pi^2 l^3 \div 3\lambda^3 \log. l/r$ . With the Marconi aerial as the wave-length  $\lambda$  is four times

the effective length of the aerial,  $\delta$  may be taken as  $2/6 \div \log. l/r$  approximately; also as the increase in the capacity of the aerial due to the earth is about 10 per cent., it is not far wrong to take  $\delta$  as  $8 \div \log. l/r$ . The useful oscillations of the aerial (that is, until the oscillations have been reduced to one-hundredth of their original value) =  $(4/6 + \delta) \div \delta$ . Mr. Pletts then dealt with the remarkable variations in the maximum distance, which could be overcome with the same equipment. It had been noticed that not only does the transmission distance vary greatly between day and night, but also from day to day and from hour to hour. Once or twice ships in the Atlantic have been able to communicate over a distance of 1,100 miles with an equipment of only 200 watts capacity. The equipment at Clifden and Glace Bay is of 220 kw. capacity, giving 160 kw. in the aerials, although only about 120 kw. are generally employed. There have been occasions, however, when readable signals have been transmitted with only one-thirtieth of this power. Dr. Eccles has advanced the theory that owing to ionisation of the upper layers of the atmosphere this acts as a reflecting surface, and so keeps the waves on the surface of the earth. It is easy to see that if this surface is not smooth but crumpled, as it may well be with changing atmospheric conditions, abnormal effects may be obtained. Since atmospheric effects may be a thousand times as strong as the signals themselves, they cannot be eliminated by any process of tuning, as they set the aerial oscillating in its own period. However, by the use of musical notes it is easy to distinguish the actual signals. To explain the propagation of the waves, Mr. Pletts resorted to an analogy which he had developed many years ago. A downward stream of water spreads out over a plane at right angles; if this plane is imagined to be porous the equivalent of the absorption found in practice is obtained. Professor Austin (United States Wireless Telegraph Department) has also given a similar formula,

$$C_R = (AC_r h_1 h_2 e^{-\alpha x / \sqrt{\lambda}}) \div \lambda x$$

where  $C_R$  = the current in the receiving aerial,  $C$ , the current in the sending aerial,  $h_1$  and  $h_2$ , the heights of the aerials in metres.  $A$  comes to about 0.00425, and the absorption constant (over water),  $\alpha$ , about 0.0475. This value, however, is not true if  $\lambda$  is greater than two miles. It is then found that more accurate results are given if the  $2/\sqrt{\lambda}$  is used. It has not been found possible to obtain an absorption constant for transmission over land. The next lecture will be given to-day at 5 p.m., and will deal with coupling; double waves; transmitting circuits; low frequency tuning and disc dischargers.

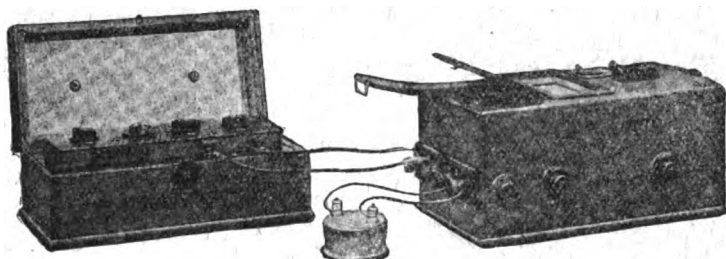
Experiments extending over a year on the relative intensity of received wireless signals have been made between the German Norddeich station and a receiving station 260 miles distant. The results are described by Herr H. Mosler in the *Elektrotechnische Zeitschrift*, No. 35, 1913. The strength of the signals was measured by means of a mirror galvanometer and a resistance connected in parallel with the receiving telephone. A 60-ft. aerial and a crystal detector were employed. No appreciable variation in the strength of the signals was observed during the day at any time of the year, the intensity being apparently uninfluenced by the height of the sun. On the other hand, the signals at night during the spring and autumn were double the strength of those by day. In the summer months the night signals were not much stronger than those by day. The intensity of the signals was not influenced by variations in temperature, pressure, or moisture of the air. On some winter nights, with a clear sky, the strength of the signals fluctuated up to six or eight times the average value within a few minutes at quite irregular intervals. Moonlight was found to have no appreciable influence on the strength of the signals. The variations are put down by the author to periodic fluctuations in the conductivity and reflective properties of the upper ionised layer of the atmosphere, which is some fifty miles high, according to the latest theories. This is confirmed by the observation of Taylor that the night signals are particularly strong during the "Northern Lights," which are at a maximum in the spring and autumn.

The Oran-Tangier cable was repaired on the 11th inst., and on the 12th inst. the Compagnie Française des Câbles Télégraphiques suffered a further interruption, the Martinique-Paramaribo cable having joined its brothers on strike. They have now four sections in West Indian waters down.—Besides this, the Jamaica-Colon cable has been down for a long time.—The Kartal-Nagra cable was down on the 15th inst.—The Greek office states that international telegrams can again be accepted for Samos, but at sender's risk.—Messages are sent as far as Smyra by telegraph and beyond by wireless without extra charge.



## The "Bridge-Megger" Testing Set

combines in one instrument many advantages. It has an immense range, and provides means for testing insulation by direct deflection with a



afford to be without one of these instruments, and they are equally indispensable to the station man and the wiring contractor. Every instrument carries **FIVE YEARS' GUARANTEE.**

**Sole Makers: EVERSLED & VIGNOLES, Ltd.,**

Telephone: 1370 Chiswick (2 lines).  
Telegrams: "Dorothea, London"

**Acton Lane Works, Chiswick, LONDON, W.**



## Constant Pressure Generator:

as well as making measurements of low resistance by bridge method, so adapted as to enable the operation to be performed in a tithe of the time necessary with any other apparatus.

No power user having a large equipment of electrical plant can

afford to be without one of these instruments, and they are equally indispensable to the station man and the wiring contractor. Every instrument carries **FIVE YEARS' GUARANTEE.**

## G. C. R. RESTAURANT CAR SERVICE

**BETWEEN**

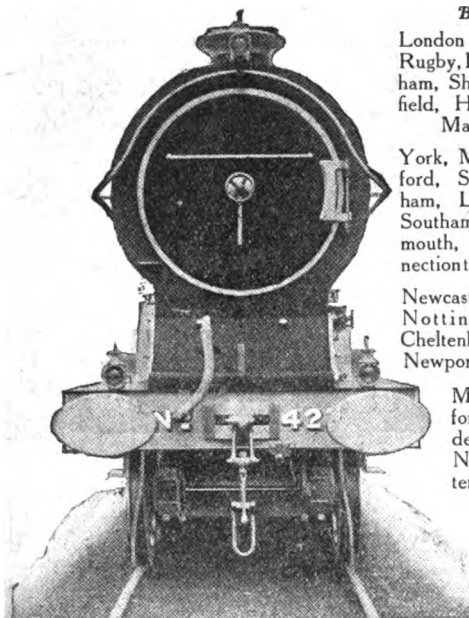
London (Marylebone).  
Rugby, Leicester, Nottingham,  
Sheffield, Huddersfield,  
Halifax, Bradford,  
Manchester, &c.

York, Manchester, Bradford,  
Sheffield, Nottingham,  
Leicester, Oxford,  
Southampton, and Bournemouth,  
with direct connection to the Isle of Wight.

Newcastle, York, Sheffield,  
Nottingham, Leicester,  
Cheltenham, Gloucester,  
Newport, Cardiff & Barry.

Manchester, Bradford,  
Halifax, Huddersfield,  
Sheffield, Nottingham,  
Leicester, Bath & Bristol.

Manchester,  
:: Sheffield, ::  
Grimsby (for  
the Continent),  
& Cleethorpes.



**MEALS SERVED À LA CARTE AT ANY TIME TO  
SUIT THE CONVENIENCE OF PASSENGERS.**

For particulars of Train Service and Special Travel Facilities,  
etc., apply any Great Central Station, Agency, Dean & Dawson's  
Offices, or send post card to Publicity Department, 216,  
Marylebone Road, London, N.W.

**SAM FAY, General Manager.**

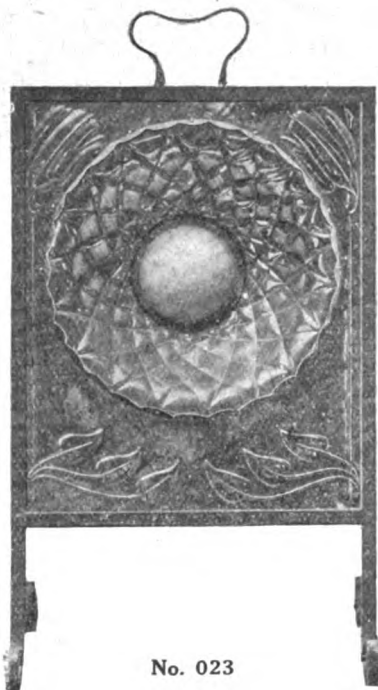
**FOR  
BRITISH  
MANUFACTURED  
PAPER  
INSULATED  
CABLES**

**THE  
UNION  
CABLE  
CO., LD**

**DAGENHAM DOCK,  
ESSEX.**

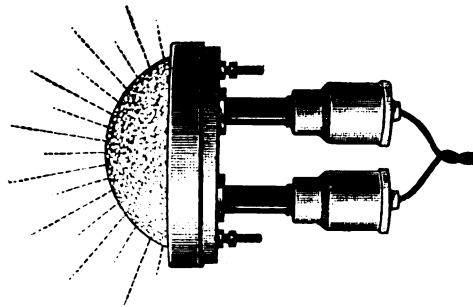
# "Redglo" RED-HOT ELECTRIC FIRE

**Comfort and Economy.**



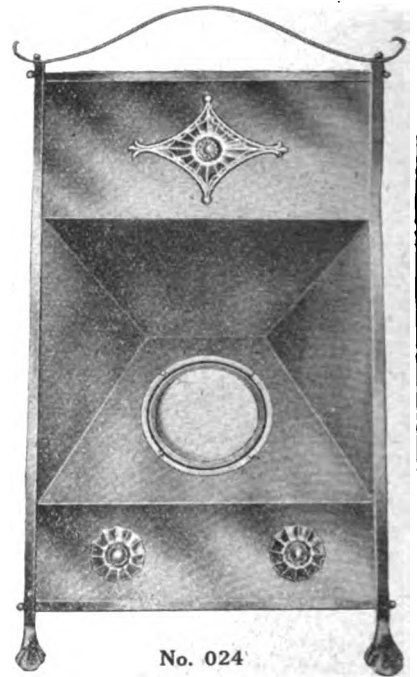
No. 023

The "Redglo" Unit



Consumption 600 Watts

(Martin's Patent)



No. 024

## THE Red-Hot FIRE

*Write for Catalogue No. 27.*

**REDGLO, Ltd.,**

647, Royal Liver Buildings,

Works: MANCHESTER.

**LIVERPOOL.**

WHEN CORRESPONDING WITH ADVERTISERS, PLEASE MENTION "ELECTRICAL ENGINEERING."

## "ELECTRICAL ENGINEERING" TRADE SECTION

— Notes on Tenders Invited and Prospective Business appear on p. 657. —

### CATALOGUES, PAMPHLETS, &c., RECEIVED

W.C.) a brochure describing Oerlikon generators, built for **SLOW-SPEED GENERATOR**.—We have received from the Maschinenfabrik Oerlikon (Oswaldstre House, Norfolk Street, coupling to Diesel engines, gas engines, &c., the magnet wheel of which revolves round the stationary armature instead, as is the case with ordinary flywheel-type generators, in the bore of the latter, the object being that of increasing the flywheel effect for a given weight of the rotary part in proportion to the square of the increased mean diameter of the rotor.

*Readers desiring copies of catalogues or pamphlets should apply to the firms in question, referring to the notice in "Electrical Engineering."*

**ELECTRIC IMMERSION HEATERS, CARPETS, &c.**—Some neat little immersion heaters for heating small quantities of liquid, from  $\frac{1}{4}$  pint to  $\frac{1}{2}$  gallon, are described in a leaflet from Landau & Co. (St. Ann's Chambers, Orchard Street, Westminster, S.W.). The heater is known as the "Lanco," and is made of plated brass and wound for pressures between 100 and 220 volts. The usual size takes about 440 watts, and will boil a quart of water in about fifteen minutes, but a larger size taking 660 watts, is also obtainable. One design is adapted for pressures between 100 and 130 volts, or 200 and 230 volts, so that it is suitable for travellers' use. Another "Lanco" speciality consists of an electric heating cushion fitted with neat rotary heat regulator, by means of which three heats may be obtained. The cushion measures 12 in. by 15 in., and weighs 14 oz. It makes a convenient bed warmer, but may be used for many other purposes as well. Foot-mats and rugs in different materials and sizes may also be obtained for use where a supplementary local floor heating is desirable.

### A LARGE CABLE ORDER

**T**HE contract for the supply and erection of the cables for the conversion of their suburban lines to electric traction was placed by the London & South Western Railway Co.

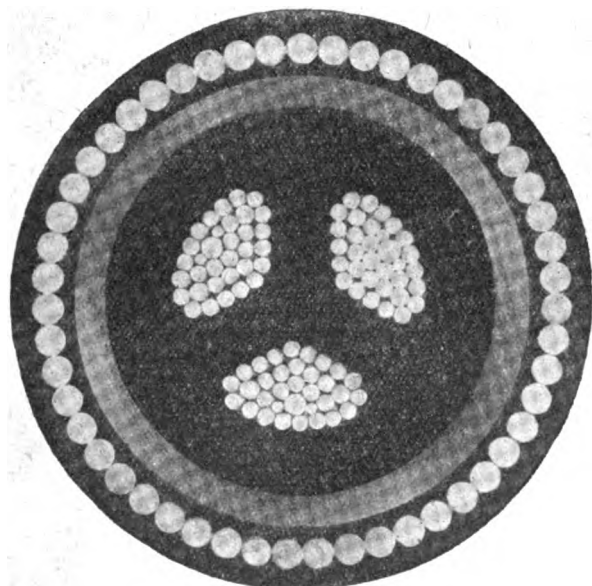


FIG. 1.—11,000-VOLT 3-CORE CABLE FOR L. & S.W. RAILWAY.

with Siemens Brothers & Co., Ltd. (Woolwich). The leading particulars are as follows:—The three-phase current has a working pressure of 11,000 volts at a frequency of 25 cycles per sec. The generating station is

to be at Wimbledon, and sub-stations containing transformers and rotary-converters are to be erected at Waterloo, Clapham Junction, Raynes Park, Hampton Court Junction, Barnes, Twickenham, Isleworth, Sunbury and Kingston. The cables (see Fig. 1) are three-core, paper-insulated, lead-covered, jute-served and armoured with a layer of galvanised

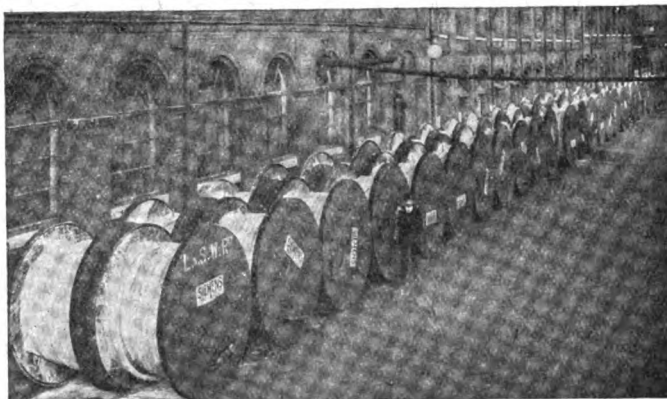


FIG. 2.—THE FIRST BATCH OF CABLE READY FOR DELIVERY.

steel wires, and served all over with jute. The approximate quantities of three-core cable to be used are as follows:—84 miles 0.2 sq. in., 21½ miles 0.15 sq. in., and 19 miles 0.06 sq. in. The chief particulars of the cables are as follows:—

Section.	No. of Wires.	Diameter of Wire varying from	Thickness of Dielectric between Conductors and Lead.	Thickness of Lead.	Overall Diameter of Cable.
Sq. in.			inches.	inches.	inches.
0.2	33	0.06 to 0.114	0.36	0.16	3.17
0.15	33	0.054 to 0.11	0.36	0.15	3.01
0.06	22	0.048 to 0.068	0.35	0.13	2.65

The cables are being erected on brackets supported by stakes driven into the ground. They were subjected to a test pressure of 25,000 volts between any core and lead. The work is being carried out under the superintendence of Mr. Herbert Jones, Chief Electrical Engineer to the London & South Western Railway Co. Fig. 2 illustrates the first batch of finished cable before despatch from Woolwich Works.

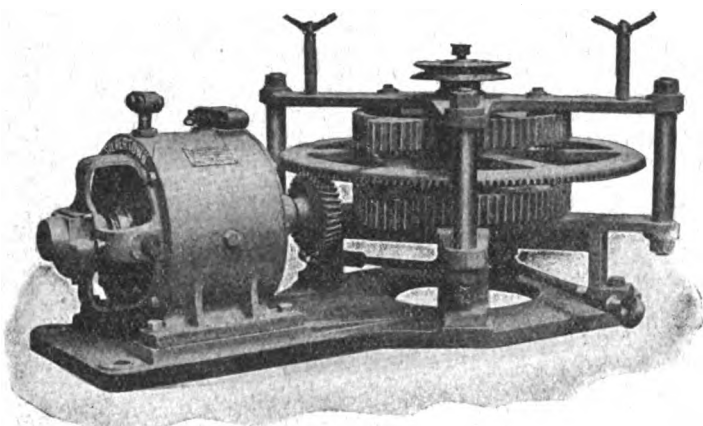
### "REDGLO" ELECTRIC FIRES

**REDGLO, LTD.** (Royal Liver Building, Liverpool), have brought out some attractive designs incorporating their electric fire unit. As it is well known, this consists of a heating element covered by a quartz bowl through which the heat passes. It attains a glowing red surface within a few moments of the current being switched on, and gives a particularly large heating area for its current consumption. The heating surface of each unit is 28 sq. in., and the current consumption is 600 watts. Thus in places where the charge of electricity is 1d. per unit, the cost for one hour is only a trifle over  $\frac{1}{4}$ d. The object which has been aimed at is the conversion of the maximum amount of electrical energy into radiant heat. The losses due to convected heat which are losses when the aim is radiant heat have been reduced to a minimum. A large number of designs have been got out to suit all requirements, and in some of the frames two or three units are incorporated for use where great heat is required.

The single unit designs should prove a great attraction to retail establishments, owing to their reasonable cost and the fact that such a short time is taken to attain their maximum temperature.

### A 1295 TO 1 REDUCING GEAR

THE illustration shows one of a number of special reducing gears designed by The India Rubber, Gutta Percha and Telegraph Works Co., Ltd. (Silvertown), to operate the damper of a bank of boilers. The reducing gear consists of a combination of bevel and epicyclic spur gearing which rotates a vertical shaft. A crank is fitted to the lower end of the shaft which operates two connecting rods attached to the cranks on the damper. The gear ratio is 1295:1. The



SILVERTOWN MOTOR DRIVING REDUCING GEAR.

motor is of the Silvertown "Z.15" type, and develops 1½ B.H.P. at 1,295 r.p.m. The chain wheel fitted on top of the gear serves to drive an indicator erected in the stoke-hole, thus the stoker can see at a glance the exact position of the damper. As the motor and gear are installed over the boiler flue, a metal cover is fitted over the complete gear to exclude dust as far as possible. We would draw attention to the fact that the arrangement of the gear renders it impossible for the dampers to jam when closed, should the motor be allowed to over-run.

### ILLUMINATED DECORATIONS

AN attractive series of electrical illumination devices for Christmas and festive decorations is included in a new list from Siemens Bros. Dynamo Works, Ltd. (Lamp and Fittings Department).



ILLUMINATED FRUIT BASKET.

In one of these, the basket illustrated here, the coloured lamp bulbs are moulded to represent fruit, and in another a basket of roses is similarly imitated. There are also a number of single lamp designs representing oak sprays, poppies, pears, geraniums and hyacinths. The baskets are obtainable ready wired for the usual supply voltages, and the single lamp devices are provided with 15-volt lamps, which can be run in series with the baskets. The devices are strongly made, and of quite natural colours and shapes, the floral and other designs are specially suitable for

table decorations, and lend considerably to the effectiveness of the festive board. Illumination lamps of many varied shapes are available for use on Christmas tree decoration, and include representations of fruit, flowers and birds. All these types can be obtained with clip contacts, which simplifies wiring, and a selection of these devices may be interconnected to complete any required decoration scheme. Copies of this list will be supplied to any member of the trade who may be interested.

**Lundberg Switching Competition.**—We are asked to state that amongst the Preliminary Grade Certificate holders "P. Riach (Birmingham)" should have appeared as "P. Riach (London)." The error was not ours.

### INDIRECT LIGHTING

THE British Thomson-Houston Co., Ltd. (Mazda House, 77 Upper Thames Street, E.C.), have just issued a twenty-four page booklet on the "Eye-Rest" system. This booklet describes the system, and illustrates and prices the complete range of "Eye-Rest" fittings. Amongst the many new designs shown in this booklet are some flambeaux pendants and wall brackets with X-ray reflectors concealed in the flambeaux, as illustrated in Figs. 1 and 2. A number

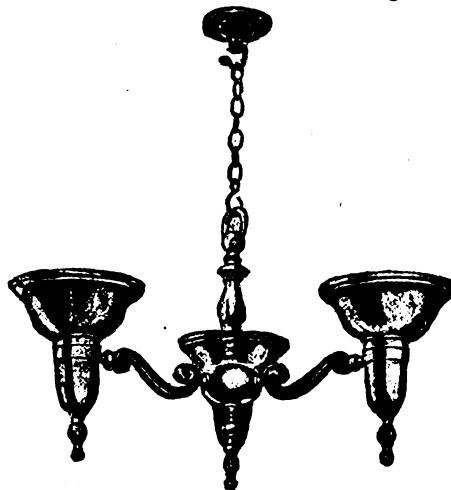


FIG. 1.—EYE-REST FLAMBEAU FITTING.



FIG. 2.—FLAMBEAU WALL BRACKET.

of illustrations of typical installations are included in the booklet. Electrical engineers and contractors should write for copies.

An interesting article on indirect lighting appeared recently in the *Standard*, where the excellent diffusion obtained by this method was emphasised, and the well-known effect of increasing the apparent height of the room commented on. Another advantage pointed out is the absence of unpleasant

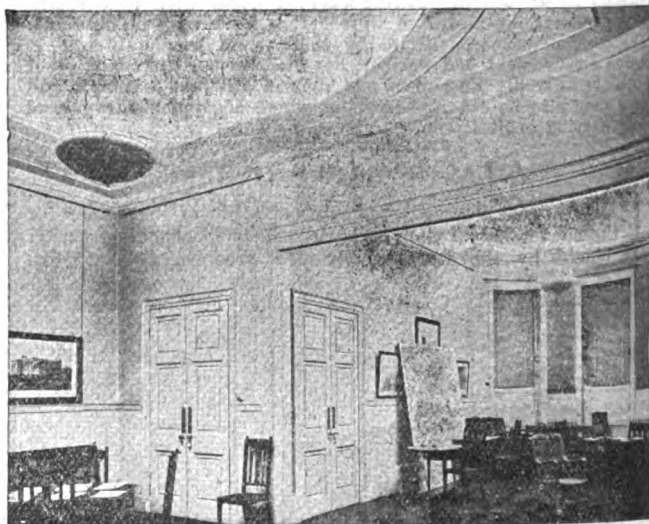


FIG. 3.—ASSEMBLY ROOM, SOCIETY OF ARCHITECTS, BEDFORD SQUARE, LONDON.

glare from glossy paper when reading. The system is truly named "Eye-rest," as compared with some of the crude methods of illumination by "lumps of light" hitherto practised. A good example of an interior lighted by this method is shown in Fig. 3.

**A Social Gathering.**—A. Reyrolle & Co.'s employees held their annual whist drive and dance in the Hebburn Co-operative Hall on Friday last. The event was very successful. After supper, prizes for the works' annual sports were presented by Mrs. Reyrolle, who received a handsome bouquet. Mr. H. C. Stuart, of the purchasing department, then moved a vote of thanks, and referred to the cordial relations between the officials and workmen, and the genuine interest taken in the welfare of the employees by the head of the firm. This vote was seconded by Mr. P. Wright, of the switch department, after which Mr. Reyrolle replied. An enjoyable programme of dancing followed. The success of the function was largely due to the work of the hon. secretary and his committee.



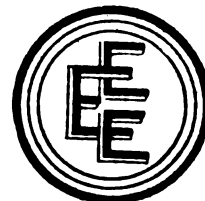
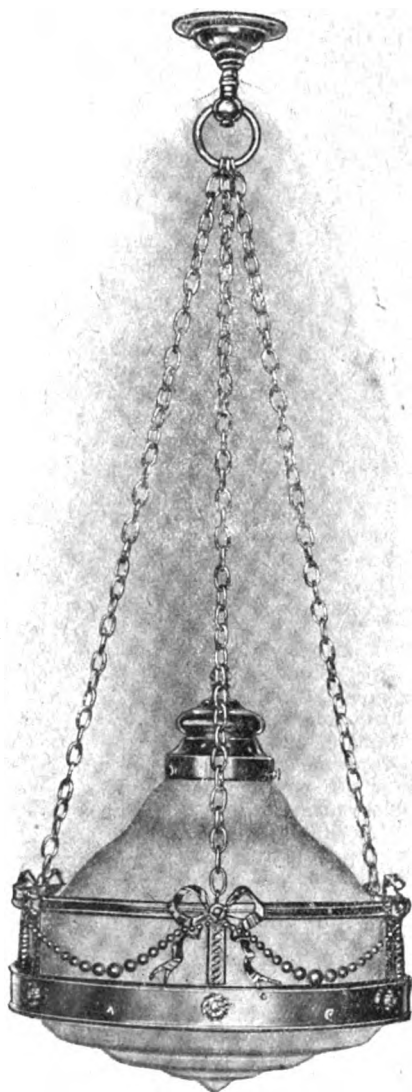
# **"INDRA"**

**PATENTED**

## **SCIENTIFIC LIGHTING**



**OVER  
30,000  
FITTINGS  
ALREADY  
IN  
USE**



**LIGHT  
WITHOUT  
GLARE  
AND WITH  
MINIMUM  
LOSS**

**WRITE FOR LIST OF NEW REDUCED PRICES.  
LIBERAL TRADE DISCOUNTS**

**The Electrical Engineering  
& Equipment Co., Ltd.,**



**109/111, New Oxford St.,  
London, W.C.**

**Telephone: 133 Gerrard.**

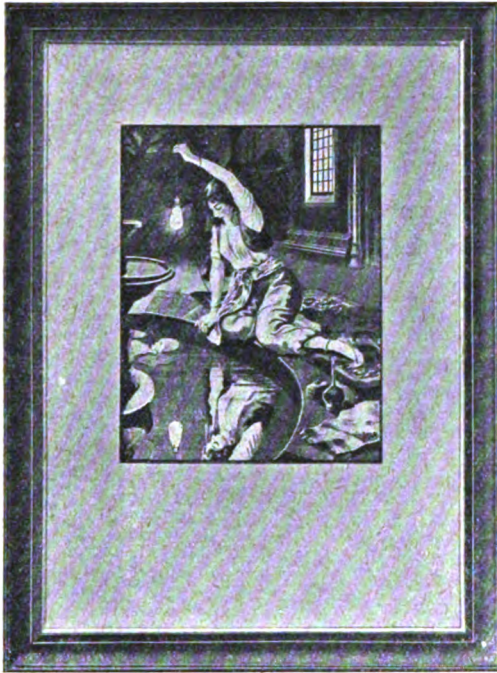
**Telegrams: "Thermotype, Westcent."**

*When corresponding with Advertisers, please mention "Electrical Engineering."*



### AN ARTISTIC ADVERTISEMENT

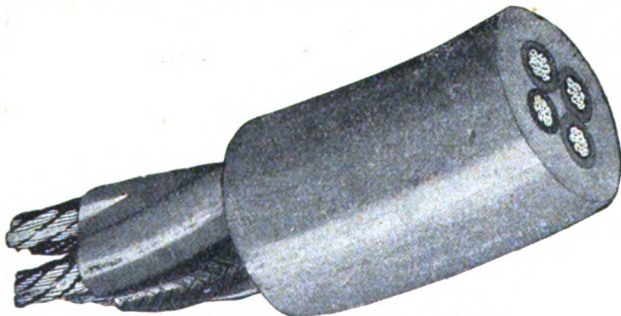
THROUGH the kindness of Siemens Bros. Dynamo Works, Ltd. (Lamp Department), we are able to adorn our office wall with the handsome coloured picture which we reproduce here showing a Wotan lamp in very charming company and surroundings. The firm are being very liberal with their good



things, and offer to present copies of this picture ready for framing to any electric light consumer who would care to have one. The supply is, of course, limited, and in view of the huge peak that the maximum demand is expected to attain, the priority will be given to consumers who are using lamps of Siemens' manufacture. The offer is, however, open to anyone who has electricity installed.

### SOLID RUBBER-SHEATHED CABLES

WE have recently received a list from W. T. Henley's Telegraph Works Co., Ltd. (Blomfield Street, London Wall, E.C.), dealing with solid rubber sheathed cables, which are now widely used where there is a liability of meeting with mechanical damage. The conditions under which trailing cables are used in mines, on wharves and docks in connection with portable apparatus, cranes, &c., are, in most cases, exceptionally severe, and call for cables which must be specially protected to give satisfactory results. Also in workshops, factories and mills there is a probability of the ordinary lighting cables and flexible cords being accidentally knocked



FOUR-CORE RUBBER SHEATHED CABLE.

or struck by some sharp material. The sheathing consists of vulcanised india-rubber of a tough and durable quality, specially prepared to withstand the effects of rough usage. Although the initial cost of this type is greater than those types which have been previously installed, it is more economical in the end, owing to the fact that the life of solid rubber sheathed cables in such circumstances is longer than that of the ordinary pattern. The illustration gives a good idea of the nature of the cable. One layer of pure rubber and two layers of vulcanising rubber are used for the actual insulation of the conductors, all is then vulcanised together and sheathed with a vulcanised rubber of a special

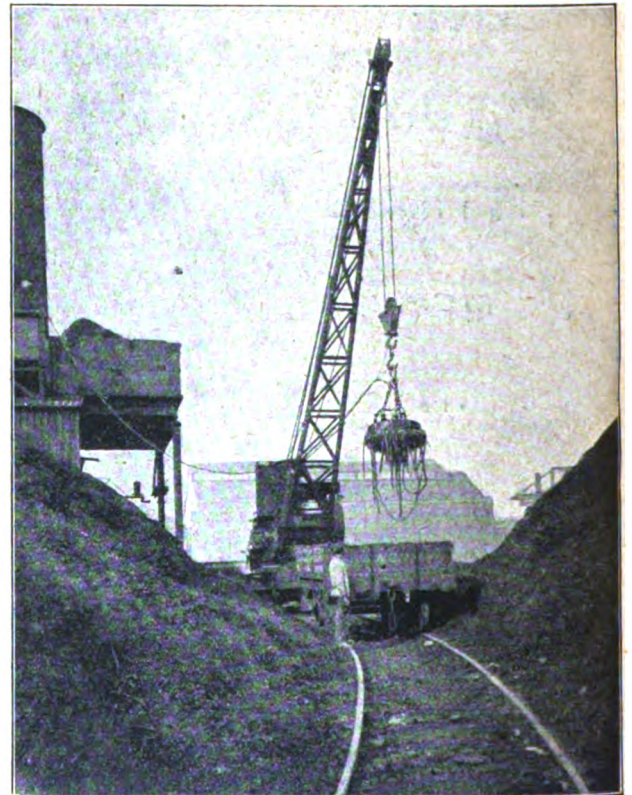
tough and durable quality. Single and twin ordinary cables are made in this way as well as 2, 3 or 4 core special trailing cables, and "C.M.A." flexibles with this class of protection. The firm will be glad to send a copy of the list to anyone in the trade who is interested in the matter.

### TELEPHONE SWITCHBOARDS

THE Peel-Conner Telephone Works, Ltd., have issued a Bulletin describing their central battery multiple switchboards. It contains a description of their system of telephone exchange equipment, bringing out clearly the points which should appeal to the telephone engineer. Although the book contains some fine photographs of the exchange switchboards in use in various places, the descriptive matter is not subordinated to the illustrations, and the latter are for the most part excellent reproductions, showing in detail the various pieces of apparatus used in a telephone exchange on the Peel-Conner system. The Company is proud of its relays, and guarantees that the relay faults in their exchanges per year are less than one-tenth of one per cent. of the number of relays installed. A feature of the Peel-Conner system, it will be remembered, is that the central battery is fed to the lines through relay windings which operate the supervisory signals as well as serving as impedance coils, and the voice currents pass from one side of the cord circuit to the other through a condenser. Although the Company make exchanges for 22-volt working as well as for 40-volt central batteries, they recommend the latter in most cases.

### LIFTING MAGNETS IN STEEL WORKS

THE great field of utility for lifting magnets in steel works is rarely realised except by those who are brought directly into contact with such work. In an important works thousands of tons of scrap rapidly accumulate, making it extremely difficult for human labour to cope with the large amount of material. Seeing that the accumulation of scrap was getting out of hand, one of the largest steelworks in the country decided to resort to lifting magnets for its



WITTON-KRAMER MAGNET LOADING SCRAP IN A STEEL WORKS.

removal, and some idea of the work to be performed by the magnet can be gathered from the mountains of turnings and other scrap that lie on either side of the rails, after gathering for several decades. The magnet, which was supplied by the Witton Kramer Electric Tool & Hoist Co. (for whom the General Electric Co., 67 Queen Victoria Street, London, E.C., are the sole selling agents), is 42 in. in diameter, and, as will be observed from the illustration, is suspended from a jib crane. From the latest reports the magnet is making great headway in the collection of scrap.



## TENDERS INVITED AND PROSPECTIVE BUSINESS

### Generating Stations, Sub-Stations, Mains, &c.

**Australia.**—The Sydney Council is seeking authority to borrow £250,000 for the general purposes of the electricity undertaking.

**Basingstoke.**—A Local Government Board inquiry will be held shortly concerning a loan of £14,000 for the Council's electric lighting scheme.

**Birkenhead.**—Twelve months' supply of motors and motor starters from  $\frac{1}{2}$  h.p. to 15 h.p. Borough Electrical Engineer. (See advertisement on another page.)

**Bradford.**—A Local Government Board inquiry was held on Friday concerning a loan of £90,000 for plant extensions at the Valley Road works. The chief need for this expenditure, it was explained to the inspector, is from the increased applications for power purposes in textile works.

**Cornwall.**—The Great Treverbyn China Clay Co. proposes to erect a power station. Particulars from Cowell & Cowell, Central Chambers, Newquay.

**Hereford.**—A loan of £1,000, repayable in 25 years, has been sanctioned by the L.G.B. for services.

**London: Hackney.**—A loan of £56,748 has been sanctioned by the L.C.C. for electrical extensions.

**Shoreditch.**—Transformer and converting plant for sub-station. Borough Electrical Engineer. December 16th. (See advertisement on another page.)

**St. Marylebone.**—The Finance Committee of the L.C.C. recommends sanction to a loan of £10,825 for electrical extensions.

**Loughborough.**—In reporting upon the proposed loan of £14,000 for re-arrangement of the electricity undertaking and change of supply from direct current to alternating current, the Local Government Board has informed the Corporation that it will defer sanction until the approval of the Board of Trade to the new system of supply has been obtained. This loan is in connection with the installation of a Ljungstrom turbo-alternator, about which Mr. H. R. Hooper, the Local Government Board Inspector, expressed himself rather freely at the time of the inquiry.

**New Zealand.**—An extensive electric pumping plant is to be installed in the Otago Province for rendering some 6,000 acres suitable for fruit growing and similar purposes. Further particulars, Board of Trade, 78 Basinghall Street, London, E.C.

The Fielding Council proposes to borrow £10,000 for an electric lighting undertaking.

**Plymouth.**—H.T. switch panels are required for the electricity works. Borough Electrical Engineer. December 1st.

**Radcliffe.**—A loan of £3,950 is to be taken up for electrical extensions.

**South Africa.**—The East London Council proposes to raise a loan of £18,000 for mains extensions, and £16,270 for plant extensions.—The Cape Province Council is raising a loan of £7,000 for electrical purposes.

**Wallasey.**—A Local Government Board inquiry was held on Tuesday concerning a loan of £65,000 for extensions at the electricity works. It is proposed to construct a new generating station at Seacombe.

**Wolverhampton.**—The Local Government Board has sanctioned the borrowing of £15,000 for mains, £5,000 for station equipment, and £2,000 for switchgear.

### Wiring

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Bannockburn.**—The Co-operative Society's premises are to be equipped with an electric lighting and power installation, current being supplied by the Scottish Central Electric Power Co.

**Barry.**—Rebuilding of Boys' County School, recently destroyed by fire. Clerk, Glamorgan County Hall, Cardiff.

**Beckenham.**—The necessary loans have been sanctioned for an elementary school in Balgovan Road.

**Blackpool.**—Public baths and wash-houses (£10,000).

**Dewsbury.**—Electric lighting of Dewsbury Pioneers' Industrial Society. Architects, Holton & Fox, Corporation Street.

**Finchley.**—New swimming bath.

**Grimby.**—Bank premises, Victoria Street. Architects, Garside & Pennington, Old Bank Chambers, Pontefract.

**Huddersfield.**—The electric lighting of the Crosland Moor workhouse has been decided upon.

**Liverpool.**—Drill hall for West Lancashire Territorial Force Association. Secretary, 21 Islington, Liverpool.

**London: L.C.C.**—225 points at Chester Road elementary school, St. Pancras. (See advertisement on another page.)

Enlargement of Ennersdale School, Lewisham (£5,360).

**Manchester.**—Additions to Dispensary and Ophthalmic Department at West Didsbury workhouse. Architect, F. H. Overmann, 49 King Street.

Alterations to Labour Exchange and Health Insurance Offices, 30 Dickinson Street. H.M. Office of Works, London.

**Pontefract.**—Nurses' Home at workhouse. Clerk to Guardians. December 2nd.

**Pontypridd.**—Tenders are invited for the electric lighting of the Cottage Homes, Church Village. Clerk to Guardians, November 25th.

**Stalybridge.**—New swimming bath. Borough Surveyor.

## TENDERS RECEIVED AND ACCEPTED

**Barnsley.**—The Electricity Department has placed a repeat order with Edward Bennis & Co. for four "Bennis" machine-stokers and self-cleaning compressed-air furnaces.

**Loughborough.**—Subject to the consent of the Local Government Board (see "Tenders Invited" columns) the following contracts have been signed for plant extensions:—Ljungstrom turbo-alternator, Brush Electrical Engineering Co.; rotary-converter and switchgear, Siemens Bros. & Co

## MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. G. Smith & Son, of 5 Philpot Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night, was £70 10s. to £71 10s. (Last week, £73 to £73 10s.)

**Agencies Wanted.**—A firm of electrical and general engineers in Sydney, N.S.W., desires to take up a few agencies for switchgear, instruments or any special electrical apparatus for firms not already represented in Australia. Firms desiring to be put into communication with this firm may apply to the Editor of ELECTRICAL ENGINEERING for its name and address.

An American manufacturer desires agents in Great Britain for electrical vacuum cleaners, &c. (See advertisement on another page.)

**Liquidations.**—A meeting of the creditors of Metalite, Ltd., now being wound up voluntarily with a view to reconstruction, will be held at 9 and 10 Pancras Lane, E.C., on Monday, the 24th inst., at 12 noon.

The Hydro Electrical Gear Co., Ltd., is to be wound up voluntarily, with Mr. J. A. Henderson, of 11 Pancras Lane, E.C., as liquidator. A meeting of creditors will be held at the above address to-day at 11 a.m.

A meeting of the creditors of the Preston Electric Co., Ltd., was held at the office of the liquidator, Mr. T. L. Rawlins, 12 Bennets Hill, Birmingham.

With reference to the notice on page 638 of last week's ELECTRICAL ENGINEERING, regarding the winding up of Ozonair, Ltd., it should be stated that this voluntary liquidation is with a view to the sale of the business to a new company, which has already received its certificate of incorporation and permission to trade.

**Fire Brigade Competition.**—The Brigade of the General Electric Co., Ltd., participated in the annual competition of the Associated Fire Brigades on the drill ground of Achilles Serre, Ltd., Hackney Wick. In this case they were not successful in carrying off the prizes, as they often have done, but the honours went to their hosts.

FOR  
**STEAM JOINTS**  
USE



JOHN HUDSON & CO.'S SUCCESSORS, Mansell St., London, E.

## LOCAL NOTES

**Bristol: Workhouse Lighting.**—At the last meeting of the Guardians reference was made to the satisfactory results of the electric lighting installation at the Stapleton workhouse, and the beneficial effect upon the decorations compared with what was the case when the buildings were previously lighted by gas.

**Bath: Diesel Engine.**—The official tests of the Diesel engine have now been carried out with satisfactory results.

**Consett: Electric Lighting.**—The Cleveland & Durham Electric Power Co., having given an undertaking that they will definitely inaugurate public electric lighting this month, notice is to be given to the Shotley Bridge & Consett District Gas Co. to cease lighting the street lamps.

**Dudley: Electricity Supply.**—Although it was said to be the intention of the Power Co., which has acquired the Dudley Corporation electricity works, to convert the power station into a sub-station, information has now been received which goes to show that the Company has now changed its plans, and that the Dudley Works will be extended and continued in use as a generating station.

**Edinburgh: Extension of Area.**—The Town Council has decided to apply for an electric lighting provisional order to deal with some half-dozen suburban districts outside the present area of supply.

**Hove: Purchase of Electricity Co.**—It is anticipated that the total cost to the Corporation of the purchase of the Hove Electric Lighting Co., Ltd., will be £175,000. The transfer is to take place on December 8th, but apparently as yet the Corporation has not come to a decision whether to work the undertaking itself or to lease it.

**Hebburn: The Cable Breakdowns.**—According to the *North Mail*, Prof. Thornton's report on the recent cable troubles attributes the failures of the 240-volt continuous-current cables to the effect of moisture forced by the osmotic effect of the continuous current into cracks in the bitumen. The Supply Co. is now changing to A.C. supply, which is expected to rectify the trouble, as has been the case at Monkseaton and other places. The high-pressure cables are reported to be in good order.

**Leeds: Electric Lighting Accounts.**—The expansion of the business of the electric supply undertaking, which has been noticeable during the past few years, has proceeded without any falling off during the past half year. The growth of the power supply is beyond all precedent, there being an increase in output for this of 37·57 per cent. over the first half 1912-13, with an increase in the horse power of motors connected of 10·74 per cent. The increase in private lighting has more than neutralised the loss in price consequent upon the reduced tariff which took effect in October, 1912. The total sales for the half year, viz., 12,858,263 units, show an increase of 33·54 per cent over the corresponding period for 1912-13, and the total income, viz., £52,828, is 19 per cent. in advance. The average price obtained has been reduced from 1·15d. per unit to 1·02d. per unit.

**Lytham: Electricity Supply.**—With reference to the proposal of the Council to proceed with an electric lighting scheme of its own (*ELECTRICAL ENGINEERING*, November 13th, p. 633), Mr. J. H. Tonge, Engineer and Manager, National Electric Supply Co., Ltd., Preston, has reported to the Council that with an estimated output of 180,000 units per annum, and the maximum load of 180 kw., the cost of supply from the St. Anne's Council's electricity works delivered to the Council's low-pressure feeders will be 3·35d., whilst he estimates that the Lytham Council could, with its own plant, generate at 2·93d. per unit, the capital charges for distribution being the same in either case. It is in consequence of this difference in price and the fact that the St. Anne's Council requires a contract for twenty-one years, that the Electric Lighting Committee has recommended the Council to proceed with its own scheme.

**Loughborough: Electricity Committee.**—Hitherto the electricity and gas undertakings have been managed by one committee, but at the first meeting of the new Town Council after the November elections it was decided to have these undertakings in future managed by separate committees.

**Newcastle-under-Lyme: Cooking Demonstrations.**—A series of electric cooking demonstrations is being held by Mr. F. S. Grogan, of the British Electric Transformer Co., Ltd., who are the makers of "Tricity" cookers. The demonstrations were arranged for by Messrs. Gillespie & Beales (Amberley House, Norfolk Street, Strand), who are sole wholesale agents for these cookers, in co-operation with Mr. A. J. C. de Renzi, Borough Electrical Engineer.

**Rushden: Electric Supply.**—The power house recently erected by the Rushden & District Electric Supply Co., which got into working order about a month ago, contains two Diesel oil-engine driven generating sets of 240 kw. each.

**Sunderland: Reduced Heating Tariff.**—The Electricity Committee recommends that the tariff for heating and cooking where the premises are lighted throughout by electricity be reduced from ½d. to ¼d. per unit.

**Teignmouth: Electric Supply.**—The consideration of Mr. E. M. Lacey's report upon an electric lighting scheme (*ELECTRICAL ENGINEERING*, November 6th, p. 623) has been deferred for a month.

**Troon: Electric Supply.**—Negotiations are being carried on with the Kilmarnock Corporation for a supply of electricity to be given in this district. It has been estimated that an independent plant could be put down at £5,000, but an endeavour is being made to obtain a supply at about ½d. per unit from Kilmarnock.

**Weston-super-Mare: Street Lighting.**—The Weston-super-Mare & District Electric Supply Co., Ltd., has placed a scheme before the Council for installing centrally suspended arc lamps along the Boulevard to give a candle power of not less than 3,600, at a cost of £42 per annum on a five years' contract. The offer has been accepted. The penalty for non-maintenance of candle power is to be 5s. per night upon the figures ascertained by the Borough Surveyor.

## APPOINTMENTS AND PERSONAL NOTES

Mr. J. E. Pownall, of Hampstead, has been appointed Assistant Electrical Engineer at Tunbridge Wells, at a salary of £170 rising to £200 per annum, in succession to Mr. J. Bemrose, who has been appointed Chief Electrical Engineer at Leek.

We are glad to report that Mr. H. Clifford Palmer, Manager of the Publication Department of the General Electric Co., who met with an accident when motor-bicycling about a month ago and seriously damaged his leg just below the knee-cap, is now practically well again.

A mains inspector is required in the London County Council Tramways Department. Salary £3 10s. per week. (See advertisement on another page.)

Two switchboard attendants are required in the Birkenhead Corporation Electricity Department. (See advertisement on another page.)

Mr. R. J. Wright has been appointed Charge Engineer at the Hereford Corporation electricity works.

## NEW COMPANIES

**ENFIELD ELECTRIC CABLE MANUFACTURING CO., LTD.**, 47 New Broad Street, E.C. Capital £50,000.

**CUMBERLAND WASTE HEAT OWNERS CO., LTD.**—Registered by Kerr & Lanham, 16 Farnival Street, E.C. Capital £50,000. To undertake schemes for the production of electrical energy from waste heat. First directors, L. Wood and C. S. Hunting.

**Southend Yacht Club "Tricity" Dinner.**—Messrs. Gillespie & Beales, the sole wholesale agents for "Tricity" electric cookers, recently arranged to cook a dinner for forty of the club members at the request of Mr. Birkett, the Borough Electrical Engineer of Southend. The members were very extravagant in their praise of the results. The proceedings terminated with a joint toast to Mr. Birkett, and to Mr. Grogan, of the British Electric Transformer Co., Ltd., which was duly replied to.

**Velveduct.**—It would on first consideration appear improbable that anything novel in the shape of a conduit tube was capable of being produced. After continued experiment, however, the General Electric Co., Ltd., are able to put on the market a drawn tube, similar in quality and appearance to solid drawn or seamless conduit, but at a price very little higher than welded or brazed tube. The chief points of superiority which have maintained the employment of the higher-priced seamless conduit have been the facility with which it could be bent or set cold, and the freedom from internal fins and burrs, such as are sometimes found in the cheaper tubes. The processes employed in the production of "Velveduct" entirely prevent the possibility of the tube having any internal irregularities, and it can be set cold with equal facility to the seamless tube. "Velveduct" is stocked both in the standard electric thread and also gas thread, and can be used with all the varieties of screwed accessories illustrated in the Conduit Catalogue issued by the General Electric Co., Ltd. (67 Queen Victoria Street, E.C.).



# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 361 [Vol. IX., No. 48]  
*All rights reserved.*

THURSDAY, NOVEMBER 27, 1913.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES and TECHNICAL COLLEGE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

*Other Advertisement Rates on Application.*

### Latest Time for Receiving

Letters for Insertion, Tuesday first post.

Small Advertisements and Official Announcements, Wednesday first post.

Displayed Advertisements, Tuesday first post.

Corrections in Standing Advertisements, Monday first post.

All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 208-209, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Oireling, Fleet, London."

Telephone No.: 5509 Holborn.

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

SOME handsome new street lamp standards have been erected in Marylebone. (Page 660.)

THE electricity supply scheme at Calcutta has recently been reorganised, and a large three-phase station at Cossipore now gives the supply through a number of sub-stations. (Page 661.)

In a Paper read last night at the Birmingham Local Section, and to be discussed to-night at the London meeting of the Institution of Electrical Engineers, Mr. S. Evershed detailed the results of a research showing how important a part absorbed moisture plays in insulation resistance. (Page 663.)

A BADLY designed hand-lamp, and an installation connected so that a 440-volt shock could be obtained from the lighting circuit, were the subject of a Home Office prosecution at Birmingham. A heavy fine was imposed. (Page 663.)

THE connections of petrol-electric cars are discussed in our Questions and Answers columns. (Page 664.)

ABOUT 70 to 100 students broke into the Albert Hall sub-station of the Kensington and Knightsbridge Electric Lighting Co. on Wednesday last week, with the intention of switching off the light in the Albert Hall during James Larkin's meeting. Although some damage was done, their object was not accomplished. (Page 665.)

THE life of the chief of the patents covering the telewriter, as now in use, has been extended five years. Among the specifications published on Thursday last

by the Patent Office is one for maintaining constant the frequency of an A.C. circuit supplied by an inverted rotary. The patentees are the B. T.-H. Co., E. Garton, and A. H. Watson. A disc discharger to give oscillations of a high group frequency suitable for wireless telephony, is described by F. Majorana. (Page 666.)

MAJOR PRINGLE's report on the Aisgill disaster insists on the necessity of superseding gas lighting on trains by electric lighting, and makes some suggestions with regard to automatic stop signalling.—The North-Eastern Railway Co. proposes to use trolley omnibuses for conveying passengers and goods between their stations in Newcastle and Gateshead.—A double-deck trolley omnibus has been approved by the Board of Trade for Brighton.—Good progress is being made with the electrification of the London & North-Western suburban lines. (Page 667.)

DURING the successful hearing of the application for extension of the chief telewriter patent, the progress of the National Telewriter Co. was mentioned. Mr. J. St. V. Pletts gave some particulars as to the couplings used in wireless telegraph circuits, and demonstrated the oscillation of energy from one circuit to the other by means of a mechanical analogy in a lecture last week. The Wireless Society of London has a large number of members, and has now drawn up a set of rules. (Page 667.)

FOOL-PROOF motor control panels for constant and variable speed motors are illustrated. An ingenious interlocking system employed is described. (Page 668.)

A COMPREHENSIVE, well-arranged new season's price-list, dealing with electrical supplies, has been produced by Drake & Gorham, Ltd. (Page 669.)

STREET lighting with ornamental lamp-posts, lowering gear for large electroliers, and a contractor's window display in Australia form the subjects of short illustrated articles on page 670.

A 5,000-kw. alternator is required at Dundee; a similar set, together with storage batteries and transforming plant at Bradford, and expenditures as follows are contemplated:—Stratford (£21,500); Stepney (£7,180); Neath (£9,536); Aylesbury (£20,800); and Rathmines (£12,500).—Electrically-driven pumps are required at Rotherham; motor-converters at Johannesburg, and it is proposed to convert to electric traction certain Cape Town suburban lines. (Page 671.)

THE L.B. & S.C. Railway Co. has agreed to take all supply for lighting and power in its Brighton workshops from the Corporation.—The Broughty Ferry power station is to be linked up with Dundee.—The cost of the recent breakdowns at the L.C.C. power station, including the cost of temporary supply from outside, was £1,713.—The Board of Trade has stipu-

lated that covers on switches, framework, and guards on electric cooking apparatus on the Marylebone supply system shall be sufficiently earthed.—The Hove Corporation, having taken over the electric lighting undertaking from the Hove Electric Lighting Co., are now ready to enter into arrangements for the sale or another lease of this profitable business. (Page 672.)

THE Local Government Board has informed the Association of Municipal Electrical Engineers (Greater London) that expenditure by local authorities on advertising literature is legal. (Page 672.)

A SCHEME for postponing the date of the purchase by the L.C.C. of the London electric supply companies is promised for the next session of Parliament, which may possibly involve an amalgamation of existing supply interests in London. (Page 672.)

### ARRANGEMENTS FOR THE WEEK

(TO-DAY) THURSDAY, NOVEMBER 27TH.

*Institution of Electrical Engineers.*

8 p.m. "The Characteristics of Insulation Resistance," by S. Evershed.

FRIDAY, NOVEMBER 28TH.

*Physical Society.*

5 p.m. At Imperial College of Science. The agenda includes an exhibition of a Double-Fibre String Galvanometer, by H. W. Aphorpe.

SATURDAY, NOVEMBER 29TH.

*Association of Mining Electrical Engineers.*

5.30 p.m. Warwickshire and S. Staffs Section. At Imperial Hotel, Birmingham. "Large Prime Movers and Boilers for Power Houses," by E. Kilburn Scott.

MONDAY, DECEMBER 1ST.

*Institution of Electrical Engineers: Western Section.*

5.45 p.m. At S. Wales Institute of Engineers, Park Place, Cardiff. "The Characteristics of Insulation Resistance," by S. Evershed.

*Institution of Electrical Engineers: Newcastle Students' Section.*

7.30 p.m. At Armstrong College of Science. "Notes on Boiler Testing and Efficiency," by M. Wodeson.

*Society of Engineers.*

7.30 p.m. At Institution of Electrical Engineers. "The Corrosion and Rusting of Iron," by E. K. Rideal.

TUESDAY, DECEMBER 2ND.

*Institution of Electrical Engineers: Manchester Section.*

7.30 p.m. At the University. "The Characteristics of Insulation Resistance," by S. Evershed.

*Institution of Electrical Engineers: Scottish Students' Section.*

8 p.m. At Technical College, Glasgow. "Some Electrical Troubles I have met in the Mines," by John Menzies.

WEDNESDAY, DECEMBER 3RD.

*Institution of Electrical Engineers: Students' Section.*

7.45 p.m. At Victoria Embankment. "Technical Education at Charlottenburg, with some Comparative Observations," by R. Marx

### The London Electrical Engineers.

(TO-DAY) THURSDAY, NOVEMBER 27TH.—C. Company. Technical Instruction 7 to 10 p.m.

FRIDAY, NOVEMBER 28TH.—D. Company. Technical Instruction. 7.30 to 10 p.m.

SATURDAY, NOVEMBER 29TH.—Headquarters open from 10 a.m. till noon.

MONDAY, DECEMBER 1ST.—A. Company. Technical Instruction, 7 to 10 p.m.

TUESDAY, DECEMBER 2ND.—B. Company. Technical Instruction, 7 to 10 p.m.

WEDNESDAY, DECEMBER 3RD.—Recruits only. Infantry Drill and Technical Instruction, 7 to 10 p.m.

THURSDAY, DECEMBER 4TH.—C. Company. Technical Instruction, 7 to 10 p.m.

FRIDAY, DECEMBER 5TH.—D. Company. Technical Instruction, 7.30 to 9.30 p.m.

Special Class on Crossley Engine. 7 p.m.

SATURDAY, DECEMBER 6TH.—Headquarters open from 10 a.m. till noon.

**Obituary.**—We regret to announce the death of Mr. James Howden, in his eighty-second year, Chairman of Messrs. J. Howden & Co., makers of the Howden-Zoelly turbines.

**The Electrical Trades' Benevolent Institution.**—On Saturday evening last, friends and well-wishers of the Electrical Trades' Benevolent Institution gathered in force at the Royal Court Theatre, Sloane Square, to witness an excellent performance of Granville Barker's interesting play, "The Voysey Inheritance," by members of the Garrick Dramatic Society. The performance was well finished and noticeably free from that crudeness which one often associates with amateur efforts. The sharp contrasts between the characters of the different members of the Voysey family were very well brought out. An excellent study of the old man was made by Mr. George Quennel, and there was some fine acting in the arduous part of Edward Voysey by Mr. Clive Brook, while all the ladies, especially Miss Ethyl M. Jolley, acquitted themselves well.

### NEW STREET LAMPS IN MARYLEBONE

A DEPARTURE in street lighting has been made at the new Baker Street Circus, by Baker Street Station. Some handsome new four and five lamp columns on the American ornamental street-lighting system have been erected, each containing a total of 600 watts, in the case of the five-lamp brackets, made up of four 100 and one 200-watt lamps. The fittings were supplied by Mr. Haydn Harrison. The columns are the standard Metropolitan Board of Works type, slightly extended, the globes are Alba and Superlux, and the lamps Osram and Mazda. On the refuge and sidewalk are three lamp fittings, taking 400 watts per post.

Mr. A. H. Seabrook (General Manager, Marylebone Electric Supply Department) remarks in his characteristically outspoken way that this method of street lighting breaks nearly every rule of illumination, but it is contended that it gives



5-LAMP STANDARD AT BAKER STREET CIRCUS.

a most pleasing effect, and, if wasteful in current, a pleasing effect is of more importance from an advertising point of view than a correct system of illumination, which may possibly not be pleasing in appearance. The previous posts erected on this site were of two-light 160 watts, and three-light refuge type of 240-watt capacity, for which the Department charged £4 9s. 6d. and £6 14s. 6d. per post per annum. The charge for the new 600-watt posts is £14, and the 400-watt £10 per post per annum, so that over three times the light is being given for approximately twice the money. The final globes are not yet decided upon, and when this is done all the posts will be of 600-watt capacity. All that has been done is to calculate a small additional cost per unit for the current consumption, reckoning the turning on and off, annual maintenance, &c., the same as before, with the exception of a small increase in lamp maintenance.

**Wages of Electrical Workers.**—It is stated that the Electrical Trades Union has given notice to the London employers for an advance in wages to electrical wiremen to 11d. per hour. A special conference, it is stated, will be held of all the unions connected with the building industry in connection with this demand.

**An Electrically-driven Weaving Shed.**—We are informed by Messrs. John Emsley & Co. that the last paragraph but one in the description of "An Electrically-driven Weaving Shed," on page 645 of our issue last week, containing some figures with regard to the speeding-up, charges and capital expenditure, is incorrect.

## ELECTRICITY SUPPLY IN CALCUTTA

THE development of the undertaking of the Calcutta Electric Supply Corporation, culminating in the large power station now running at Cossipore, and its extensive distribution system, is an interesting example of engineering progress, and considering the large part that electric power is likely to play in the industries of India, involves a scheme in which the prosperity of that populous city is largely bound up.

The first movements towards centralised electricity supply in Calcutta were the passing of the Calcutta Electric Lighting Act of 1895 and the formation in 1897 of the Indian Electric Co., Ltd., reorganised later into the Calcutta Electric Supply Corporation, Ltd. This Company opened its first small generating station at Emambagh Lane in 1899. In 1902 a 750-kw. station was added at Alipore. Both these were continuous-current

ten acres, of which only a portion is yet built on, in the Cossipore-Chitpur municipality, with a frontage on the Hooghly River, and a siding connecting with the Eastern Bengal Railway. A building containing quarters for the engineering staff is provided on the river bank near by. A plan of the station is given in Fig. 1. The main generating plant consists of four 3,000-kw. turbo-alternators, one 800-kw. small turbo-generator, some continuous-current plant moved from the old stations, and one 475-kw. motor-converter. The 3,000-kw. sets are Oerlikon 6,600-volt 3-phase 50-cycle alternators driven by Oerlikon high-pressure steam turbines. Three formed the initial equipment, and a fourth one has just been delivered, but is not yet in commission. These alternators are ventilated by fans carried on their own shafts, and the air is at present drawn through dry filters. In view of the climatic conditions, special precautions have been taken with the insulation, and a complete spare stator is kept in readiness, interchangeable with that of any machine

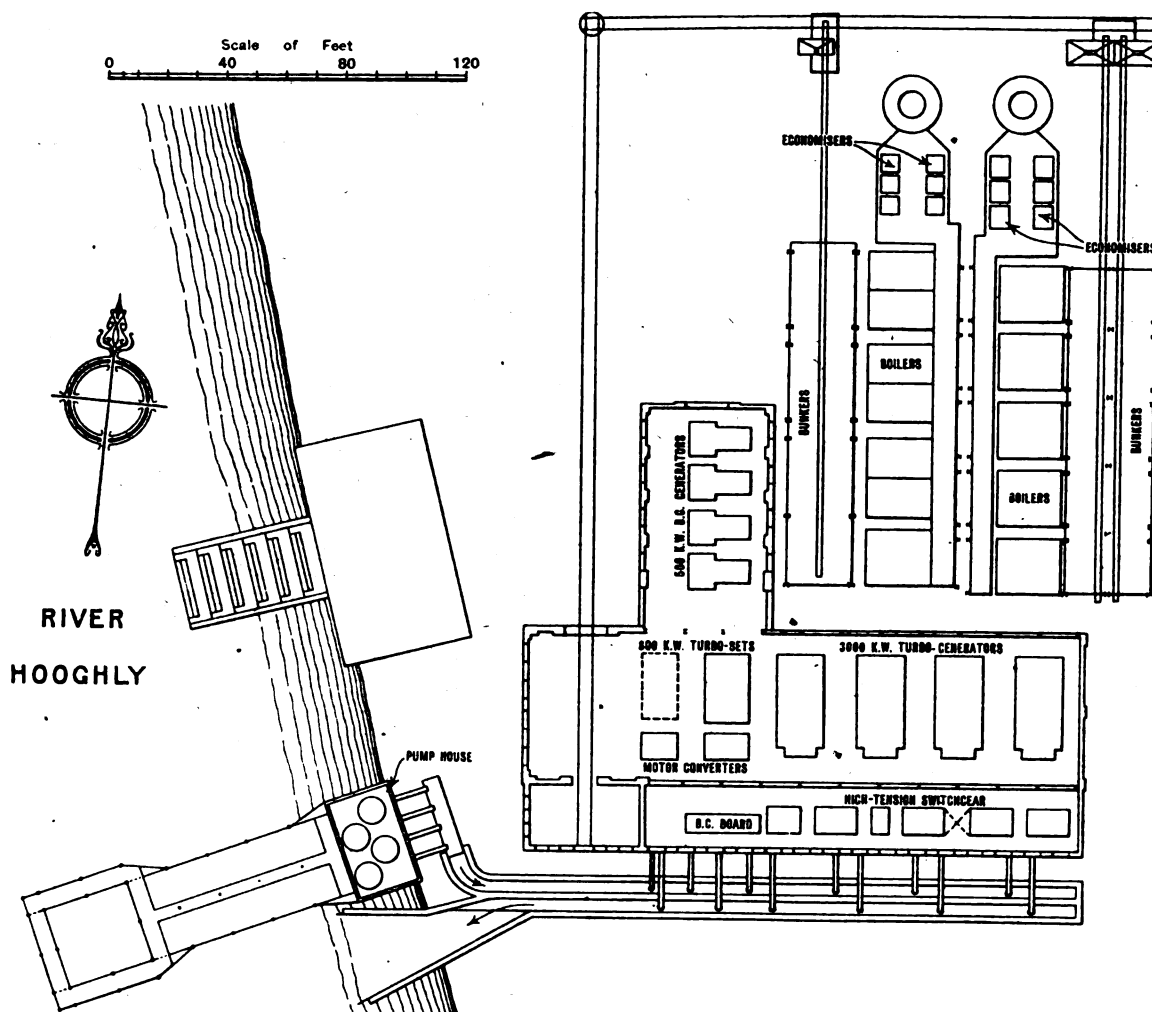


FIG. 1.—PLAN OF COSSIPORE GENERATING STATION.

stations, driven by high-speed reciprocating engines. In 1906 a suction gas station of 165 kw. was started at Howrah, and a further steam station of 1,200 kw. was built at Ultadanga. The load, however, increased so rapidly, that these stations became insufficient, and in 1909 Messrs. Kennedy & Jenkin were asked to report on the situation, and on their advice an 800-kw. 6,600-volt Willans-Siemens turbo-alternator was added at Ultadanga in 1910, marking the entry of alternating current into the system. This was, however, only a temporary measure, and the construction of a large new high-tension generating station at Cossipore, on the River Hooghly, where ample condensing facilities were available, and the conversion of the old stations into sub-stations was decided upon. Work was put in hand on this station—which it is our main object to describe here—in 1910; supply from it commenced in 1912, and the old stations were gradually closed down. It may be mentioned here that Mr. K. A. Scott-Moncrieff was Chief Engineer from the commencement till 1902, when he was succeeded by Mr. S. G. L. Eustace, who held the position till 1909, when the present Chief Engineer, Mr. R. E. Winkfield, was appointed.

The site acquired for the Cossipore station comprises about

in case of breakdowns. It is found that a stator can be replaced in less time than insulation repairs can be effected. The small turbo-generator, which is of 800-kw. capacity, is an Oerlikon mixed-pressure set, which can utilise exhaust steam from the reciprocating continuous-current sets brought from the old stations. Of these latter there are four, each for 500 kw.; they consist of Belliss engines driving Crompton dynamos, and formerly ran non-condensing. A 475-kw. Bruce Peebles-La Cour motor-converter, which can be used as a connecting link between the D.C. and A.C. plant, completes the engine-room equipment. The continuous-current plant will be used to supply a certain amount of external load in the immediate neighbourhood, but is also important as supplying the whole of the auxiliary services of the station.

The boiler houses run at right angles to the main turbine room, and at present contain two rows of boilers, each row having its own flue and short steel chimney for forced draught. In one boiler house are five Stirling water-tube boilers, each of 20,000 lb. normal evaporative capacity per hour, and an overload capacity of 25 per cent. The first boiler in the other boiler house (from the turbine-room end) is a similar unit, and the others are

six Babcock & Wilcox boilers, each of 14,400 lb. evaporative capacity per hour, removed from Emambagh Lane. All these boilers are fitted with Underfeed stokers, and each range has its own group of Green's economisers. The coal bunkers are fed by bucket conveyors from the hoppers at the siding. The capacity of the left-hand bunker is 850 tons, and of the right-hand bunker 1,200 tons, which can be increased to 1,400 tons when a second conveyor is added.

The surface condensers to the Oerlikon turbines were all supplied by W. H. Allen, Son & Co. (Bedford), and are arranged without any shut-off valve between the turbine exhaust and the condenser. The air pumps are driven by continuous-current motors. Condensing water is obtained from the River Hooghly. Owing to the muddy condition of the river, it was considered desirable to have the intakes as near to the surface as possible, and floating intakes were provided, arranged on a jetty and connected to jointed pipes. There are in the pump house by the river a set of four vertical-shaft centrifugal pumps direct coupled to 80-B.H.P. continuous-current motors, and having a capacity of 6,500 gallons per min. Both pumps and motors are of Messrs. Allen's manufacture. The intakes are screened with grids, and the water is taken to the pipes leading to each condenser by open channels or goits four feet wide, arranged as shown in the plan. Feed-water is also obtained from the river, and a storage and settling tank (not shown in the plan) is provided near the middle of the site. The feed-water and make-up water is handled by Allen and Holden & Brooke pumps, and is passed through a Lassen & Hjort treatment plant. The feed pumps are of Weir's make.

The whole of the switchgear was supplied by the British Thomson-Houston Co. (Rugby), and is mounted in a steel frame-

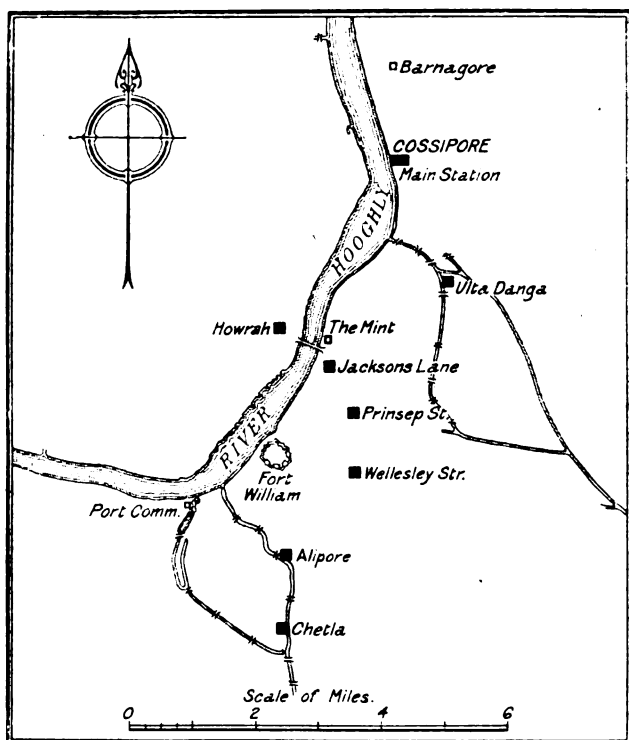


FIG. 2.—SKETCH MAP SHOWING POSITIONS OF SUB-STATIONS.

work in three tiers, with the high-tension gear in stonework cells. The trifurcating boxes and instrument transformers are in the lowest tier, with the cells containing the oil switches above and the control boards at the top. The switches are mechanically operated. Ferranti liquid resistance feeder charging apparatus is employed, and surge arresters of the electrolytic type are provided. The gear is divided into four main sections, each controlling one alternator and four feeders, and another section controlling the small alternator and the motor-converter. It will eventually control the 800-kw. alternators and the motor-converters. Duplicate bus-bars run throughout, and can be sectionalised by automatic oil switches, motor operated, which can break heavy loads if necessary. Two Tirrill regulators are provided. In general, one regulates the whole section, while the other is kept as a stand-by; but it is possible to use one on each section when the bus-bars are divided into two sections, which are to be kept at different voltages. It may be mentioned here that the neutral points of the alternators are not earthed. The continuous-current board, which does not call for special remark, is quite separate.

The feeders leaving the stations are 3-core 0.15 sq. in. section wire-armoured, lead-covered, paper-insulated cables laid solid in bitumen in cast-iron troughs, and were supplied by W. T.

Glover & Co. (Trafford Park, Manchester). All are of this one size, rated at 1,000-kw. capacity. The feeders leading to the Howrah sub-station have to cross the Hooghly River, and are specially armoured for the purpose. They are in duplicate, and the laying of them in the river was a work of no small magnitude, considering that the weight of each drum was about 14 tons. They are specially insulated, and were tested for double the present working pressure, so that when the load is much increased the same maximum current can be put through them at a higher voltage by transforming up, as this might possibly be a less expensive course than laying new cables in the river.

Most of the old stations have been turned into sub-stations, and some new ones have also been added, bringing the total number up to seven. Their positions are shown in the sketch-map in Fig. 2. With the exception of Ultadanga, all are equipped with Bruce Pebbles-La Cour motor-converters in numbers varying from one to six of 475 kw. There are nineteen of these machines in all, including one in the Cossipore main station, those in the sub-stations being distributed as follows:—Howrah, two; Jackson's Lane, three; Prinsep Street, six; Wellesley Street, three; Alipore, three; and Chetla, one. This last machine was moved from Howrah, where there were originally three. The sets at Ultadanga are Dick Kerr synchronous motor-generators, three in number, of 500-k.v.a. capacity each. The sub-stations deliver continuous current to a three-wire system, with 450 volts across the outers, and all balancing is effected by mid-wire boosters. Extensive use is made of pilot wires to control the voltage at various parts of the network. The sub-station switchgear is on the same general lines as that in the main station, except that both the A.C. and D.C. control gear is mounted on the same panel for each individual machine. All the sub-stations except the small one at Chetla are provided with spark-gaps and charging gear. The equipment of the sub-stations is kept as uniform and interchangeable as possible in order to reduce the number of spare parts required to a minimum.

At the beginning of this year there were 230 miles of underground and 124 miles of overhead mains, a total of 354 miles. Connected to the mains were over 40,000 ceiling fans, the equivalent of 370,000 lamps of 8 candle-power, and nearly 2,000 motors varying from  $\frac{1}{4}$  to 300 h.p. in size. The maximum load at present varies from 5,000 kw. in summer to 6,000 kw. in winter, which may seem small compared to the capacity of the generating and distributing systems, but very large extensions of load, especially in connection with mill driving, are anticipated in the near future; and when it is said that a single mill will probably call for as much as 2,000 kw., the necessity for having so much plant in commission will readily be understood.

In conclusion, we should like to express our thanks both to the Calcutta Electric Supply Corporation and to the consulting engineers, Messrs. Kennedy & Jenkin, for permission to publish this description and for much valuable help during its preparation.

**A New Two-rate Tariff System.**—In our report of the Paper describing a proposed new two-rate system of charging by Mr. H. H. Perry (ELECTRICAL ENGINEERING, November 20th, page 649), we stated erroneously that the Paper was read in Birmingham. It was, of course, read at the meeting of the Manchester Local Section of the Institution of Electrical Engineers.

**The Institution of Municipal Engineers.**—At a meeting of the Institution of Municipal Engineers on Nov. 7th, Mr. Horace Boot, the newly elected President, gave his Presidential address. He dealt with a number of matters, including municipal power supply to mills and factories, and the growth of railless electric traction, and concluded with a plea for the federation of the various engineering societies. A conversazione was held in the evening at the Holborn Restaurant.

**Illumination.**—At a meeting of the Illuminating Engineering Society on Tuesday, Nov. 18th, a Paper by Mr. J. S. Dow and Mr. V. H. Mackinney on shadows by natural and artificial light was read. A number of photographs showing the effect of shadows in the wrong places in industrial lighting were exhibited, and interesting comparisons were made between the shadows cast by direct and indirect lighting. The intensity of the latter is greater than is generally supposed, but owing to the absence of sharp edges they are not so obvious. Cases where oblique lighting easily casting shadows is desirable were mentioned, such as for examining the back of a lay-off sheet in printing to see if the impression of the type is not too heavy. The question of the amount of shadow most suitable for showing off statuary, moulded decorations, and architectural detail, &c., was also discussed. Some authorities, said the authors, seemed to dislike the use of oblique lighting to show off surface ornaments, arguing that the effect produced is quite different from that of daylight, and therefore unnatural. At the same meeting Mr. L. Gaster gave some notes on progress during the vacation, mentioning the various congresses and exhibitions where illumination had been treated of, and Dr. J. Kerr gave some notes on the International Congress on School Hygiene, held in Buffalo last August.



## THE EFFECT OF MOISTURE ON INSULATION RESISTANCE

AN interesting Paper, entitled, "The Characteristics of Insulation Resistance," by Mr. S. Evershed, was read last night before the Birmingham Local Section of the Institution of Electrical Engineers, and will be discussed at the London meeting of the Institution to-night. The key-note of his Paper—which describes a long series of researches—is that the insulation resistance of the majority of materials in common use is governed almost entirely by the moisture that they absorb. Everyone knows, said Mr. Evershed, that insulation resistance decreases on a damp day and recovers during dry weather, but it is not so generally known that in most cases insulation resistance decreases, in a perfectly definite way and almost instantaneously, as the electric pressure upon it is increased, and slowly recovers if the pressure is restored to the initial value or cut off altogether. A typical curve showed that the insulation resistance of an absorbent material drops, at first rapidly, when the voltage is increased, then declines less quickly, and finally falls with a steep curve soon before the breakdown voltage is reached. Mr. Evershed's researches related chiefly to the less steep middle part of the curve. The majority of the measurements were made by the direct deflection method with a sensitive Broca galvanometer, using continuous current. Alternating currents were unsuitable owing to the magnitude of the capacity current relatively to the leakage current. A large number of typical voltage-insulation curves are given in the Paper, and those in which the voltage steps were retraced show an interesting hysteresis effect. It was contended that any true dielectric leakage that there might be through the substance of the insulators could be ignored, as the real dielectric resistance was enormous in comparison with the resistance of the leakage paths which are formed by traces of moisture. Incidentally, Mr. Evershed maintained that in tests of long cables the slow dying down of the charging current often made tests taken after the customary "one-minute's electrification" unreliable as regards disclosure of the true leakage current.

The curves shown for the insulation resistance of cotton containing various amounts of moisture are very instructive. In one case, for example, drying in an oven at 150° for two hours gave resistances five or six times greater all over the curve, and further drying raised the insulation to something like eighty times its original value. The curve, however, still showed the bend characteristic of the moisture effect. A similar effect was shown by paper, and the opportunity was taken to investigate the influence of mechanical pressure. Increase of pressure was found, roughly speaking, to decrease the change due to difference of voltage. The degree of moisture, however, although altering the value of the resistance enormously, alters the law of its variation with voltage but little until the paper is sensibly damp; finally, however, with the paper absolutely sodden, the curve is nearly a straight line of constant resistance. Micanite cloth and various other materials showed similar results, and Mr. Evershed writes that the composition of the insulating substance seems to be of little importance. So long as the structure of the material is such as to provide capillary spaces to harbour moisture, leakage will take place in the characteristic manner.

Although oils, varnishes, and such substances have an approximately constant resistance, the impregnation of paper by oil seems to have no effect in preventing the absorption of water, for curves of the same characteristic shape as before were obtained both with samples of oiled paper and an impregnated paper cable which had been left with its ends open for thirteen months. Again, it was found in experiments with insulated windings that varnish reduces the extent to which moisture is absorbed, but it seems powerless to stop absorption altogether if the windings are subjected to the temperature variations which occur in ordinary use. The author attributes this failure to exclude moisture altogether to insufficient elasticity in the body of the varnish. Unless this is a highly elastic substance it is unable to follow the expansions and contractions of the windings, and ultimately the continuity of the coat of varnish is broken up, leaving numerous crevices by which moisture can enter.

With a view to the elucidation of the ultimate nature of the phenomena, experiments were made with filter paper containing ascertained quantities of water of a measured specific resistance, and it was found that the resistance of the sample was out of all proportion to the water that it contained. Mr. Evershed therefore put forward the theory that the water must be considered to be divided into two very unequal portions, which may be called resistance water and dormant

water. In one typical case the resistance water formed only 9.4 parts in one million of the total, the major portion occupying blind alleys, so to speak, entirely off the paths of the leakage current.

The Paper then discussed the law of the resistance curve, which appears to be of the general form  $R = kx\sqrt{\frac{1}{v}}$ ,

where  $x$  has a value not much greater than 2. The author then dealt with the influence on the curve of non-absorbent insulators in series with absorbent material, and finally investigated the nature of the action by means of an ingenious model. He took two beakers of water, connected by an inverted capillary U-tube, dipping into both, and filled with a series of air bubbles between sections of water. A potential difference was applied to the beakers, and the behaviour of the bubbles was examined through a microscope, which revealed a progressive thickening of the water films on the inside of the tube, forming the walls of the bubbles starting from the positive end. This magnified demonstration of the nature of electrical endosmose gives us an idea of the way the water films on the wall of the diminutive channels of the absorbent insulating material are rendered more conducting by the change in their distribution produced by the applied voltage. Resistance curves taken with a model, with a number of capillary tubes in parallel, gave results exactly corresponding to those from absorbent insulators, including the hysteresis effect.

Finally, it is concluded that the broad principle of film conduction in an absorbent insulator is clear; the moisture curve—the first part of the complete characteristic curve—is the direct result of electric endosmose. The electrically produced hydraulic pressure drives dormant water into the films, and their increasing thickness is made evident by the gradual fall in resistance as the potential difference is increased.

## IMPORTANT FACTORY PROSECUTION

MESSRS. WILLIAM BAYLISS, Ltd., tube manufacturers, of Birmingham, were fined £55 and costs at the Birmingham Police Court on Friday, for neglect to comply with certain requirements of the electrical regulations under the Factories and Workshops Act. A man named George Farraday, working in the motor garage of the factory, received a shock from a hand-lamp and was unable to remove his hands from the lamp. He called to a fellow-workman, who switched off, but the lamp guard was still "live," and this man and another man received shocks on trying to pull Farraday away. Finally, after some delay, the man in charge of the electrical work was summoned from the works, and pulled down the flexible so that the man could be released. He was, however, unconscious for about four hours, and his hands were badly burned.

Mr. J. E. Harsdon, H.M. Inspector of Factories for the district, appeared in support of the summons, and Mr. G. S. Ram, H.M. Electrical Inspector of Factories, gave evidence. Mr. Ram stated that on testing he found that the potential between the lamp terminals and earth was 440 volts, although the installation was nominally a 110-volt installation. The pressure of 440 volts three-phase is used for driving the motors in the works, and the lighting circuits were taken off one of the phases presumably through an auto-transformer. The single-pole switch was, therefore, not sufficient to disconnect the lamp from the 440-volt mains.

The lamp itself did not comply with the Home Office regulations, as the guard was in metallic connection with the lampholder, and it was not earthed; the workshop flex had been cut at a sharp edge at the top of the lampholder, and this and the lamp guard had thus been made "live." The defence was that "electrical experts" had seen the apparatus only fourteen days before the accident, and had tested it, and that the defendants had been "let down" by these experts.

The case shows the extreme necessity of having factory installations properly installed under good supervision. The use of improperly constructed hand-lamps, sometimes consisting of a lamp merely in an ordinary metal lampholder, is unfortunately not rare, even in electrical stations where competent persons are in charge, and few people seem to realise that the use of auto-transformers for reducing the pressure across the lamp terminals does not reduce the voltage of the pressure as regards shock to earth, or even that single-pole switches do not cut off the pressure. There are safety-type hand-lamps on the market, some of which are so well protected that earthing may be dispensed with, and there seems to be no excuse for not making use of them.

## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,366.

During a sharp thunderstorm the telephone on the ground floor in a private house using electric light from the supply mains was struck by lightning. It was afterwards found that five of the metal filament lamps had their filaments completely shattered. The lamps were not in use at the time; there was not the least sign of blackening, no fuses whatever were blown, nor was there any trace of damage to the electric lighting installation. How would you account for this failure of the lamps—"F. T."

(Replies must be received not later than first post, Thursday, December 4th.)

### QUESTION No. 1,367.

The composition of an oil-resisting alloy is required, suitable for cast-metal tanks, for use with oil-immersed apparatus; the alloy must have been found successful in practice, and be inexpensive to make. Any special foundry precautions should be stated—"U. R."

(Replies must be received not later than first post Tuesday, December 9th.)

### ANSWERS TO No. 1,364.

How is the electrical equipment connected in a petrol-electric car, the engine being 40 horse-power, the dynamo being compound wound with interpoles, and the motor being series wound with interpoles? Show in the diagram how two different speeds are obtained by the shunt and series resistances and the reverse control, and state what efficiency of transmission should be expected—"ELECT. EQUIP."

The first award (10s.) is made to "W.H." for the following reply:—

The diagram (Fig. 1) shows the method of connecting up the electrical equipment of a 40-h.p. petrol-electric car. If the car is intended to be operated from either end it will be necessary to duplicate all the controllers, the circuit-breaker and connections to the controllers and circuit-breaker. The reversing controller, R.C., is interlocked with the regulating controller, C., so that until R.C. is either in "forward" or "reverse" it will be impossible to move C. from the "off" position; and further, when C. is in the "on" position on any stop it will be impossible to move R.C. to the "off" position. C. would be provided with a magnetic blow-out coil, R.C. would not. The circuit-breaker, C.B., will be so interlocked with R.C. that it will be impossible to replace C.B. once it has opened for overload, until C. and R.C. are both in the "off" position. It will be seen that the first four stops on the regulating controller, C., give a gradually strengthening shunt field on the generator, and therefore gradually increasing volts, while the motor, M., is on full field. Stops, S., divert a portion of the motor series field, and more current is diverted by the succeeding stops 6, 7 and 8, thus increasing the speed of the vehicle by weakening the motor field. The generator, G., will always run at full speed, being direct-coupled to the petrol engine, and thus the greatest efficiency and power will be obtainable. The overall efficiency from petrol motor output to electrical motor output should be somewhere in the neighbourhood of 75 per cent.

The remainder of the transmission losses would be very small as compared with an ordinary geared petrol motor, since direct drive could be utilised, or, at any rate, a single reduc-

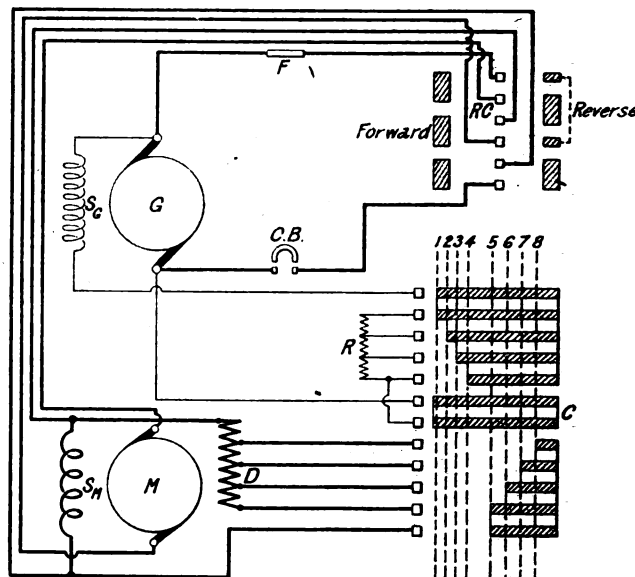


FIG. 1.

#### REFERENCE.

- G = Generator Armature.
- Sg = " Shunt Field.
- F = Fuse.
- C.B. = Circuit Breaker interlocked with R.C.
- R.C. = Reversing Controller interlocked with C.
- C = Speed Regulating Controller.
- R = Generator Shunt Field Resistance.
- M = Motor Armature.
- Ss = " Series Field.
- D = " " Divertér.

tion, if it was desired to use high-speed motors. Even then, the losses should not amount to more than a further 7 to 10 per cent.

The second award (5s.) is given to "MARF," who writes as follows:—

The question re the wiring of a petrol-electric car raises some interesting points, and I have pleasure in putting forward the accompanying diagram, which I think will meet the case. It will be noticed that the windings for the interpoles are connected in series with the armatures both on the dynamo and motor, as the function of these small poles is to counteract the distortion of field, to which the armature current gives rise. Without these poles there is a tendency to sparking to occur at the commutator as the load varies. The dynamo windings should be designed so as to give a constant output for a given speed of the engine, i.e., the product of the volts and amperes should be approximately constant. This prevents the excessive rush of current through the motor whilst the latter is starting up, which would occur if the dynamo were wound to maintain a constant voltage. To start the car the engine would be set running and allowed to attain its normal speed, and the control finger moved on to the first contact. This puts the motor in series with the starting resistance, and allows the car to speed up gradually without unduly taxing the dynamo. When the car has developed a uniform speed on this notch, the finger must be moved on to the next contact. This cuts out the series resistance, and the car can then attain its normal speed. To increase the speed, the finger must be moved to the next position. This, as can be seen from the diagram, puts a resistance in shunt with the field windings of the motor, thereby weakening the field and accelerating the motor. In passing I would point out that this method is somewhat unusual, the more common method of regulating the speed of a series-wound motor being to divide the field windings into several equal parts, and to have the latter in series for ordinary speeds, and in shunt for higher speeds. To reverse the motor, the control handle is moved to the left. This reverses the field of the motor, and at the same time puts the starting resistance into circuit. A double-pole

**AVOID  
MISTAKES.**

**SPECIFY  
'IGRANIC'**

**SWITCHGEAR**

**Proved by  
experience**

**IGRANIC ELECTRIC CO. LTD.  
LONDON and BEDFORD**

switch is included in the circuit, also a fuse. This latter should be as near to the dynamo as is compatible with accessibility, so as to protect it in case of short-circuit. The fuse should be adequate to stand a current considerably above the normal working current, otherwise there will be a

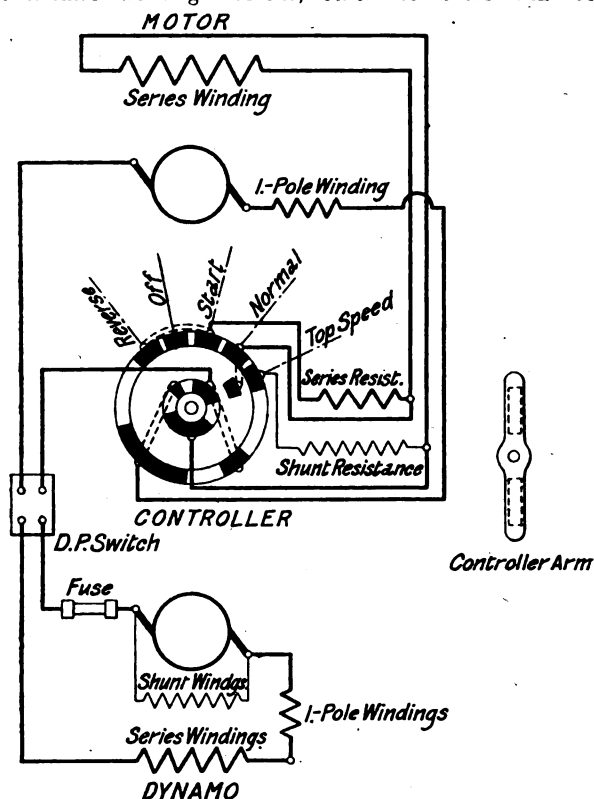


FIG. 2.

tendency to "blow" on starting up. The combined efficiency of the motor and dynamo should be from 65 per cent. to 70 per cent. when running under normal conditions. That is to say, if the engine develops 30 h.p. at the dynamo shaft (while running normally), the output from the motor shaft would be approximately  $\frac{30 \times 70}{100} = 21$  h.p.

It will be noticed that at any rate one of the successful competitors has assumed that the vehicle is a tramcar, and that both run their engine at constant speed whatever load is demanded of it. In some systems a large part of the control is done on the throttle, and when the car is standing, the engine is only just turning round at a speed at which the dynamo will not excite, ready to be speeded up for the start, when the dynamo will pick up its voltage and start the motor with a smoothness unobtainable with any definite controller step. The system also has the advantage that the main circuit need never be broken, and no series resistances need be used, greatly simplifying the equipment. In this connection reference may be made to articles in *ELECTRICAL ENGINEERING* describing the Stevens petrol-electric system widely used on motor-omnibuses (Vol. VII., page 641, November 23rd, 1911, and Vol. VI., page 678, October 27th, 1910).

### STUDENTS' "RAG" IN A SUB-STATION

ON Wednesday night a mob of between seventy and a hundred students attacked the Albert Hall sub-station of the Kensington & Knightsbridge Electric Lighting Co. with a view to switching off the electric light in the Albert Hall, where the notorious James Larkin, of Dublin fame, was addressing a meeting.

The sub-station in question is one of the Company's three sub-stations to supply the three-wire D.C. system in the Company's area, and it deals with the central Kensington district.

The students forced the doors of the sub-station, and attacked the switchboard attendant (G. W. Walker) as he was making for the telephone for assistance. Fortunately there was another man in the sub-station, and also one in the adjoining distribution department, and assistance was telephoned for to the Kensington Court station. The Engineer-in-Charge there sent for the police and also proceeded himself to the sub-station, together with an assistant, to render help. The mob, besides breaking the telephones about, pulled off a few switches, but no serious disturbance was occasioned to the supply in the district. The total amount of damage has been estimated at about £20.

Two of the students, G. W. Elkington and A. Macallum, were detained by the police, and appeared at the police court on Thursday, charged with maliciously damaging telephones, electric lamps, switchgear and ironwork. Walker, the switchboard attendant, in giving evidence, identified Elkington as one of the men engaged in destroying the telephone boxes, but no evidence has been given that Macallum actually did damage, and his statement was that he was forced into the works by the mob. Both the accused were remanded on bail. Walker, who was slightly injured in the fight, showed considerable courage in resisting the attack, especially as such implements as a truck and pole were used as a battering ram to force open the doors.

### ELECTRIC TRACTION NOTES

Major Pringle's report to the Board of Trade on the Aisgill disaster, which occurred last September, has now been issued, and he makes it quite clear that the gas lighting of the trains was largely responsible for the fatal results. There were, he said, two sources of fire—burning gas and live cinders. He strongly urges on railway companies the desirability of employing electricity as their standard illuminant, and of constructing all new stock with electric lighting, as well as replacing as soon as possible the existing gas-lighted stock on main line and express services. This he points out is now the trend of general practice all over the world. In the United Kingdom alone from the end of 1910 to August 31st, 1913, the number of gas-lighted vehicles decreased from 41,474 to 40,536, whilst those electrically lighted increased from 10,808 to 11,906. Major Pringle also refers to cab signalling, particularly that adopted by the Great Western Railway at a number of important centres. (A description of this system appeared in *ELECTRICAL ENGINEERING* of March 7th, 1907; Vol. I., p. 431.) The method, he says, has not yet been proved to be efficient, however, to the extent of meeting adequately the very complicated requirements of traffic on English railways and has still to be experimented with more thoroughly. The wireless control of trains is mentioned as "still in its infancy." He recommends that the railway companies should unite in experimenting with the automatic train stop as used on the London Tube railways, which comes into contact with a stopcock on the train and automatically applies the continuous brake, to see if the method is reliable and practical at high speeds.

Another report deals with a slight accident which occurred near Shepherd's Bush station of the Central London Railway on September 30th. A stationary train was run into from the rear by another train, and a few passengers were slightly injured. This section of the line is worked by the lock and block system with Spagnoletti's electric interlocking apparatus, and the accident is attributed to a series of blunders made by the signalman, who availed himself of his emergency unlocking gear in a way described by Major Pringle as "incautious and stupid." The report concludes as follows:—"During the past year the Company have been replacing the old method of lock and block working on this tube railway by automatic signalling with track circuit work. I am informed that the last remaining section—Holland Park to Wood Lane—will be completed in a month's time. In the circumstances no more need be said than that an accident of

## "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

### Specifications Published November 20th, 1913

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

**Names in italics indicate communicators of inventions from abroad.**

**24,586/12. Oven.** SIMPLEX CONDUITS and F. G. TAYLOR. A pivoted hood is arranged in connection with a base and back plate, so that the heated air is always maintained within the hood. A turned-over edge or sealing plate on the hood makes joint with the back plate when the hood is open for this purpose. The heating element is fixed to the hood. Eight figures.

**25,499/12. Communication with Submerged Submarines.** A. TURPIN and R. ROBINSON. The submerged boat carries a vessel containing calcium carbide and water. The resulting gas causes it to rise to the surface, and take with it a communicating wire, so that a bell or hooter can be worked from the boat. The apparatus is set in operation by a solenoid controlling the water valves. Three figures.

**25,976/12. Molybdenum.** CHEMISCHE FABRIK VON HEYDEN A.-G. Bands, wires, &c., are obtained from a mixture of molybdenum with magnesium or barium oxide, or carbonate.

**26,177/12. Dynamos.** G. PLAISANT. The armature is given an epicycloidal motion in a magnetic field between two concentric annular poles. The arrangement is said to be of use for automobile lighting dynamos, and for wireless. Three figures.

**27,758/12 A.C. Distributing Systems.** B.T.-H. Co., E. GARTON, and A. H. WATSON. Constant frequency in an A.C. system supplied by an inverted rotary is obtained by varying the field through an exciter, by a Tirrill regulator, proportional to the speed variations. The regulator has a coil connected across a pilot generator driven at a speed proportional to that of the rotary, and a contact controlling solenoid with opposing coils, one across a steady pressure, and the other across the exciter armature. One figure.

**2,125/13. Arc Lamps.** M. S. OKUN. The electrodes, which are in a vacuum, are kept in slight contact during working. The pressure is controlled by a solenoid having its core directly connected to one electrode. The electrodes are held apart when the lamp is not working. Two figures.

**4,945/13. Circuit Breakers.** B.T.-H. Co. (*G.E. Co., U.S.A.*). A magnetic blow-out is constructed so that the flux generated by a current in the winding in portions of the pole faces adjacent to the arc, repels this away from them. The flux across the arcing spaces forces the arc away from the magnetising winding. Four figures.

**9,070/13. High Voltage Generators.** F. W. HOWORTH (*M. P. Ryder, U.S.A.*). Two sets of magnets are arranged to produce flux in opposite directions through the armature coils by means of two reciprocating iron "armatures," which move into and out of contact with the cores so as to close and break a magnetic shunt circuit round each of the coils. The armatures act in co-operation alternately, each to close a magnetic circuit through the coils and a shunt circuit round them during the breaking action of the other. Four figures.

**10,153/13. Wireless Telephony.** F. MAJORANA. To produce oscillations of a high group frequency, a rotary discharger has the rotating discs arranged with their axes perpendicular. One or both of the discs has a continuous metallic rim rising a little out of the plane of the disc. A cleaner or wiper is also provided. One figure.

**16,526/13. Alternators.** SIEMENS DYNAMO WORKS and G. H. TAYLOR. The end connections are made of copper strips through which insulated stiffening studs pass. These are fixed to the frame of the machine. Two figures.

### Specifications Published To-day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free.

Summaries of some of the more important of these patents will appear in our next issue.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** BEAVER and CLAREMONT [Water-proof cable covering] 22,355/12; SIEMENS DYNAMO WORKS, LYDALL and FAIRBURN [Change-over arrangements] 15,149/13; GILES [Safety devices for conductors] 15,951/13.

**Dynamos, Motors, and Transformers:** BROWN, BOVERI ET CIE. [Conductors] 6,036/13; SOC. INTERNATIONALE LUMIERE FROIDE (PROCÉDÉS DUSSAUD) [Pedal-driven lantern generators] 20,288/13.

**Electrometallurgy and Electrochemistry:** NELSON and MURRAY [Electrotypes] 27,911/12; SOC. GÉNÉRALE DES NITRURES [Aluminium nitride] 10,975/13; [Furnace element] 12,837/13; CIE. POUR LE TRAITEMENT DES METAUX ET DES MINÉRAIS PAR ÉLECTRICITÉ [Furnaces] 12,444/13.

**Heating and Cooking:** WILKINSON [Heating] 19,543/12; BERRY [Water heating] 22,546/12; HIRST and MAURICE [Irons] 29,350/12; ARPIN [Bath water heater] 10,403/13.

**Ignition:** LEITNER [Starting internal-combustion engines] 28,286/12; SYDENHAM, 4,965/13; ELEKTROTECHNISCHE FABRIK SCHAEFFLER [Mine-igniting machines] 12,813/13.

**Incandescent Lamps:** NAAMLOOZE VENNOTSCHAP PHILIPS' METAAL GLOEILAMPENFABRIEK, 1,340/13.

**Instruments and Meters:** HAMILTON and the FERRANTI CO. [Mercury motor meters] 26,359/12.

**Switchgear, Fuses, and Fittings:** WILKINSON [Lighting fittings] 24,953/12; B.T.-H. Co. and MCCARTHY-JONES [Automatic regulators for distributing systems] 25,286/12; B.I. Co. and BLADES [Multicore cable dividing boxes] 29,783/12; PERFECT [Quick make and break vibration-proof switches] 1,984/13; BLOXAM (*R. Bosch Co.*) [Terminals] 6,551/13; EICKHOFF [Explosion-proof inner cover for cable wells] 6,587/13; ELECTROMOTOR EQUIPMENT CO. and BARLOW [Motor-driven controllers] 11,069/13; SIEMENS & HALSKE [Relay] 17,879/13.

**Telephony and Telegraphy:** W.E. Co. (*W.E. Co., U.S.A.*) [Printing telegraph systems] 25,382/12; [Transmitter for selective system] 6,767/13; [Paper feeding for printing telegraphs] 6,768/13; [Re-inking mechanism for printing telegraphs] 19,124/13; SIEMENS BROS. and LAIDLAW [Two-line telephone instrument] 25,673/12; THOMSON [Signalling] 9,632/13; DOS SANTOS [Telegraph stations] 11,243/13; MCBERTY [Telephone exchanges] 19,421/13.

**Traction:** VEDOVELLI, PRIESTLEY ET CIE. [Overhead construction] 11,310/13.

**Miscellaneous:** POLLARD and EMMOTT [Magnetic separators and screens] 25,195/12; B.T.-H. Co. (*G.E. Co., U.S.A.*) [Refractory materials] 25,370/12; ASPREY and FARROW [Striking mechanism for electric clocks] 26,194/12; PREWETT [Signalling on motor vehicles] 819/13; FORD [Synchronous working of cinematographs and gramophones] 1,036/13; GRIFFIN & SONS [Gyrostats] 8,379/13; PELLI [Alarm for safes] 10,087/13; MAGNET WERK GES. EISENACH SPEZIALFABRIK FÜR ELEKTROMAGNET-APPARATE [Holding magnets for metal-working machines] 22,706/13.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Arc Lamps:** SIEMENS-SCHUCKERT. [Searchlights] 24,312/13.

**Distributing Systems, &c.:** SOC. SCHNEIDER ET CIE. [Pressure dividing devices] 21,309/13.

**Dynamos, Motors and Transformers:** WEISS [Oil transformers] 24,162/13; SCHERBIUS [Conversion of alternating current] 24,615/13.

**Heating and Cooking:** MADSEN [Toasters] 24,419/13.

**Ignition:** DIRAND [Spark plugs] 11,737/13.

**Telephony:** ZIVNOSTENSKA BANKA V. PRAHA [Exchanges] 20,856/13; SIEMENS & HALSKE [Semi-automatic] 24,459/13.

**Traction:** SOC. D'ELECTRICITÉ MORS [Switches for railways] 22,127/13.

**Miscellaneous:** EDISON [Illumination] 24,711/13.

### Extension of Life of Patent

**24,048/99. Telewriter.** F. RITCHIE. The life of this patent, on the application of the National Telewriter Co., Ltd., has been extended from 14 to 19 years. See also under "Telephony and Telegraphy," page 667.

### Expired Patents

The following are the more important Patents that have become void through non-payment of renewal fees.

**Arc Lamps:** W. G. HEYS (*Scott Elec. Co., U.S.A.*) [Multiple carbon flame lamps: Arcs controlled by own magnetic field] 17,655/07.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** A. S. ADLER [Railway train lighting system using axle-driven dynamo, storage battery, and automatic switches] 17,141/02 and 17,142/02; B.T.-H. Co. (*A.E.G.*) [Control of a number of motors simultaneously driving a common load] 16,621/08.

**Ignition:** I. ZUBALOF [Make and break effected electro-magnetically] 17,062/03.

**Storage Batteries:** R. M. LLOYD [Casing and arrangement to indicate when the electrolyte is leaking away. Also arrangement for exhausting the gases, &c., suitable for use in submarines] 15,916/01; [Rigid cell casing for traction, &c.] 15,817/01.

**Miscellaneous:** W. L. WISE (*A.-G. "Magna," Switzerland*) [Oscillating clock armature] 15,833/01; P. A. NEWTON (*F. Schürmann, Germany*) [Cigarette making machines] 17,106/04; D. P. GHADIALI [Use of high-pressure sparks for producing indelible records] 16,493/08.



this description shows that lock and block working in itself does not afford the security necessary for this kind of traffic."

Traffic on the Baker Street & Waterloo (Tube) Railway was suspended on Monday from 4.30 till 5.5 p.m. It appears that, owing to a mechanical defect, a brake bracket fell from a train at Edgware Road station on to the "live" rail, and caused an earth. Current was cut off while an examination was made, but as soon as the bracket, which was found welded to the rail, was removed, running was recommenced.

The reports by the Town Clerk, Borough Surveyor, and Borough Electrical Engineer, upon the electrification of the Stirling tramways, referred to in our last issue, have been referred to Mr. Peter Fisher, General Manager of the Dundee Tramways, and Mr. J. A. Robertson, Borough Electrical Engineer at Greenock, for consideration.

It was stated at the meeting of the National Electric Construction Co. that an important continental tramway concession is likely to be brought to a successful conclusion at an early date. All the local authorities, who number thirty, have come into line.

The Board of Trade have sanctioned the use of double-decked trolley buses between Brighton and Hove, on the understanding that the width of the vehicles is not to exceed 7 ft., on account of the comparative narrowness of some of the streets. The buses will not run along the sea front, and the scheme will now go forward with the agreement of the Hove Council. Current will be supplied by the two Councils, each in its own area.

The notices of bills which are to be promoted in the next session of Parliament include a number of applications for trolley omnibuses, but probably the most noticeable is that by the North Eastern Railway Co., which proposes to instal this type of vehicle for conveying passengers and goods between its stations in Newcastle and Gateshead. Another railway matter of considerable interest is the proposal of the Midland Railway Co. to enter into agreements between the London Electric Railway Co. and the Underground Electric Railways Co. of London, for taking a supply of electrical energy, presumably in connection with the conversion of the Tilbury-Southend line to electric traction, upon which the General Manager of the Midland Railway Co. recently stated the Company is prepared to spend £1,000,000. It is also proposed to revive the scheme of the Isle of Wight Junction Railway for connecting up the Isle of Wight with the main land by means of an electric tube railway under the Solent. The venture this time seems to be promoted by the London & South Western Railway Co. The tube railway scheme between North and South Shields is also to be revived.

The conversion of the suburban lines of the London & North Western Railway to electric traction is making good progress, and the line from Willesden to Earl's Court is now practically completed, so far as the track work is concerned. According to *The Times*, it is hoped to obtain delivery of the rolling stock at an early date, and to begin service in February. Pending the completion of the Company's own power-house at Stonebridge Park, current will be purchased from an outside source.

### TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

The hearing before Mr. Justice Warrington last week of the application for extension of life of Patent No. 24,048/99, by F. Ritchie, which was brought by the National Telewriter Co., Ltd., has resulted in the life of the patent being prolonged by five years, so that it will now expire on December 2nd, 1918. Evidence was given by Professor C. Vernon Boys, Sir John G. Craggs (Chairman of the National Telewriter Co.), and by the inventor, Mr. F. Ritchie. The evidence showed that the same people had consistently put money into the concern since the start, but had not yet received any return. Mr. Ritchie has been paid an annual salary of £400 to £500 as Works Manager, making in all about £7,000 cash, plus about one-fifth interest in the present Company. After many attempts the Post Office, in March, 1908, granted the Company a licence for twenty-one years certain and permission to establish telewriter exchanges. Since this time the business has regularly extended. For the half year to June, 1909, the amount received from rentals was £801, while from July of the present year to date the amount is £6,453. There are now two telewriter exchanges in London, one at Wallbrook and one at Charing Cross, and one at Liverpool. In 1907 the whole rights were offered to the Post Office for £70,000, but the offer was not accepted. There was no opposition, but

the application was watched by the Solicitor-General, Mr. S. Buckmaster, on behalf of the Board of Trade. He admitted the usefulness and merit of the invention, and suggested that an extension of life of five years might be allowed. (In general, the maximum allowable is seven years.) In granting the extension Mr. Justice Warrington said that he was governed in his decision by the fact that there had been nothing in the nature of gambling with the shares.

Mr. J. St. Vincent Pletts, A.C.G.I. (Chief of the Patents Dept., Marconi's Wireless Telegraph Co., Ltd.), gave the third of his series of lectures on Wireless Telegraphy at the City & Guilds (Engineering) College last Thursday. He showed mathematically how the energy of one oscillatory circuit is inductively transmitted to a second oscillatory circuit in tune with the first. The form of the final equation shows that the resulting current is both pulsating and oscillating. If the frequency of the components is designated by  $a$  and  $b$ , the frequency of pulse,  $N=a-b$ , which is also equal to  $1/T$ , where  $T$  is the time period of the pulse. The coefficient of coupling,  $k = M/\sqrt{L_1 L_2}$ , where  $M$  is the mutual induction between the two circuits, and  $L_1$  and  $L_2$  their self-inductions respectively. In practice  $k$  is quite small; it cannot be zero, as then no energy would be transmitted from one circuit to the other. It does not, however, usually exceed 5 per cent. Calling  $n$  the natural frequency of either circuit,  $k=N/n$ , so long as the coupling is small. Now  $TN=1$ , therefore the number of oscillations in a pulse varies inversely as the coupling, but as it is difficult to count the oscillations in a pulse it is usual to determine the wave-lengths, and so determine the coupling. If the difference in wave lengths,  $\lambda_1, \lambda_2$ , is not very great,  $k=(\lambda_1-\lambda_2)/\lambda_1$ . When the reaction of the second current on the first is considered, it is found that initially current and voltage in the primary are in the same direction, but they are in opposite directions in the secondary, i.e., there is an oscillation of energy from one circuit to the other. When the effect of resistance in the circuits is considered, it is found that the damping is given by  $(R_1/L_1 + R_2/L_2) \div 4(1 \pm k)$ , i.e., the damping of one wave is greater, and the other less, than the mean. At the station at Clifden with a wave-length of 19,500 ft. and a total resistance in circuit including the spark of 0.022 ohms, the coefficient of damping is 0.025. The spark frequency is 500 per second. The whole oscillation lasts about 0.001 sec.; therefore the time between two sets of waves is also 0.001 sec. The oscillation of energy from one circuit to another may be demonstrated by a mechanical analogy consisting of two pendulums a little distance apart, suspended from a stretched string. One is started oscillating, and as its amplitude dies down that of the other increases to a maximum, which in turn dies away, while the first one grows again, and so on. The gradual change in phase relations, as takes place in the electrical circuit, is also shown. If a chain having three times the time period of one of the simple pendulums is substituted for one of these, it is set oscillating with a third harmonic, i.e., there is a node in it, about  $\frac{1}{3}$  of the total length from the lower end. This distance, however, is not exactly  $\frac{1}{3}$ , for the tension throughout is not uniform. The next lecture will take place to-day at 5 p.m.

A large meeting of the 160 members of the newly formed Wireless Society of London was held on Tuesday evening in the Westminster City Schools, with the President, Mr. A. A. Campbell Swinton, presiding. It was announced that the club-rooms at 107 Hatton Garden were ready, except that no licence or instruments were yet obtained, though nearly £100 is now promised for the latter purpose. With regard to the granting of licences to experimenters, the President said that the Post Office would not in future grant them for stations near shipping routes, Government or Marconi stations. As the aims and objects of the Society have vastly increased since its foundation, it was proposed by Mr. Russell Clarke and seconded by Mr. F. Hope-Jones that the subscription be raised to one guinea per annum for London, and 10s. 6d. per annum for country members, plus an entrance fee of 10s. 6d. The rules and objects of the Society are now provisionally settled, and may be obtained from the Hon. Sec., Mr. R. H. Klein (18 Crediton Road, West Hampstead, N.W.). Dr. W. H. Eccles (Vice-president) outlined the programme of work of the Radio-telegraphic Committee of the British Association, and pointed out how the Society could help this Committee in its important work. The next meeting will be held in January, when the President will deliver an address. It is hoped to provide for the reading of three or four important Papers during the year, and informal discussions at frequent intervals.

Beyond an interruption to Cassinga, Angola, there is no further news to communicate this week regarding cables and landlines.—The interruptions reported of the French West Indian cable system still continue.



## "ELECTRICAL ENGINEERING" TRADE SECTION

— Notes on Tenders Invited and Prospective Business appear on p. 671. —

### CATALOGUES, PAMPHLETS, &c., RECEIVED

**WOODWORK, &c.**—In bringing its price list up to date, C. Jennings & Co. (Pennywell Road, Bristol) has provided this with a stiff cover. The 270 pages of this convenient list embrace almost every product of the woodworking industry. Illustrations and full details in regard to prices for electric light casings and cappings, as well as creosoted troughings for underground cables are given. It is claimed that whether creosoted by dipping or by pressure the material used is free from injurious acids. Sharp flexion and fatigue is minimised by the use of long lengths. The Company points out that it supplies these troughings both for home and export. Large stocks of teak are also held at the depot. We are very pleased to receive from the Company a strong four-fold brass-jointed 2 ft. rule, similar to those it advertises, which will be sent in conjunction with the price list, post free, on receipt of 1s. 6d.

**TELEPHONE EQUIPMENT.**—The Stromberg-Carlson Telephone Manufacturing Co. (Rochester, 1050 University Avenue, New York) is issuing lists dealing with a number of its numerous manufactures, including C.B., magneto, party and private line telephones, exchange equipment, dry cells, the "Deffone" for deaf people, mining telephones, linesman's tools, &c.

*Readers desiring copies of catalogues or pamphlets should apply to the firms in question, referring to the notice in "Electrical Engineering."*

**PRINTING-PRESS CONTROL.**—A pamphlet from J. H. Holmes & Co. (Newcastle-on-Tyne), serves once more to remind one of the large amount of electrical equipments for printing offices that the company has carried out. We note that 25,000 h.p. in "Castle" D.C. and "Holmes-Clayton" A.C. motors is now installed for driving printing machines. Among the specialities is a hand-operated starter with interlocked shunt regulator, so that the motor is always started with full field strength, and a steel-beaded panel by which the whole apparatus is controlled through a double-pole switch. Again, an automatic starter and regulator combined, fitted for pilot control and interlocked with the shunt regulator, is listed.

**ELECTRIC LIGHT FITTINGS.**—Another pamphlet from the same firm deals with searchlights for marine purposes, and robust fittings for use in ships, workshops, factories, &c.

**ILLUMINATED SIGNS.**—An attractive booklet, entitled "That Blue Light," deals with the system of illuminating electric signs, canopies, and façades by means of mercury vapour lamps. The publication is to be obtained from the Westinghouse Cooper-Hewitt Co., Ltd. (80 York Road, King's Cross, N.), which has carried out a number of bold schemes, some of which are illustrated. It is also pointed out that silica lamps can be installed in the existing ornamental gas lantern, still often seen outside various buildings, so as to compel attention and yet not to necessitate a great expense.

### FOOL-PROOF MOTOR CONTROL PANELS

WE are able to illustrate here two motor-control panels recently introduced by the Igran Electric Co., Ltd. (147 Queen Victoria Street, E.C.). These are known as the "Conspede" and the "Varispede" starting panels. The former is illustrated in Fig. 1. Both have been used, we are informed, in large numbers, both at home and abroad. As may be seen from the illustrations, there is only one handle in the "Conspede" panel, while in the "Varispede" there is in addition the handle of the shunt regulator, which is electrically interlocked. As the latter panel embodies all the features of the former, it will be sufficient to describe this. The connections are shown in the diagram, Fig. 3. The shunt field regulator shown at the top is arranged so that it can be short-circuited by a contact controlled by a spring and opposing magnet in series with the holding-on magnet of the starter. When the shunt regulator handle is moved to the resistance all-out position (*i.e.*, to the right), it depresses the armature of the magnet against its spring, so that the short-circuit is removed. If the circuit is then closed, there is sufficient current through the magnet to hold the armature,

so that any movement of the regulator handle may now be made; but as soon as the circuit is broken the resistance is short-circuited, and when next the motor is started full field is automatically put on; nor can this be altered until the handle of the regulator is brought hard over to the right so as to depress the armature against the spring as before.

The holding-on circuit of the clapper switches is controlled through two contacts on the single-starter handle passing over

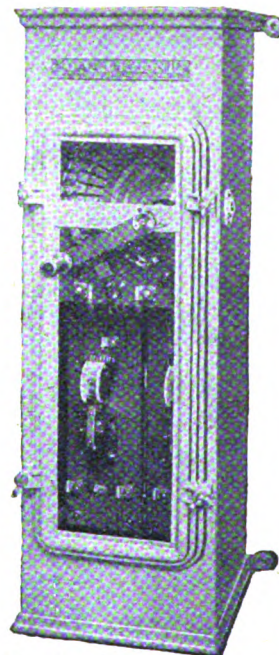


FIG. 1.—CONSPEDE PANEL.



FIG. 2.—CLAPPER SWITCH.

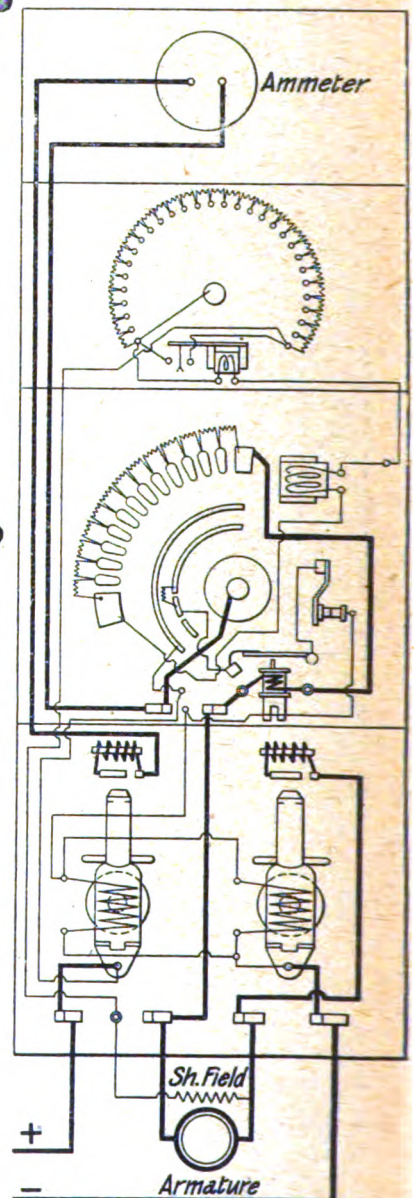


FIG. 3.—CONNECTIONS OF VARISPEDE MOTOR CONTROL PANEL SHOWING "ARC-PREVENTING INTERLOCK."

two concentric metal rings on the starter base. One of these contacts—the one on the outer ring—consists of a wheel, part of the periphery of this is an insulator and part of metal in connection with the contact engaging the inner ring. As the handle is moved the inner contact passes from the dummy stud to the live stud, and the wheel of the other contact rotates so that the metal part comes into engagement with



the ring, and the circuit, through the clapper switches, is completed, thus closing the main circuit. The wheel is prevented from rotating further by a stop, and continued forward motion of the starter handle speeds up the motor in the ordinary way. However, should any backward movement be made, the little wheel rotates so that the metal part no longer engages the ring, and the clapper switches open. To prevent any forward motion of the starter handle putting the clapper switches into circuit again, the inner ring is divided and a resistance inserted, as shown, so that the current is reduced sufficiently to keep the clapper switches closed, but yet is not sufficient to close them after they have been opened. It will thus be seen that the main circuit is always broken by the clapper switches. These are shown in Fig. 2 and are of very robust construction with copper and carbon break, and have a strong magnetic blow-out. It is seen that overload and no-voltage attachments are provided in these panels, and the circuit may be opened by depressing a push-button switch. The clapper switches and their connections make up what is aptly called an "arc preventing interlock," for the only other circuit which is ever broken is the holding-on circuit of the clapper switches, where the current is necessarily very small indeed. These one-handle control panels will no doubt become almost universal, especially where unskilled labour is employed.

### ELECTRICAL SUPPLIES

**D**URING the last few months there have been many new varieties of lighting, heating and cooking equipments put on the market, and the inclusion of some of the best of these in the 1914 edition of the catalogue issued by Drake & Gorham, Ltd. (1 Felix Street, Westminster Bridge Road, S.E.), has necessitated its being about twice as big as the one it supersedes. The very convenient system of thumb indexing the various sections has been adhered to, while the usefulness and accessibility of every item in the catalogue has been enhanced by the inclusion of a complete index, giving both section and page number. As practically every kind of electrical supply is listed, it is difficult to particularise. We may mention that the list of flexibles, in addition to the qualities for ordinary installations, includes varieties for ship, stage, crane, motor-car and other purposes. Price's system of heating for houses, offices, green-houses, garages, &c., is illustrated and described in the section on heating apparatus. The heating element is contained in a large, thin iron pipe. Another useful contrivance is a motor-driven carbonic acid gas refrigerating plant, made in three types. These machines occupy but little space, and take but little power to drive them. In the section on fittings are shades and reflectors for every purpose, hand-lamps to meet the Home Office regulations, electric torches and battery lanterns of robust construction for use in difficult situations. There is no electrical contractor or dealer in accessories who should be without a copy of this catalogue, which will be sent to anyone who cares to apply for it, mentioning **ELECTRICAL ENGINEERING**.

### CORRESPONDENCE

#### CABLE CASINGS.

To the Editor of **ELECTRICAL ENGINEERING**.

DEAR SIR,—We should be pleased to have the opinion of your readers whether it is advisable to screw the capping on casings in the centre or at the edges of the capping. In manufacturing these casings and capping it is our desire to manufacture it to suit the wishes of the electrical trade generally. When the cappings are nailed or screwed on the outside edges, the capping is less likely to gape open and allow dust to go inside the casing, in which case the thicker timber would have to be left on the outside of the grooves and reduce the centre portion somewhat. On 1½-in. casing, what is the best shape, therefore, which will suit the trade? Any replies from your readers on this point would be appreciated, whether given by sketches or figures.

Yours, &c.,

C. JENNINGS & Co.

Pennywell Road, Bristol.  
November 22nd, 1913.

**Osram Lamp Patents.**—Judgment in default of defence, with inquiry as to damages, was obtained yesterday in Mr. Justice Astbury's Court by Osram Lamp Works, Ltd., against the Oro Light and General Supply Co., Ltd., for infringement of Osram metal filament patents.

## MODERN ENGINES AND POWER GENERATORS.

By Rankin Kennedy, C.E.

The Coupon below entitles any reader to a complimentary copy of an illustrated booklet, describing what is probably the most valuable work upon this subject ever published.

The importance of the subject is growing day by day, and "The Book of Modern Engines and Power Generators," can easily prove of the greatest value to those who desire to be fully informed upon the latest developments in every branch of the subject.

The author, Mr. Rankin Kennedy, C.E., is well known as an authority on his subject, and in this work he explains in the clearest and most thorough manner the design and construction of prime movers; the term is here used in its widest sense, as it applies to all engines, whether worked by petrol, oil, steam, air, gas, water, or electricity, and as it includes all machinery and processes connected with power generators and distribution.

### ENTIRELY UP TO DATE.

Moreover, all these subjects have been brought entirely up to date. The previous Edition of the work achieved such an immediate success, that for the new and Revised Edition, the scope of the work has been widened and extended so as to cover every branch of the subject, by the addition of a great amount of new matter, and many new illustrations of very great interest and high value.

This new Edition is indeed already recognised as the standard work on its many varied subjects, including Rotary Engines, Gas Turbines, Gas Engines, Oil Engines, Petrol Engines, Suction and Producer Gas Engines, Blast Furnace Gas Engines, Marine Engines of every design and type, Compressed Air Motors, Air Compressors, Refrigerating Engines, Windmills, with electric storage, Fluid Hydraulic Engines, Water Pressure Engines, Hydraulic Rams, Water Pressure Turbines, and Water Raising Engines, Centrifugal Pumps and Air Lifts, Power Distribution and Transmission by Gearing, Water Pressure, Compressed Air and Electricity, etc.; etc.

### OVER 2,000 ILLUSTRATIONS.

The work is profusely illustrated by diagrams, text-cuts, and plates. In all there are over 2,000, every one of great practical utility to the engineer.

Enough has been said to show that this work is indispensable to all electrical, mechanical, steam, and hydraulic engineers, and to all who are concerned with manufacturing, designing, draughtsmanship, electro-chemical, and metallurgical work, with automobiles, tramways and railways, boilers, shipbuilding, collieries and mines, etc.

We would advise those who are determined to keep abreast with all the latest specialist knowledge concerning every detail of their profession to send for the free booklet which is supplied by the publishers to those mentioning this paper.

## A FREE BOOKLET.

To the CAXTON PUBLISHING CO., LTD.,  
97, Surrey Street, London, W.C.

Please send me, free of charge, a copy of the book describing the "Book of Modern Engines and Power Generators," and showing how it can be obtained for a first payment of 1s. 6d., the balance to be paid by small monthly payments.

NAME .....  
(Send this form or a postcard.)

ADDRESS .....  
.....



## STREET LIGHTING WITH ORNAMENTAL POSTS

MUNICIPAL AUTHORITIES in this country are sometimes apt to give less attention to the æsthetic aspects of street lighting than to its more utilitarian object. Streets lighted artistically as well as efficiently attract people to a town and to the business streets, and thus increase the wealth and therefore the rateable capacity of the community. In this connection the British Thomson-Houston Co.



ORNAMENTAL LAMP-POSTS OUTSIDE THE B. & K. ELECTRIC RESTAURANT, EARL'S COURT ROAD.

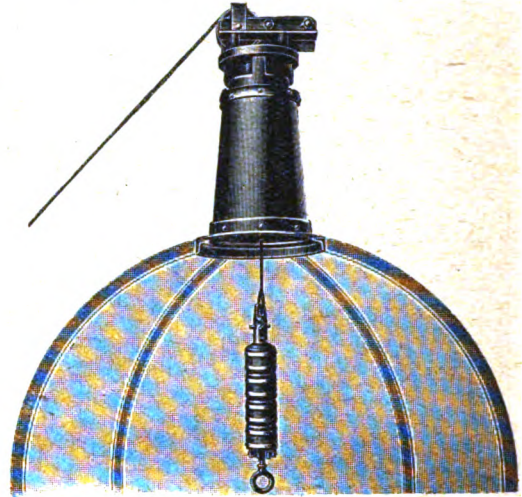
(Mazda House, 77 Upper Thames Street, E.C.) remind us of an ornamental street-lighting standard of artistic and dignified design, which they introduced not long ago, and was illustrated in *ELECTRICAL ENGINEERING*, March 6th, 1913. This standard consists of a Corinthian pillar surmounted by four arms and a single central point. The standard is 9 ft. to the top of the ironwork, and its proper equipment is one 200-watt and four 100-watt Mazda lamps enclosed in Alba globes. The Alba globes are sufficiently dense to render the lamp filament invisible, but, on the other hand, the light absorption is very small. The globular shape and smooth exterior surface permit the rain to wash away all dirt and dust, so that the globes always appear clean. Altogether, the new B.T.-H. standard, with its complete equipment of Alba globes and Mazda lamps, forms a very distinctive street-lighting unit—the general use of which would greatly enhance the appearance of some of our streets. Two of these B.T.-H. standards, equipped with Alba globes, have been erected outside the Brompton & Kensington Electric Restaurant in the Earl's Court Road, and are seen alight in the illustration. They are ornamental both by day and by night, and give an air of refinement and distinction to the exterior of the restaurant, which has undoubtedly contributed to its present popularity.

## LOWERING GEAR

THE London Electric Firm (George Street, Croydon) write us that many remarkable problems present themselves for solution in the prosecution of their business as lowering gear experts. One of these was involved in the gear illustrated here, which is an eight-ring contact-suspension gear for suspending from a dome an electrolier, suitable for seven circuits, for a church in Edinburgh. It will be noticed that the gear is not pendant (which is the more common practice), but is supported from beneath, being located between the inner and outer structures of the dome of the building. The firm believe their concentric system of contacts is the only one by which multi-circuit problems can be satisfactorily solved.

Amongst other similar gears they have done are a number of four-contact gears for picture theatres, giving two entirely different circuits for red and white lights; also five-ring gears for a hall in Edinburgh. Ordinary single-circuit gears for lowering semi-indirect fittings, electroliers, &c., for cleaning, renewal of lamps, &c., have been common things with them for many years.

In all cases the weight of the fittings—sometimes reaching as much as 20 cwt.—is taken by their well-known positive acting weight relieving feature, by which the weight is only on the winding rope during the actual raising and lowering operation. Their patent self-sustaining winches are also used



8-RING LOWERING GEAR FOR LARGE ELECTROLIER.

in conjunction with these fittings, so that even when raising and lowering, the weight of the fitting is always under safe control.

## A FINE WINDOW DISPLAY

THE General Electric Co., Ltd. (67 Queen Victoria Street, E.C.), have sent us the illustration given here of a window display of G.E.C. material in Victoria, Australia.



This display, in which Osram lamps form a prominent feature, was arranged by Messrs. McQueen, of the township of Hamilton.



## TENDERS INVITED AND PROSPECTIVE BUSINESS

### Generating Stations, Sub-Stations, Mains, &c.

**Aylesbury.**—A loan of £20,800 is to be applied for in connection with the new electric supply scheme.

**Barbados.**—The Barbados Electric Supply Corporation, Ltd., proposes to extend its generating plant.

**Bradford.**—One 5,000-kw. turbo-alternator, storage batteries, boosters and switchgear, and two 1,500-kw. rotary-converters, transformers and switchgear. City Electrical Engineer. December 19th. (See advertisement on another page.)

**Cleethorpes.**—Extensions are to be carried out at the electricity works.

**Dundee.**—An additional 5,000-kw. alternator is to be installed at the Carolina Port power house, at an estimated cost of £36,500.

**London: Stratford.**—A Local Government Board inquiry is to be held to-morrow concerning a loan of £21,500 for electrical extensions.

**Stepney.**—The Finance Committee of the L.C.C. recommends sanction to a loan of £7,180 for electrical extensions.

**Neath.**—A Local Government Board Inquiry was held last week concerning a loan of £9,536 for electrical purposes. The inquiry was adjourned in order that the Council's officials might supply a statement showing the difference between the loan sanctioned and the amount actually expended upon the undertaking.

**Rathmines.**—Loans of £11,000 for additional generating plant, and £1,500 for wiring are to be applied for.

**South Africa.**—The *African World* states that the Johannesburg Council requires six motor-converters. London agents, Messrs. E. W. Carling & Co., St. Dunstan's Buildings, St. Dunstan's Hill, E.C.

**Turkey.**—Tenders are invited by January 14th in respect of a concession for an electric lighting installation at Dardanelles. Further particulars, 73 Basinghall Street, E.C.

### Wiring

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Barnet.**—New infirmary.

**Bingley.**—Electric lighting of Town Hall. Borough Engineer.

**Broadstairs.**—Concert Hall in High Street.

**Camborne.**—Extensions to County School for Girls. Secretary, County Hall, Truro.

**Durham.**—Residential school for children. Education Committee, Shire Hall.

**Falkirk.**—Cinematograph theatre (£3,000). Falkirk Picture House, Ltd., 18 Brandon Street, Motherwell.

**Glasgow.**—Tenders are invited for an electric lighting installation at the Langside Library. Town Clerk, December 1st.

**Kingston-on-Thames.**—Additions to workhouse. Union Offices, Coombe Road.

**Leeds.**—Cinematograph theatre, Queens Road. Architects, T. Winn & Sons, 84 Albion Street.

**London: L.C.C.**—265 points at the Ocean Street elementary school, Mile End. (See advertisement on another page.)

**Paddington.**—An expenditure of £90,000 is contemplated on public baths in Porchester Road.

**Manchester.**—Baths (£13,000) at Levensholme. City Architect.

**Thirsk.**—New cinematograph theatre, Long Street.

**Weymouth.**—Electric lighting and power equipment at new bakery, Cromwell Road, for Weymouth & District Co-operative Society.

### Miscellaneous

**Aberdeen.**—Additional rolling stock is required by the Tramway Department.

**Australia.**—Copper track bonds and accessories for Melbourne Suburban Railways. Consulting Engineers, Messrs. Merz & McLellan, 92 Victoria Street, S.W. (See advertisement on another page.)

**Rotherham.**—Two electrically-driven, automatically controlled pumping sets capable of delivering 1,800 gallons per minute against a head of 25 ft. are required. Borough Engineer.

**Southend.**—After some discussion, a proposal by the Highways Committee to place thirteen electric lamps in South-

church Road has been sanctioned. There was considerable opposition in favour of the adoption of high-pressure gas.

**South Yorkshire.**—The Joint Municipal Board, known as the Don Valley Light Railway Joint Board, is to be created for the purpose of constructing tramways to serve the Don Valley between Barnsley and Mexborough. The estimated cost of the scheme is £120,000.

**West Hartlepool.**—Tenders are invited for electrical equipments of tramcars. General Manager, December 3rd.

## TENDERS RECEIVED AND ACCEPTED

**Grimsby.**—The tender of Messrs. W. Lucy & Co. for house service boxes and fittings has been accepted at £171 6s. and £48 16s. respectively. The same firm's tender for house fuse boxes at £153 has been accepted, and a contract for metal filament lamps has been placed with the Cryselco Co.

**London.**—Messrs. Scholey & Co. have received an order from the British Westinghouse Co. for their special tool steel gears and pinions for the whole of the equipments required in the electrification of the suburban lines of the London & South Western Railway. This constitutes the largest single order ever placed in this country for gears and pinions.

**Rotherham.**—A repeat order has been placed with Messrs. E. Bennis & Co. for two mechanical stokers, and self-cleaning compressed air furnaces in the Corporation power station.

## MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. G. Smith & Son, of 5 Philpot Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night, was £68 to £68 10s. (Last week, £70 10s. to £71 10s.)

**The Electrical Co., Ltd.**—This firm has appointed Mr. G. S. Helme (late of the Lancashire Dynamo & Motor Co.) to be their Engineer and Sole Representative in Scotland. Mr. Helme will take up his appointment immediately, his headquarters being at the firm's present Glasgow address, Baltic Chambers, 50 Wellington Street.

**Switchboard Manufacture.**—Mr. S. Ferguson has resigned his position as Chief Draughtsman to Messrs. Ferranti, Ltd., and is joining Mr. G. Pailin for the purpose of carrying on the business of switchboard building. The new Company is Messrs. Ferguson, Pailin & Co., Edward Street, Higher Openshaw, Manchester, and has no connection whatsoever with Messrs. Ferranti, Ltd., but is prepared to build up switchboards with any specified make of detail gear.

## John E. Raworth,

Queen Anne's Chambers, Chartered Patent Agent  
39, Broadway, Westminster, London, S.W.

### EVERY INSTALLATION ENGINEER

Should join his Trade Protection Organisation,  
THE

**ELECTRICAL CONTRACTORS' ASSOCIATION**

(Incorporated).

Inquiries cordially invited by the Secretary,

L. G. TATE,

20, Bucklersbury, LONDON, E.C.



## LOCAL NOTES

**Accrington: Supply for Outside Districts.**—In connection with the recent recommendation that the gas plant at the generating station should be duplicated, negotiations are being carried on with one or two outside districts for a supply either in bulk or in detail.

**Barnsley: Electrical Fittings.**—The Corporation is seeking powers in the next session of Parliament to supply electrical fittings, &c., and to enter into contracts, if necessary, for carrying out the work.

**Brighton: Supply to Railway Co.**—A new arrangement has been entered into by the Corporation Electricity Department with the London Brighton & South Coast Railway, under which the Railway Co., instead of paying a minimum of £1,000 a year for current as at present, will take a minimum of 1,000,000 units per annum, and in addition take all power and lighting supply for their workshops from the Corporation mains.

**Dundee: Broughty Ferry Power Station.**—Following on the amalgamation scheme sanctioned by Parliament last year, arrangements are being made to link up and standardise the Broughty Ferry electric supply scheme with that of Dundee. The cost is estimated at between £800 and £1,000.

**Hove: Purchase of Company's Undertaking.**—The purchase money to be paid by the Hove Corporation for acquiring the electric lighting undertaking from the Hove Electric Lighting Co. has been practically agreed at the sum of about £175,000 mentioned in our last issue, and we have reason to believe that the Council are open to receive proposals for working this concern together with that of their own undertaking in Aldrington (which is at present supplied "in bulk" from Brighton). In round figures, £200,000 is estimated by the Council as the value of the combined undertaking. The Council, we believe, are sanguine as to the likelihood of arranging with a suitable purchaser, as they consider that the undertaking involves considerable possibilities in the way of supplying current for power for the proposed trolley 'buses, street lighting, and other purposes, and the Hove Electric Lighting Co. has for some time paid good dividends and accumulated a reserve fund of many thousands. Particulars are obtainable from the Town Clerk, Hove Town Hall.

**Llanfairfechan: Electric Lighting.**—Having considered the estimated cost of a water-power electric supply scheme, the Council has decided to take current from the North Wales Electric Power Co. The terms of the Power Co. for a minimum supply of 24,000 units on a seven years' contract, are a charge of £120 per annum for two years, and £150 per annum for the remaining five years, upon which terms it is estimated that the Council can supply current at from 5½d. to 6d. per unit.

**London: L.C.C.: Greenwich Power House Breakdowns.**—The cost of repairing the machinery at Greenwich in consequence of the breakdown a few months ago, and also the cost of taking a temporary supply of current from outside authorities during the repairs, was £1,713, of which £759 represents the cost of the temporary supply of current. Arrangements have been made with the London Electric Supply Corporation to take a supply up to 1,800 kw. per annum at £3 per kw. per annum, plus 0.35d. per unit, pending the completion of the work of substituting turbines for the existing reciprocating engines at Greenwich. The Company will supply the necessary switchgear and meters at its works at Deptford, and cable ducts between the Council's line of ducts and the Company's generating station, whilst the Council will provide the necessary feeder cable between the Company's works and the nearest sub-station.

**Marylebone: Electric Cooking Apparatus.**—The Board of Trade recently issued a regulation providing that the framework of cooking apparatus, as well as the guard protecting the heating elements, should be efficiently earthed. A further regulation has now been made which provides that the

covers of the switches, framework and guards of the appliances shall be efficiently earthed.

**Motherwell: Electrical Exhibition.**—An electrical exhibition is now being held under the management of the Electricity Department.

**Tynemouth: Electric Cooking.**—A series of demonstrations of electric cooking was commenced on Tuesday by Mr. F. S. Grogan, of the British Electric Transformer Co., makers of the Tricity cooker, at Tynemouth. The arrangements were made by Messrs. Gillespie & Beales (Amberley House, Norfolk Street, Strand, W.C.), sole wholesale agents for Tricity cookers, in conjunction with Mr. C. Turnbull, Borough Electrical Engineer.

## APPOINTMENTS AND PERSONAL NOTES

Mr. J. J. McGregor, at present Assistant Engineer at the Deptford generating station of the London Electric Supply Corporation, has been appointed Charge Engineer at the L.C.C. Greenwich power station, at a salary of £250, rising to £300.

The Blackpool Tramways and Electricity Committee recommends that the salary of Mr. C. Furness, Borough Electrical Engineer and Tramways Manager, be increased from £700 to £900 per annum.

Mr. Walter T. Young, Traffic Superintendent of the Oldham Corporation Tramways, has been appointed to a similar position at West Ham.

We are informed that Mr. J. H. Collings, who for many years has been connected with the Electrical Fittings Department of the General Electric Co., Ltd., at their Head Office, 67 Queen Victoria Street, London, E.C., has been appointed by the Board of Directors to the important position of Manager of Sales Counters and Showrooms, at the Queen Victoria Street premises. Callers at the General Electric Co.'s Head Office will find Mr. Collings ready and willing at all times to devote personal attention to their requirements.

**Important London Electric Supply Scheme.**—The outstanding electrical feature of the Parliamentary notices which are just appearing is a proposal of the County of London Electric Supply Co., either by itself, or in combination with other London electric supply companies, to seek powers for the London County Council and the companies to agree to postpone the date at which the L.C.C. can at present purchase the electric supply companies' undertakings of London. This date at present is 1931. This scheme is evidently the outcome of certain negotiations, rumours of which were in circulation just over a year ago; reference to these was made in our issue of October 17th, 1912. At the meeting of the L.C.C. on Tuesday, in reply to a question, the Chairman of the London Electricity Supply Committee said that the Committee were not aware of what lay behind the notice given by the County of London Co., but that the Council's officers had been instructed to report on the scheme as soon as the bill has been deposited. Nothing, he added, could be usefully done before this, as the notice did not necessarily offer any reliable information as to what was in the bill. We shall, however, publish further details of the scheme in a few weeks' time.

**Advertising Electricity Supply.**—We have received from Mr. E. Calvert, Hon. Sec. Associated Municipal Electrical Engineers (Greater London), copies of correspondence between that body and the Local Government Board on the question of the legality of expenditure by local authorities on advertising electricity supply. A similar point had been raised by the Commercial Gas Association. The letter from the Local Government Board encloses a copy of the reply which had been given to the Commercial Gas Association, and states that its provisions as regards the purchase of literature apply equally to electric supply undertakings. While the Board considers that it could not properly give sanction to payment of subscriptions by local authorities to such a body as the Commercial Gas Association, it is advised by the Law Officers of the Crown that "publications containing information so immediately connected with the discharge by a local authority of their duties, as to be likely to enable them to discharge those duties more efficiently, might legally be purchased by the local authority." It will be seen that this only covers the actual purchase of advertising literature, and that the question of other forms of advertising is still as uncertain as it was before.

## THE RECORD ELECTRICAL Co., Ltd.

LONDON OFFICE:  
CAXTON HOUSE,  
WESTMINSTER, S.W.  
Telephone:  
3067 Victoria.

**CIRCUIT  
BREAKERS.**  
RECORD'S PATENT.

WORKS:  
BROADMEATH,  
MANCHESTER.  
Telephone:  
164 Altrincham.  
Telegrams & Cablegrams:  
"Infusion,"  
Altrincham."

Telegrams & Cablegrams:  
"Infusion,"  
London."

Write for Prices & Particulars.

# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 362 [Vol. IX., No. 49]  
*All rights reserved.*

THURSDAY, DECEMBER 4, 1913.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES and TECHNICAL COLLOQUE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

*Other advertisement Rates on Application.*

### Latest Time for Receiving

Letters for Insertion, Tuesday first post.

Small Advertisements and Official Announcements, Wednesday first post.

Displayed Advertisements, Tuesday first post.

Corrections in Standing Advertisements, Monday first post.

All letters to be addressed to "Electrical Engineering," at the EDITORIAL and PUBLISHING OFFICES: 208-206, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Circling, Fleet, London."

Telephone No.: 5509 Holborn.

Orders to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

Two new 3,000 kw. Oerlikon turbo-alternators, running at 3,000 r.p.m., have been put down at the Marylebone Electricity Works, which formerly only contained continuous current plant. (Page 675.)

The future of the Edison battery vehicle in this country was discussed most hopefully at the opening of a new showroom last Thursday. (Page 677.)

AN article on Mr. S. Evershed's Paper before the Institution of Electrical Engineers, suggests that his hypothesis as to the nature of conductance through absorbent insulators, might well apply to practically all commercial insulators. In the same article the main points raised in the discussion on the Paper are reviewed, and a curve is given showing Mr. E. H. Rayner's tests on insulation resistance at "breakdown" pressures. (Page 678.)

THE report of Sir Henry Cunynghame on the Cadder Pit disaster does not attribute the fire to electrical causes. (Page 679.)

SOME descriptive notes are given on an exhaust steam colliery generating plant. (Page 679.)

AN important order for electric winding plant for the Rand is referred to. (Page 680.)

IN a Paper presented to the American Institute of Electrical Engineers, Mr. H. H. Clark deals with the dangers attending the use of electricity in mines, as well as its advantages. In another Paper Mr. F. B. Crosby deals with the electrically driven mine fan, using alternating current power, and discusses at length the advantages of dynamic control. (Page 681.)

THE specifications of several patents of interest to mining electrical engineers and electro-metallurgists

were published last month. Included is system of taking up the peak loads on a winding or rolling-mill plant, which is protected by the B.T.-H. Co. and C. McCarthy-Jones. Other patents relate to mine signalling, furnaces, including one for zinc smelting, magnetic and electrostatic separators, &c. (Page 682.)

SOME notes are given on the career of Mr. James Howden, whose death we announced last week. (Page 683.)

OPPOSITION has been entered by the Osram Lamp Works, the B.T.-H. Co., and Duram, Ltd., to the grant of a patent for producing ductile tungsten to Wolfram-Laboratorium Ges. The grant of a patent to Wolfram-Lampen A.-G. for resilient filament supports is opposed by the Brimsdown Lamp Works, Ltd. (Page 683.)

A COMMITTEE has been appointed by the Board of Trade to investigate the causes of explosions with cables laid in bitumen. (Page 684.)

THE signs of trouble with turbine blading are discussed in our Questions and Answers columns. (Page 685.)

THE two students who were charged with doing damage at the Albert Hall sub-station on the occasion of the recent Larkin meeting at the Albert Hall, have been discharged on giving an undertaking to pay for the damage. (Page 684.)

THE Irish Local Government Board has remitted a surcharge of £2,800 paid to Belfast tramway employees under a profit-sharing scheme.—The Kearney High Speed Railway Co. has abandoned for the present its intention to apply for powers to construct a railway from the Strand to the Crystal Palace.—The Baker Street and Waterloo Railway is now linked up with the Paddington terminus of the Great Western Railway. (Page 685.)

THE Hull Corporation is recommended to accept an offer by the Postmaster-General for the sale of the Post Office telephone system in Hull at £192,423, the price which the Post Office paid to the National Telephone Co. (Page 685.)

THE specifications published by the Patent Office on Thursday last include one by Siemens Dynamo Works, F. Lydall, and C. E. Fairburn, for an arrangement for changing over the connections on railway vehicles running at two pressures, e.g., 600 and 1,200 volts. Another interesting specification, by C. J. Beaver and E. A. Claremont (W. T. Glover & Co.), details a construction of waterproof cables by which small defects are shown upon test. Restoration of a lapsed patent for railway signalling, by W. Reid, is being sought. (Page 686.)

A DUST-TIGHT liquid starter is described on page 687.

AN illustrated article exemplifies two methods of lighting cinematograph theatres, and a remote control circuit-breaker is described on page 688.

SEVERAL letters have been received from wiring contractors in reply to Messrs. C. Jennings & Co.'s query last week. The general opinion—with but one excep-

tion—is that the present practice of screwing the capping of 1½ in. casing on to the centre fillet should be continued. (Page 689.)

AN effective showcard is illustrated on page 690.

EXTENSIONS are contemplated at Darlington (£21,190); Bedford (£10,000); Accrington; and Adelaide (£20,000).—Rotary converters are required at Johannesburg; electric charging apparatus for a large number of L.C.C. fire stations; petrol-electric omnibuses in New Zealand; and two automatic electric lifts at Ashton-under-Lyne.—Two South African railway lines are recommended for electrical working. (Page 691.)

MR. H. RICHARDSON, the Dundee City Electrical Engineer, has made a very strong report upon the condition of the Broughty Ferry undertaking.—An interesting lecture was recently given in Haslingden on the electrical driving of cotton mills, by Mr. J. W. Crowley, of Siemens Bros. & Co.—The Manchester electricity output last week constituted a record.—The recently appointed Borough Electrical Engineer at Redditch is opposed to the feeling held by several councillors that the electricity undertaking should be sold.—The electrical arrangements in connection with the Widnes transporter bridge have been reconstructed. (Page 691.)

The option on the part of the County of London Electric Supply Co. to acquire a site of 23 acres near Barking, was the subject of questions in the L.C.C. on Tuesday. (Page 692.)

### The London Electrical Engineers.

(TO-DAY) THURSDAY, DECEMBER 4TH.—C. Company. Technical Instruction, 7 to 10 p.m.

FRIDAY, DECEMBER 5TH.—D. Company. Technical Instruction, 7.30 to 9.30 p.m.

Special Class on Crossley Engine. 7 p.m.

SATURDAY, DECEMBER 6TH.—Headquarters open from 10 a.m. till noon.

MONDAY, DECEMBER 8TH.—A. Company. Technical Instruction, 7 to 10 p.m.

TUESDAY, DECEMBER 9TH.—B. Company. Technical Instruction, 7 to 10 p.m.

WEDNESDAY, DECEMBER 10TH.—Recruits only. Infantry Drill and Technical Instruction, 7 to 10 p.m.

### ARRANGEMENTS FOR THE WEEK

(TO-DAY) THURSDAY, DECEMBER 4TH.

*Institution of Electrical Engineers.*

8 p.m. "Electricity Supply in Large Cities," by Dr. G. Klingenberg.

FRIDAY, DECEMBER 5TH.

*Faraday House Old Students' Association.*

7.30 p.m. Annual Smoking Concert at Holborn Restaurant.

*Institution of Civil Engineers: Students' Section.*

8 p.m. "The Liverpool Street Extension of the Central London Railway," by H. V. Hutt.

MONDAY, DECEMBER 8TH.

*Institution of Post Office Electrical Engineers.*

6 p.m. At Institution of Electrical Engineers. "The Elimination of Waste in Telephone Plant and Operating," by B. O. Anson.

*Institution of Electrical Engineers: Newcastle Section.*

7.30 p.m. At Armstrong College. "Electricity Supply in Large Cities," by Dr. G. Klingenberg.

*Institution of Electrical Engineers: Students' Section.*

7.30 for 8 p.m. Annual dinner at Trocadero.

TUESDAY, DECEMBER 9TH.

*Institution of Electrical Engineers: Manchester Students' Section.*

7.30 p.m. At Municipal School of Technology. "The Design and Use of a Street Photometer," by S. E. Taylor.

*Institution of Electrical Engineers: Scottish Section.*

8 p.m. At Prince's Street Station Hotel, Edinburgh. "Electricity Supply in Large Cities," by Dr. Klingenberg.

WEDNESDAY, DECEMBER 10TH.

*Institution of Electrical Engineers: Yorkshire Section.*

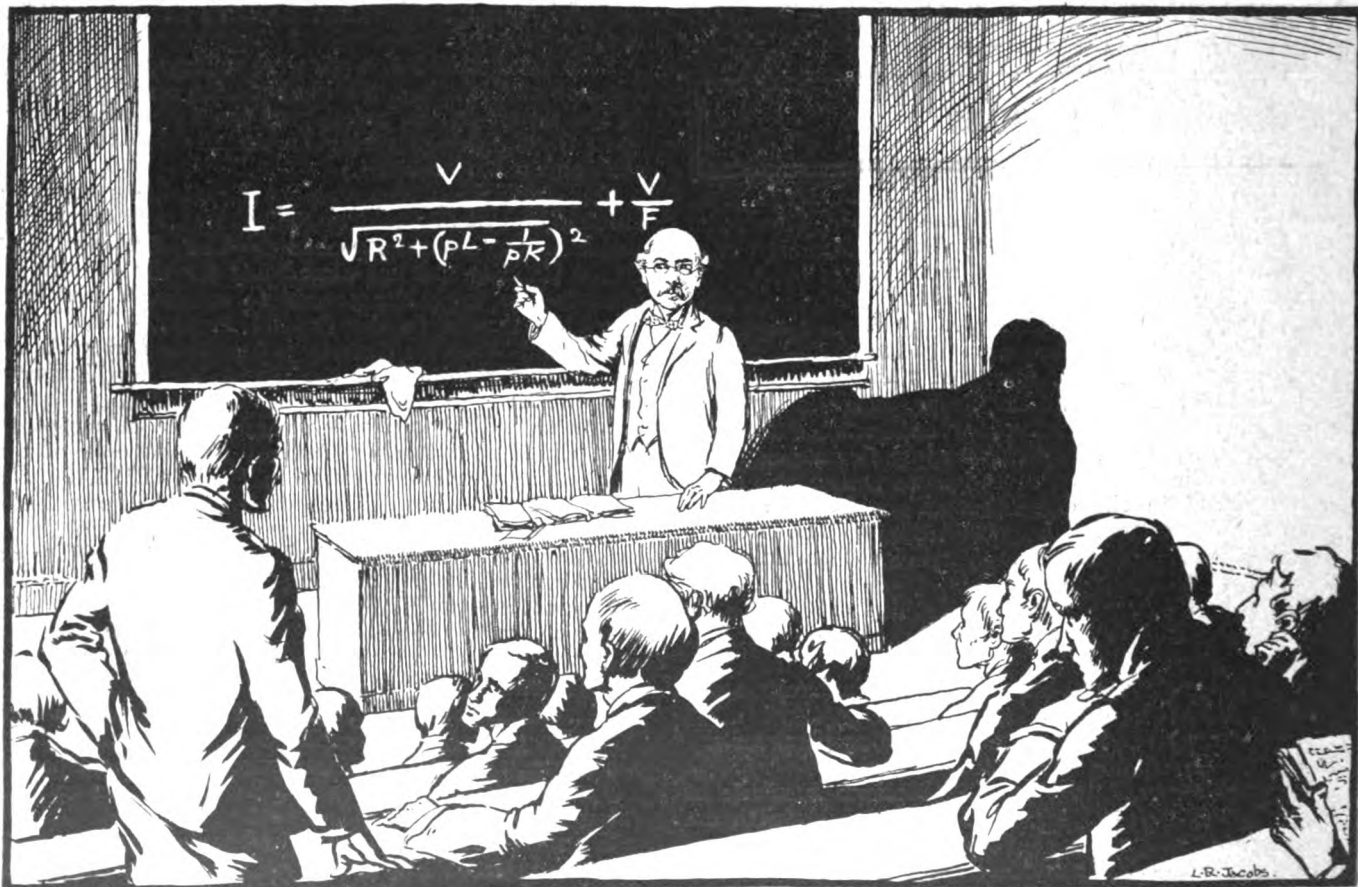
7.15 p.m. At Philosophical Hall, Leeds. "The British Standard Specification for Consumers' Electric Supply Meters," by S. H. Holden.

*Institution of Electrical Engineers: Birmingham Section.*

7.30 p.m. At the University. "The Rating of Electric Machinery," by A. R. Everest.

*Royal Society of Arts.*

8 p.m. "The Application of Electricity to Agriculture and Life," by T. Thorne Baker.



Experiments in Terminology: What might happen. See page 678.

*Professor* \* \* \* \* \*.—This equation gives the current flowing into the cable. The term  $V/F$  can usually be neglected.  $F$  is insulation resistance,—which may conveniently be called the INsulation.

*Intelligent Student*.—And is the expression under the root the IMPedance?



## NEW TURBO-GENERATORS AT MARYLEBONE

SINCE we published a complete description of the generating station of the Borough of St. Marylebone Electric Supply Department (see *ELECTRICAL ENGINEERING*, Vol. I., p. 63, Jan. 10th, 1907), there have been one or two minor alterations in the equipment, notably in connection with the arrangement of the switchgear, but the greatest change the station has seen is the introduction of extensions in the

without even removing the small D.C. sets. Compared to the older D.C. sets of 2,000-kw. capacity, they look very small indeed (as shown in Fig. 1). The main advantages obtained by the high speed of the sets are low first cost and improved steam consumption, although the conditions under which this plant is running are not quite the best. It is only possible to give the sets 190 lb. per sq. in. steam pressure

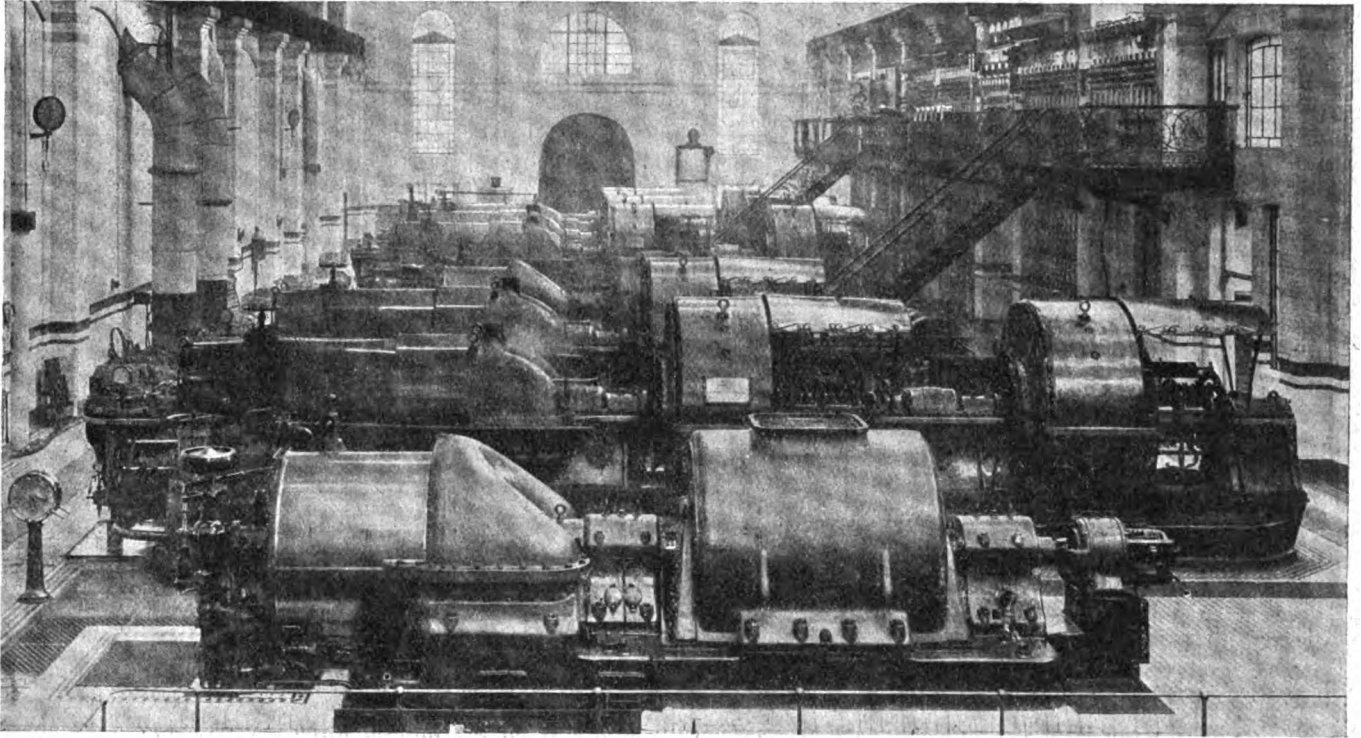


FIG. 1.—GENERAL VIEW OF ENGINE ROOM SHOWING ONE OF THE NEW TURBO-ALTERNATORS IN THE FOREGROUND.

form of three-phase alternating-current plant, part of which is now at work. It will be remembered that the station was originally equipped with continuous-current turbo-alternators only, but when large extensions became necessary, it was decided to take advantage of the better economy that a high-tension alternating-current system of distribution can afford. Two new 3,000-kw. Oerlikon turbo-alternators were therefore ordered, and these are particularly interesting sets

at the stop valves, and 100° F. of superheat, whereas the full pressure to obtain the best economy would be 250 lb. per sq. in. Even under the existing conditions, however, the steam consumptions guaranteed are 13.27 lb. per kw.-hour (with a 95 per cent. vacuum) at full load, 13.73 lb. at three-quarter load, and 14.7 lb. at half load. The actual official test has not been carried out yet, but from tests at the makers' works, in the presence of Mr. T. K. Richardson

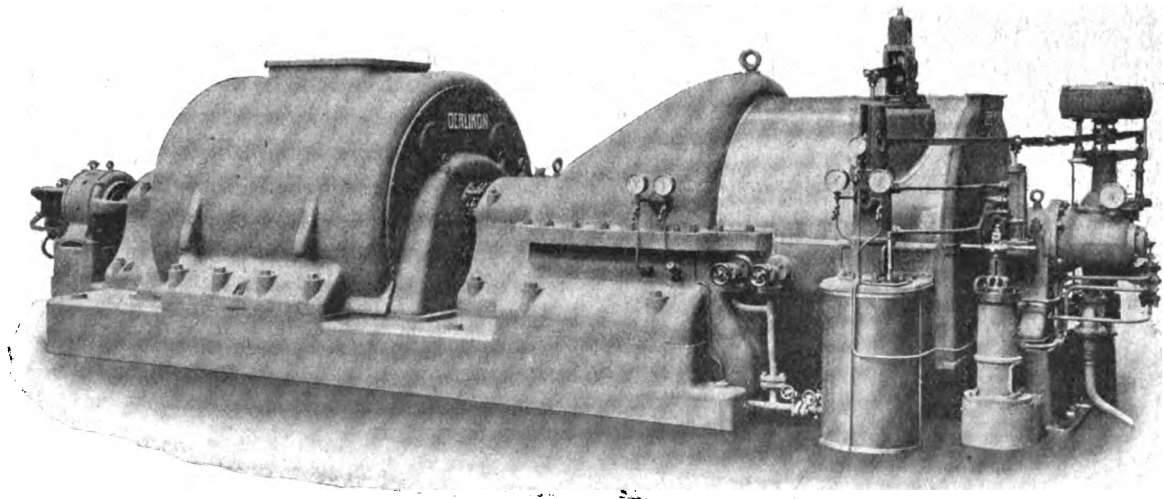


FIG. 2.—3,000-KW. OERLIKON TURBO-GENERATOR AS ERECTED AT MAKER'S WORKS.

from several points of view. One is now running, and the other is nearly ready. They are, we believe, the first sets for running at as high a speed as 3,000 r.p.m. of their size to be put down in this country, and they are remarkably small in size for their output. There was no difficulty in finding space for them in between the existing sets, and, indeed, with plant so compact for its output there would be room in the engine-room for two more of the same size

(Station Superintendent), the steam consumption appears to be about 5 per cent. better than the guarantee, and rough check figures taken at Marylebone resulted in about 4 per cent. to the good. The first set commenced running on load on October 27th, and no hitch has occurred, which is very creditable to the power station and sub-station staffs, who were accustomed to continuous-current work. The capital cost of the whole extension was £42,000, and Mr. A. H.







in Fig. 4, is also very compact. It was also made by the Oerlikon Co., and is rated at 8,000 kw. normal rating, or 4,000 kw. for six hours as an overload at 6,600 volts, three-phase, 50-cycles unity power factor. It is of the two-pole revolving field type, with slotted cylindrical core and distributed winding. It is of particularly substantial construction in view of the high speed. A small exciter is coupled to the machine by a flexible coupling. The alternator is enclosed and ventilated by fans of special design to give high efficiency, mounted on the rotors. The air is drawn through channels formed by the existing cable races—incidentally keeping them cool—from a wet air filter which has been erected outside the engine-room. This was supplied by the Sturtevant Engineering Co. The air is discharged from the "chimney" of the machine into the engine-room. The spraying of the water in the chamber of the air filter is effected by a large number of nozzles of a special pattern which completely atomise the water. The washed air then passes through a baffle plate screen with water running over part of the surface of the plates, and is freed from all suspended spray or other matter.

The condensing plant was supplied by the Worthington Pump Co., as sub-contractors to the Oerlikon Co. At present its erection is not complete, and the first set is being run temporarily on the condensing plant belonging to the small Parsons continuous-current sets, which are now rarely used.

Each condenser has been designed to deal with 52,500 lb. of steam per hour, maintaining a vacuum of 28½ in., with the barometer at 30 in., and consists of a rectangular surface condenser with 10,500 sq. ft. of cooling surface, and some 10½ miles of solid brass tubes provided with 52-in. exhaust openings and 26-in. circulating inlet and outlet openings. Owing to the comparatively high temperature of the circulating water, namely, 75° F., which is within 16° of the temperature due to the vacuum, a very large volume of circulating water is required for condensing purposes, and centrifugal pumps are provided, each 22 in. in diameter, of a capacity capable of delivering at the rate of 11,400 gallons per minute, and delivering this volume of water against a total static and frictional head equal to 50 ft. The efficiency of these machines is very high, and when discharging at the above rate, they require 220 B.H.P. to drive them. The air pumps are of the vertical triplex suction valveless type, having 20-in. air cylinders at 12-in. stroke, with attached lift pumps, 6 in. by 9 in., running at 135 r.p.m., the condensate being delivered into the hot-well tank for boiler feed supply. Each condenser is provided on the exhaust opening with a flexible galvanised steel expansion piece, and exhaust steam valve with a 5 B.H.P. motor for controlling and promptly opening and closing the same, and on the back of the valve is provided an atmospheric opening, and an automatic exhaust valve is directly carried over it. Owing to the original arrangement of the plant being of such a nature that extensions had only been contemplated on the basis of the existing plant, it was necessary for a considerable rearrangement of the existing piping to be made. All the condenser motors are of the Oerlikon auxiliary pole shunt-wound type, specially constructed for condenser work.

Although there is room on the roof for the addition of another cooling tower, this has not yet been done, and condensing water will be drawn from the adjoining canal. Even though as good temperature conditions will not be obtained as would be with a cooling tower, the effect on the ultimate efficiency will be compensated for by the smaller power taken in pumping, as the head to the top of the cooling towers on the roof is considerable.

The new switchgear is situated alongside the continuous-current gear in a gallery at the side of the engine-room, and was supplied by Ferranti, Ltd. The actual high-tension gear is in brickwork cells behind the marble control panels, and the switches themselves are hand operated. Duplicate bus-bars are provided, arranged at present to be connected or disconnected by links, but probably bar coupling oil switches capable of breaking under load will be put in later. As remarked before, the speed of the turbines can be regulated from the switch gallery.

Three high-pressure feeder cables, supplied by British Insulated & Helsby Cables, Ltd., transmit the power from the generating station to Manchester Square, where there is a special selector panel, by means of which any combination can be made to feed either at Manchester Square or connect to the two cables which continue on to Rathbone Place. At the generating station there is one Westinghouse 1,000-kw. rotary-converter; there is also one at Rathbone Place, and there are two at Manchester Square. All these rotaries are standard and interchangeable. They are fitted with self-synchronising apparatus and A.C. boosters, the latter being

necessary not so much on account of power-factor correction, but on account of the variation in voltage required for the continuous-current distribution from 490 to 560 volts.

In conclusion we wish to thank Mr. A. H. Seabrook (General Manager, Marylebone Electricity Supply Department) for giving us information regarding the plant, and to Mr. T. K. Richardson (Station Superintendent), who conducted our representative round the works, as well as to Mr. G. Wütrich, of the Maschinenfabrik Oerlikon, from whom we received the drawings and photographs from which our illustrations have been prepared, together with technical particulars of the plant.

## EDISON BATTERY CARS

A NUMBER of those interested in electrical and automobile matters congregated on Thursday last as guests of the Directors of Edison Accumulators, Ltd., at a lunch on the occasion of the opening of the Company's new show-rooms at "Edison Building," 2 and 8 Duke Street, Piccadilly, W. In the large showroom on the ground floor a number of Edison battery propelled vehicles were on view, prominent among which were examples of the finely finished Arrol-Johnstone-Edison passenger cars for town use, such as we described in connection with the Olympia Exhibition (*ELECTRICAL ENGINEERING*, November 13th, 1913, p. 629). There were also some Detroit cars of American manufacture, and to engineers perhaps one of the most interesting objects was a solidly made 5-ton commercial chassis propelled by a single motor in the rear of the vehicle driving through bevel gearing, differential and side chains. This is equipped with a battery weighing about 1½ tons, and under ordinary conditions is said to be capable of about forty miles on one charge. Samples of all the different sizes of Edison cells made, separate plates and various accessories were also examined with interest by the large company present, which included many well-known station engineers, large users of commercial vehicles and others. We do not propose to deal with the details of the cell and its advantages here. These have been fully set forth already in *ELECTRICAL ENGINEERING* (see Vol. VI., p. 319, March 19th, 1910; Vol. VII., Exhibition Supplement, p. 67, October 12th, 1911; and Vol. VIII., p. 377, June 26th, 1912). We have long had the Edison battery preached to us and we were met together to welcome the inception of a scheme for enabling it to be practised.

The lunch was presided over by Lord Montagu, who is chairman of the company, and the principal toast of success to the Edison battery was proposed by Mr. W. R. Cooper, who said that the Edison cell had a high reputation to live up to, but much scepticism to live down. There was plenty of field both for the lead cell and the Edison cell, but for traction there was much in its advantages of durability, and ability to be left discharged or charged at a very high rate without damage. In the United States there were some 37,000 battery vehicles running, including 12,000 heavy trucks, produced by 37 makers. The matter here largely depended on the encouragement of station engineers in giving low rates for charging current. Lord Montagu, in his reply, made it clear that they did not want to make extravagant claims for the Edison battery, and also referred to the wide use of the battery car in America, which showed us a large field for the electric car, especially for the two extremes of ladies' use for town work and very heavy goods traction. The low rates for charging current that were beginning to be obtainable in this country made all the difference. He quoted some tests made by the R.A.C. on an Edison battery propelled car weighing 29 cwt., which went 312.3 miles for 19,180 watt hours with an 8-cwt. load, i.e., a total of 1.85 tons, giving 378 ton miles at an average speed of 11.52 miles per hour. The efficiency worked out at 60 per cent., and with energy at ½d. per unit the power cost was 0.167d. per ton mile against 0.25d. per ton mile, as the best that petrol could give. As the price of liquid fuel went up and that of current went down, the difference would increase still more. Mr. Bernard Drake also replied, and told some amusing tales of the early battery days in England and present-day sales methods in America. The future of the battery vehicle in England lay in the hands of the supply authorities. He thought that a uniform price of ½d. per unit for charging current would yield them a large and important load. In replying to the toast of the guests, which had been proposed by the chairman, Mr. A. H. Seabrook (General Manager, Marylebone Electricity Supply) dwelt on the public health aspect of the question, and said that it was significant that in Berlin the police had given up licensing petrol cabs, and in future would only issue licenses to electric cabs. Mr. J. E. Edgecome (Borough Electrical Engineer, Kingston-on-Thames) also replied, but thought that all stations could not get down quite as low as ½d. per unit. He had great hopes that the special committee formed by the Municipal Electric Association would do much to forward the cause of the electric vehicle in this country.

## MOISTURE AND INSULATION RESISTANCE

THE main object of Mr. S. Evershed's Paper before the Institution of Electrical Engineers, summarised in our last issue, was to put forward a theory, based on a long experimental research, as to the physical nature of the conductance through insulations of the absorbent type, such as impregnated paper, cloth or fibre. Both in the discussions in Birmingham and London last week, however, the speakers chiefly devoted themselves to side issues not directly relevant to the main theme of the Paper, but this may have been simply because they were prepared to accept Mr. Evershed's deductions implicitly, and had little to add in the way of comment or criticism. In fact, there seems to be no reason to doubt that Mr. Evershed is correct in his hypothesis as to the nature of the leakage through an insulator which has absorbed small quantities of moisture—that is to say, any insulator of the "absorbent" class under normal conditions.

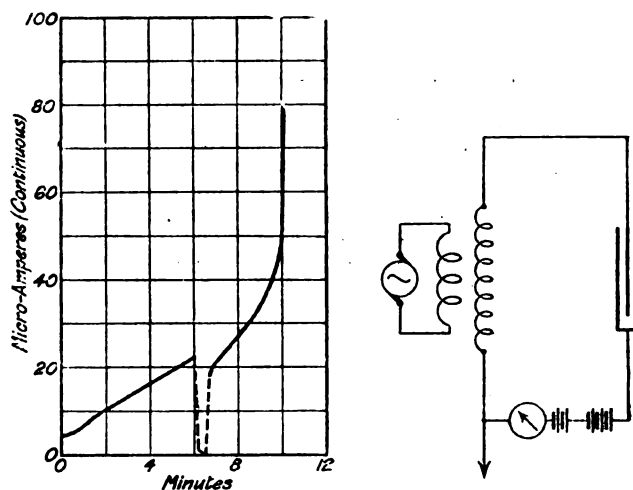
The question arises, however, whether one might not go even further, and extend the hypothesis to "non-absorbent" insulating materials, which very probably have minute quantities of water in their composition—e.g., gutta percha and indiarubber (whether vulcanised or pure), and other insulators, the preparation of which for industrial uses does not preclude the presence of moisture. When searching for a definite conception of the mechanism of conductance in an insulator, one ought not to neglect to take into consideration the phenomenon popularly known as "electrification" noted in a cable during the insulation test. The current passing through the insulation gradually decreases, and although, for the conventional value of insulation resistance for comparative purposes, the value of the current is taken one minute after its initial application, it falls off gradually for several hours with many classes of dielectric. Those whose duty it was to test impregnated cotton, jute or paper cables in the early days of the industry (before the introduction of vacuum dryers), know well that this so-called "electrification" was more marked in cables not sufficiently dried, but the shape and character of the curve was the same whether the dielectric was a partially dried impregnated fibre or paper on the one hand, or indiarubber or gutta percha on the other hand. It is therefore extremely doubtful whether this gradual "electrification" is due, as currently supposed, to a gradual increase of the physical stress on the dielectric with time. A natural insulator, such as the mica in a well-made mica condenser, reaches its final value very soon after the application of the testing battery, and a well-dried, impregnated paper or cotton cable has a much shorter period of "electrification" than one to which the drying process has not been applied long enough. Had Mr. Evershed taken some of the insulators which he classifies as non-absorbent, but which show this "electrification," and tested them over a range of voltages, it is quite probable that he would have obtained from them the same characteristic "moisture curve."

Although the drop of insulation resistance with increased pressure—and possibly also the peculiar phenomenon of slow "electrification"—may be due entirely to the moisture in the cable, it does not follow that the exclusion of all moisture with a view to increasing the insulation resistance is always desirable. Mr. B. Welbourn (of the British Insulated and Helsby Cables, Ltd.), in the discussion in London, reminded us of the fact, well known to the cable manufacturer, that a too complete drying process has the result of making the dielectric brittle.

Mr. Evershed's experiments were all made with continuous current, owing to the difficulty of differentiating between capacity and leakage current when alternating current is employed. Mr. E. H. Rayner, of the National Physical Laboratory, however, showed by an interesting curve, reproduced opposite, that it is possible to obtain a good idea of the true leakage current during an A.C. test. He applied a high-tension A.C. current at 2,500 volts to the specimen of insulation under test through a transformer, as indicated in the diagram, at the same time superposing a D.C. current at 100 volts through a micro-ammeter which was unaffected by alternating currents. The gradual drop of the insulation resistance up to the breakdown point is clearly shown in the curve. The dotted lines show the effect of removing the A.C. pressure for half a minute, and indicate that up to the actual moment of breakdown the insulation resistance is not permanently destroyed. On the other hand, it is interesting to mention a remark with regard to cable networks made by Mr. Welbourn, to the effect that there was less trouble due to low insulation resistance on A.C. networks than on D.C. networks—probably owing to the well-known trouble of low insulation on the negative pole due to endosmose

driving the moisture from the positive to the negative pole. Mr. C. J. Beaver (of W. T. Glover & Co.) assured the meeting that cable tests were now always taken with negative currents, but mentioned specifications which called for a difference of only 5 per cent. in insulation resistance of the cable tested with positive and negative currents respectively.

As the discussion will doubtless be published shortly in full in the *Journal* of the Institution, we need only refer briefly to



some of the other interesting points referred to at the meeting in London. Prof. Silvanus P. Thompson gave a glowing testimony to the value of the Paper, an equally happy exposition of the true meaning of Ohm's law, and assisted the proper appreciation of Mr. Evershed's theory of the conduction through films of moisture by the description of some beautiful experiments that can be made. Incidentally, he referred to vulcanised fibre as "neither vulcanised nor fibre," and suggested the rather unfortunate abbreviation "insulance" for insulation resistance. Mr. Beaver pointed out that if cables were tested until the "electrification" were complete, the relation between the space occupied by the testing rooms and the remainder of the cable factory might have to be reversed. Mr. Wordingham (Admiralty) pointed out that the difference in the insulation resistance when tested with positive and negative currents was known in 1892, and he and others supported the utility of the "blind" flash test which Mr. Evershed might be thought to have disparaged in his Paper. Mr. Welbourn approved the utilisation of the middle conductor of triple concentric cables as the negative, and Prof. Schwartz (Manchester University) quoted historic tests to show that pure rubber was absorbent, and suggested that the distribution of moisture in a dielectric would quite possibly have the same characteristics as the distribution of sap in trees which had recently been investigated.

**Institution of Electrical Engineers.**—The following is the result of the ballot for new members at the meeting on Thursday:—*Members:* W. F. Dawson, E. Thomas. *Associate Members:* C. E. Allsopp, D. E. Bailey, J. I. Brooks, A. G. Bruty, J. Colin, H. A. Davies, A. K. Erlang, W. A. Fairgrieve, F. C. Hall, L. F. Haslam, W. G. Heath, W. G. Hendrey, C. M. Herbert, D. G. Hurlblatt, M. M. Inglis, P. Ingouville, Z. D. King, W. Lawson, F. G. Licence, A. W. McArthur, C. G. Makins, W. H. Morris, K. A. Mountain, C. C. O'Brien, C. R. Palmer, C. S. Plank, T. A. Pond, F. B. Preston, G. H. Richards, L. J. Rouard, H. F. Simon, H. A. Starkey, H. Stone, F. G. Stuckenschmidt, C. Suggate, J. Warwick. *Associates:* H. Freeman, J. W. Punter. *Graduates:* B. C. Chatterjee, H. S. Coleman, B. Das, G. Goldthorp, T. P. Keady, B. J. Leggett, H. Leivesley, C. W. Pearce, N. S. Pillai, H. C. Rennick, C. J. Skittrall, H. Taylor. *Students:* E. Allen, S. D. Anderson, S. J. Baldwin, J. Barratt, H. A. Bly, J. Brandrich, R. G. Burton, W. H. Cable, F. Carter, H. H. Curtis, E. L. Damant, E. A. Deacon, N. Devonald, L. A. Gripper, D. K. Hall, C. E. Hawkins, W. Howe, C. Huddleston, E. H. James, N. R. Khambhati, N. Lall, J. H. Lee, H. K. Love, A. P. Mackie, H. L. Mansell, K. P. Menon, E. Midgley, W. Moody, A. Morris, S. Mouras, F. N. Mowdawalla, F. T. Obert, D. E. O'Donovan, A. S. Padgett, C. A. Powell, R. H. Smith, A. H. Todd, B. B. Walker, F. S. Weston, J. B. Windle. *Candidates Transferred:*—*Associate Member to Member:* W. M. I'Strange, F. H. Michell, C. G. Nobbs, H. S. Reid. *Associate to Member:* J. C. Darby, L. Fuller, F. Graham, J. E. Williams. *Graduate to Associate Member:* E. W. Fleming, A. A. Hurry. *Student to Associate Member:* F. Carr, J. L. Eve, J. Hacking, G. F. Hilton, F. R. Hoggett, B. Hoyle, W. E. Sale, S. N. Whitehead. *Student to Graduate:* B. Dees, S. Fahmy, J. V. Gomes, A. K. Modi, M. Sadick, E. F. Turner.



## ELECTRICAL ENGINEERING IN THE MINING AND METAL INDUSTRIES

Correspondence on any of the subjects dealt with in this Section is cordially invited from our Readers.

The Editor is willing to insert letters over a *nom de plume*, but Correspondents should send their full names and addresses in all cases.

Letters should be addressed, "THE EDITOR, ELECTRICAL ENGINEERING, 203-206 Temple Chambers, London, E.C., and should reach this office by the 21st of the month.

Correspondents are requested to write on one side of the paper only.

### THE CADDER COLLIERY DISASTER

IN view of the uncertainty as to the cause of the fatal fire at the Cadder Colliery on August 3rd last, and the allegations in some quarters that it was due to electrical causes, the publication of Sir Henry Cunynghame's report is of special interest. The report recapitulates the circumstances of the fire and the arrangement of the electrical installation in the part of the pit in question. About 125 ft. from the pit bottom, along the main haulage road, or "main dook brae," is a cabin used by the firemen, and where books, &c., are kept. Next to the cabin is a telephone space, and next to this, again, a switchboard room. The main cables led down the shaft to a switchboard placed in the switchboard room. They were single cables armoured; from the switchboard two unarmoured cables led back to a lighting switch 70 ft. from the pit bottom. These cables consisted of seven strands of No. 14 wire, rubber-insulated, taped and braided, and were supported on porcelain insulators as far as the haulage-switch; after that they were suspended by flexible cords affixed to nails in the timber of the roof. Direct current was supplied at 500 volts and the lamps were put in groups in series on this cable. Some were of 120 volts and some of 250 volts. Electricity had been used in this pit in 1906, but in June, 1913, it was reconstructed and remodelled. Single cables (armoured) led inbye from the switchboard into the mine to work coal-cutters and pumps. There was no suggestion made by anyone but that the electrical work was well and substantially done. "It will be observed, however," continues the report, "that the lighting cables were unarmoured."

In the first place it appeared that the origin of the fire must have been either some failure of the electrical apparatus, or else a misadventure due to the accidental ignition of clothes, or a lamp-wick, or some timber. One of the men who saw the fire gave it as his opinion that the cabin had caught fire. He saw the cables burning, but not sufficiently to induce him to think that the fire had been caused by electricity. The expert witnesses, including Professor Thornston, who was called on behalf of the miners, Messrs. Johnstone and Walker, Divisional Inspectors, and Mr. McLaren, Senior Inspector, were all of opinion that, though it was possible that the fire had been caused by some failure of the electrical apparatus, yet it was more probable that it was due in some way to lights or to lucifer matches. "I agree," writes Sir H. Cunynghame, "in thinking that the cause of the disaster is uncertain, but that it is far more likely to have arisen from the accidental setting alight of some material by a match or otherwise than by electricity. In this connection a question arises whether the electric lighting cables should have been armoured. They would have been better armoured. The question of the legal position as to armouring is a difficult one, depending upon the interpretation of the Act of 1911 and regulations, and I do not propose to deal with it, inasmuch as I do not consider that electricity was the cause of the fire, and, generally speaking, the electrical installation was a good one."

With regard to the telephone installation the report continues as follows:—

"There was a telephone circuit in this pit, consisting of a single wire leading from No. 17 to No. 15, and then down the down-cast shaft, and along the Main Dook Brae. At various points of it telephones were fixed with earth returns. The

circuit did not lead right round to the up-cast shaft. One of the disadvantages of this arrangement is that an accident to one part of the line may throw out of action all the telephones on the rest of the circuit. No telephone message of the fire was sent up. This, no doubt, was because telephonic communication was severed at the cabin. The severance seems to have destroyed communication not only between the Main Dook Brae and the surface, but also between the two pit heads on the surface. If an independent telephone circuit had existed along the return air road, it might possibly have saved all the men in this case. I think that in future telephonic communication should, so far as possible, be independent and arranged so as not easily to be put out of working by injuries to parts of the circuit, and I was glad to hear Mr. Murray, who appeared for the Company, express the same view. I understand that a new telephone system has been devised for use in mines, which will be independent of accidents to the wires. If this turns out to be practicable, it ought to be very useful, and might, in cases of disaster, be invaluable in ascertaining the position of men in the pit, and of assisting in the direction of the operations of the rescue parties."

### AN EXHAUST STEAM COLLIERY GENERATING PLANT

MANNERS COLLIERY, Ilkeston, affords a typical example of the utilisation of exhaust steam which would otherwise have been wasted, and the transformation of the conserved energy into electrical power. Up to the date of the installation of the exhaust steam plant there were about the colliery two winding engines, a haulage and a fan engine exhausting into atmosphere. Power was previously taken from the Nottinghamshire & Derbyshire Power Co., Ltd. To-day the whole of the electrical power in the colliery is supplied from the exhaust steam from these engines, and rarely is live steam called for, except at times when the steam-winding engines are lying idle. The accompanying illustrations give views of the power house which has been laid

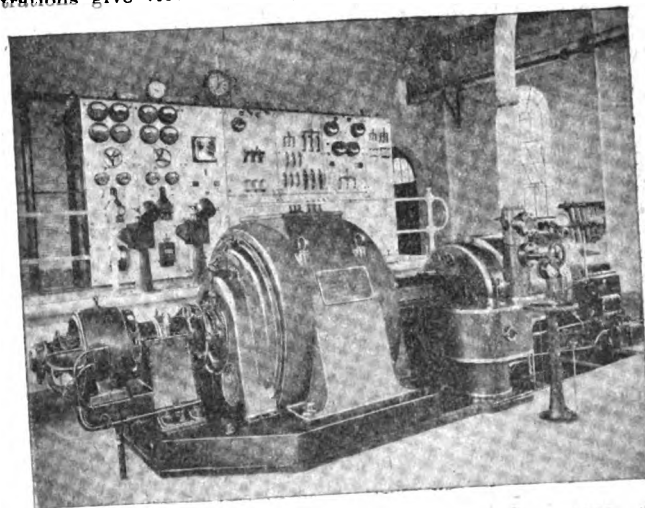


FIG. 1.—300-KW. WITTON EXHAUST TURBO-GENERATOR AND SWITCHBOARD AT THE MANNERS COLLIERY, ILKESTON.

out for utilising the exhaust steam. It consists of a 300-kw. Witton-Belliss turbo-generator, generating at 440 volts three-phase 25 cycles, and running at a speed of 1,500 r.p.m. A small reciprocating set comprising a 150-kw. Witton alternator, driven by a Belliss engine at 375 r.p.m., has been installed to take the lighter load at nights and at times when the plant which ordinarily supplies the exhaust steam is not at work. The exhaust steam from each steam engine is fed into a central reservoir consisting of a number of old boilers which have been turned to account. From these old boilers the exhaust main crosses the yard, its suspensions also serving to carry the shaft cables from the power house. The condensing plant consists of a Ledward & Beckett ejector condenser with a spray cooling pond. The circulating pumps are

**FOR  
BRITISH  
MANUFACTURED  
PAPER  
INSULATED  
CABLES**

**THE UNION  
CABLE  
CO., LD**

**DAGENHAM DOCK,  
ESSEX.**

steam driven. A grease extractor has been installed to relieve the exhaust steam of any oil or grease it may contain. The generators supply power to an open-type marble switchboard, also supplied by the General Electric Co., which includes amongst the usual complement of instruments a leakage indicator and a voltage regulator. The colliery works with an insulated neutral.

Following modern practice, no attempt has been made to

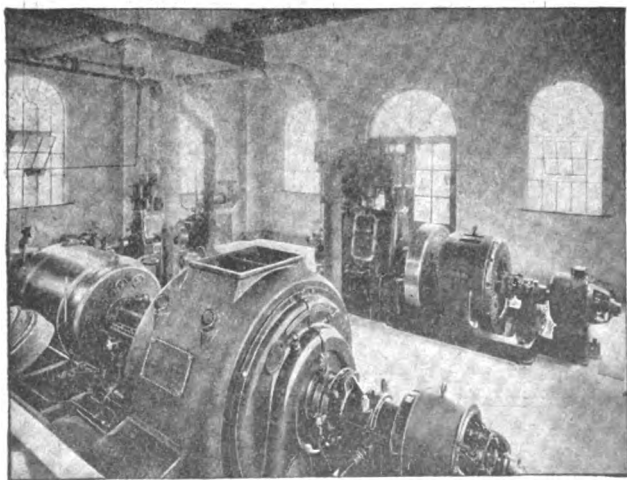


FIG. 2.—GENERAL VIEW OF THE ENGINE-ROOM FROM THE SWITCHBOARD.

give the turbo-generator a high regulation; it has been preferred to design the generator so that the transient current at the moment of short-circuit shall have a low value, and to secure good regulation by the adoption of a voltage regulator which is accommodated on the switchboard. A change-over switch is provided so that the voltage regulator can be made to control either the turbo-generator or the reciprocating set, according to whichever is running. The exciter regulators

are mounted underneath the switchboard, and are controlled by two exciter pillars with concentric handwheels, which permit the exciting current of both generator and exciter to be adjusted. A small cloth filter has been included to filter the air for ventilating the generating sets.

This power station is at present supplying a number of haulages, fans, pumps, a saw mill, shops, stable motors, as well as coal-cutters of both bar and chain types. The power house electrical equipment was supplied by the General Electric Co., of Witton and 67 Queen Victoria Street, London, E.C. Acknowledgments are due to Mr. H. O. Bishop, the Agent and Manager of the Manners Colliery, for the facilities given for taking the photographs, and for permission to publish this description. Mr. W. C. Mountain was the consulting electrical engineer to the colliery for the erection of this plant.

## ELECTRICAL WINDING EQUIPMENT FOR THE RAND

WE learn that the important order for the electrical equipment of the large winding engine for the Rand, referred to in *ELECTRICAL ENGINEERING*, November 13th, page 638, as being made by Messrs. Fullerton, Hodgart & Barclay, has been placed direct by the purchasers, Messrs. The East Rand Proprietary Mines Co., Ltd., with Messrs. The British Westinghouse Electric & Mfg. Co., Ltd. (Trafford Park, Manchester). The winder is capable of raising 8 tons of ore from a vertical depth of 4,500 ft. at a speed of from 2,200 to 2,500 ft. per minute. The electrical equipment comprises two 1,500-B.H.P. 550-volt 33.4-r.p.m. continuous-current motors direct-coupled to the winding drum one on either side. These are supplied with current from a motor-generator set working on the Ward Leonard system, and comprising a 4,200-B.H.P. three-phase 25-cycle 3,000-volt A.C. motor direct-coupled to two 1,375-kw. 550-volt D.C. generators with a direct-coupled exciter for the generators and the winding motors. All the necessary control gear and switchgear are also being provided by the electrical contractors.

Thirty-five other similar installations, comparable in size with the above, have been supplied by the British Westinghouse Electric and Manufacturing Co., Ltd., of which the following are a few examples. Six equipments for the Village Deep and City Deep of the Rand Mines, Ltd., the winding motor for each equipment being of 3,400 maximum b.h.p. Three equipments for the Brakpan Mines, of the Consolidated Mines Selection Co., Ltd., the winding motor for each equipment being rated at 3,000 maximum b.h.p. One equipment for the Great Western Colliery Co., Ltd., South Wales, England, with two winding motors capable of a maximum of over 1,800 b.h.p. each.

**Branch Meetings of the Association of Mining Electrical Engineers.**—At a meeting of the East of Scotland Branch at Dunfermline on November 14th, a Paper by Mr. C. C. Reid, of Cowdenbeath, on the repair and general maintenance of electrical plant in collieries, was read. The author complained that insufficient attention was paid to this department in many collieries, and recommended that a proper electrical stores department should be kept in connection with each colliery, and be under the control of an individual who would be responsible for the stock of spare parts, &c. Proper inquiry should be made into all the breakages of electrical material, and a register should be kept for each motor at the colliery, in which particulars should be systematically entered of each repair and breakdown. A meeting of the West of Scotland Branch was held on the following day at Glasgow, when Mr. J. P. C. Kivlen gave some valuable hints on specification and buying of mining electrical plant.

At a meeting of the Notts and Derby Branch at Chesterfield on Saturday last, certificates were awarded to Messrs. T. H. Williams and E. Barks, and a number of new members were elected. A discussion then took place on Mr. E. Kilburn Scott's Paper on large prime movers and boilers for power houses, originally read before the London Branch. A joint meeting of the Notts and Derby Branch of the Association and the Midland Branch of the Association of Colliery Managers is to be held shortly to discuss the new electrical mining regulations.

The Yorkshire Branch held a meeting at New Monkton Collieries, Royston, last Saturday, when an inspection was made of the surface plant, including the electrical power station, and Mr. J. Bentham, of Sharlstone Collieries, gave a lecture on electrical plant in collieries generally.

**Colliery Electrician Fined.**—George Williamson, colliery electrician, has just been fined 5s. and 16s. 6d. costs for failing to protect some lampholders in accordance with Rule 127 of the Home Office Mining Regulations.

## ELECTRICITY IN MINES

A RECENT paper presented to the American Institute of Electrical Engineers by Mr. H. H. Clark deals with safeguarding the use of electricity in mines. The author points out that, as compared with electrical installations above ground, those underground are temporary in character, and much portable apparatus is used. This condition increases the natural difficulties of maintaining underground electrical equipment in an absolutely safe condition, but in the opinion of the author one of the most influential factors in delaying improvement in underground electrical conditions is the fact that the electrical dangers contribute only a small percentage to the annual death-rate in mines. In the first eight months of 1912 less than three of the men killed in coal mines in the United States met their death as the result of electrical causes. If no other fatal accidents had occurred effective measures to improve the electrical conditions underground would, no doubt, says the author, have been immediately taken. In the category of "electrical equipment that promotes safety" the author places telephones, miner's electric safety lamps, electrical shot-firing, and storage-battery locomotives. The developments of electric safety lamps is only just beginning in the United States, and so far no device has been fully developed and standardised for insuring absolute freedom from gas ignition, but this will no doubt soon be accomplished, so that this type of lamp may become safer than the ordinary safety lamp, as the parts of the latter may be improperly arranged and ignition of gas occur as the result. This has happened on several occasions. The greatest benefits, however, will be had in those mines where the electric lamp supplants the open flame lamp. Shot-firing by properly designed and operated equipment is safer than fuses or other devices that ignite explosives by means of sparks or flames. Finally, the author says that although main line haulage by storage battery locomotives can hardly be advocated at present, the gathering of coal by storage battery locomotives seems, in many instances, to be a feasible proposition. The use of storage battery locomotives would entirely do away with the trolley wire from a large part of the mine entries that are now provided with this dangerous equipment. In addition to the greater degree of safety assured, storage battery locomotives would be more flexible to operate than are cable reel locomotives. The load factor on the generating station would be materially improved, satisfactory voltage regulation of the distributing system could be obtained with less copper, and the expense of installing and maintaining trolley wire and rail bonding would be eliminated in the entries worked by storage battery locomotives.

Mr. F. B. Crosby, in a Paper entitled "Alternating-Current Motors for the Economic Operation of Mine Fans," deals with the seven chief ways of obtaining variable speeds, including (1) constant-speed motors with changeable pulleys; (2) variable-speed motors with rheostatic control; (3) multi-speed windings; (4) concatenation or cascade connections; (5) single cascade motors; (6) dynamic regulation, and (7) brush-shifting motors. Of these the first is described as a make-shift method, while the second, as is well known, has a low overall efficiency. Multi-speed windings for a two to one ratio, the cost of such a motor is only slightly more than that for a single-speed motor, may be used, but for three or four constant speeds, the condition can sometimes be effectively met by two separate windings in the same slots, one or both being arranged for external multi-polar grouping. Three separate windings are not permissible in practical design. Such motors are, however, sometimes used with or without changeable pulleys and rheostatic control.

With regard to the cascade connection, the efficiency remains approximately constant, provided there is no external resistance in the rotor circuit of the second motor, while at the lower speed, the power factor drops, due to the fact that as compared with their normal individual ratings the motors are underloaded when in cascade. With the single cascade motor the stator winding is of the usual full and

half-speed type. The single rotor winding is so arranged that its magnetising effect is the same as would be produced by two separate windings, but all coils which would neutralise each other are omitted in the cascade connection and grouped together for connection to the slip rings for use only at other speeds. When the primary of the first element is properly connected with two circuits per phase in multiple corresponding to the number of poles, these circuits are in exact opposition for the number of poles in the second element, and form a perfect path for short circuiting the secondary of the second element. The stator winding, therefore, carries two currents simultaneously (1) a current from the line at full frequency, and (2) an induced current at a frequency corresponding to the slip. By inserting a variable external resistance between certain points in the stator windings and open-circuiting the collector rings, variable speed control can be obtained for the concatenated connection. Resistance across the collector rings gives ordinary variable speed characteristics for the other two speeds. This type of motor is particularly adapted to the three speeds corresponding to the polar ratios 1, 2 and 3, for example, 4-8-12, &c.

By means of the sixth method shunt speed characteristics can be obtained from standard polyphase induction motors, giving at the same time high-power factor and efficiency throughout the entire speed range. In one way of carrying out this method a compensated commutator motor taking its power from the rotor of the main motor is direct-coupled to a squirrel-cage induction motor connected to the mains, and drives the latter slightly above synchronism and returns energy to the lines depending on the slip of the main motor. Assuming that the main motor is to drive a fan at 50 per cent. of synchronous speed, the horse-power delivered to the fan will be approximately 12.5 per cent. of the rated capacity of the motor, and the same amount of energy will be delivered to the regulating set.

If the connected load required constant horse-power at the motor shaft, then, neglecting losses, the motor input at 50 per cent. speed would be 200 per cent., the shaft horse-power 100 per cent., and the energy returned to the system 100 per cent. If the load required constant torque at the motor shaft, then, neglecting the losses, the motor input would be 100 per cent., the shaft output 50 per cent., and 50 per cent. would be returned to the system. In a modified connection the commutator motor is direct-coupled to the main motor shaft. In this case the slip energy of the main motor is transformed into mechanical energy, and the torques exerted by the two motors are added, thus constant horse-power is maintained at the shaft. For fan service, however, the high-speed self-contained regulating set, says the author, is usually cheaper and yields equally satisfactory results. Also the set may often be applied to any standard induction motor with phase-wound rotor in the event of future rearrangement. The method can be applied so as to give a power-factor correction to the system if required. To start up the induction generator is thrown on to the line through an auto-transformer, and brought up to speed as an ordinary induction motor. The main motor may be started by closing the primary circuit and accelerated by automatic current timing control. Speed adjustments may be made by altering the exciter field rheostat. The range of speed regulation obtained is limited by the maximum frequency impressed on the commutator motor. In general for good design this should not exceed approximately 20 cycles, which will give about 30 per cent. regulation on a 60-cycle motor. This limit varies somewhat with the size of motor involved.

For fan installations requiring motors up to 100 horse-power capacity, in place of the regulating sets described the brush-shifting polyphase motor can often be employed to advantage. Motors can be obtained to give stable operation at speeds corresponding to about 70 per cent. below synchronism. The author thinks that in the absence of any direct-current system, the advantages of the polyphase motor leave small ground for the application of the D.C. motor for either constant or adjustable speed fan-drive.

## HOOPER'S

Telegraph and Indiarubber Works, London.

31, LOMBARD ST., E.C.

(Established 1860.)

MILLWALL DOCKS,

LONDON, E.

Hooper's Vulcanised Indiarubber Cables  
for Electrical Work

maintain the highest quality, and their durability has been proved.

PURE TAPE AND STRIP, etc.

Telegrams: "Linear, London,"

Telephone Nos. 1169 Ave. 84 East.

## ELECTRICAL MINING AND METALLURGICAL PATENTS OF NOVEMBER

THE following Specifications, which have been published by the Patent Office during November, are of particular interest to mining electrical engineers:—

For the regulation of distributing systems subject to large load fluctuations, such as supply systems for winding engines and rolling mills, Patent No. 25,286/12, by the B.T.-H. Co. and C. McCarthy-Jones, provides for a motor-generator and battery in parallel, and a regulator to vary the field strengths of both machines in the set in accordance with the load, so as to cause the motor-generator set to feed the battery or the mains to equalise the load. This is effected by a Tirrill regulator set to vary the field strength of a booster in either sense, according to the load conditions, so that the field strength of one machine is increased, and of the other decreased. In Specification No. 9,682/13, J. O. Thomson describes a signalling circuit for mines where the engine-man awaits signals from both top and bottom of the shaft before he commences winding. A bell circuit comprises, also, an electro-magnet with movable armature, and a star-wheel which is made to operate a visual indicator through another circuit when moved by the armature. The visual indicator is restored to its normal position by a switch. In No. 11,166/13 R. Nelson describes a visual signalling system operated separately from the usual code signals. The level to which it is desired to lower the cage is signalled to the engine-man, and an indication is given at the bottom of the shaft that the cage is about to be used. The gate at the level where the cage stops is unlocked by the engine-man from the engine-house, and when the gate is opened this is indicated to the engine-man. In specification No. 12,813/13, Elektrotechnische Fabrik Schaffler & Co., of Vienna, describes a shot firer in which the rotary handle or lever driving attachment has the driving mechanism so supported as normally to cause the driving axis of the machine to assume an inclined position. In specification No. 14,870/13, Cahucitwerke Nürnberg, of Nuremberg, describes a shot firer in which the driving wheel is keyed directly upon the armature spindle, while the transmitting device is in the form of an extensible helical spring or a cord which is retained in secure engagement with the driving wheel by means of a guide casing.

The following Specifications contain matter of interest to electrometallurgists:—

In No. 21,560/12, T. H. Holroyd describes a motor-driven smelting furnace comprising a wheeled carriage or bed, a cradle mounted on it so that it can be tilted on a vertical plane, and a furnace in the cradle so arranged that it can be revolved. In No. 12,444/13, Cie pour le Traitement des Métaux et des Minerais par l'Electricité, of Seine, France, describes a resistance furnace for the treatment of zinc ores. There are two resistances. The principal one consists of granulated carbon kept in constant shape by pressure, and the secondary resistance is constituted by hollow blocks within which are placed the retorts resting on the principal resistance. The secondary resistance, in parallel with the first, is brought up to the required temperature mainly by thermal conductivity. Its chief objects are to exercise a pressure on the principal resistance and to distribute equally

the heat on to the entire surface of the retorts. The leading-in cables are attached to metal plates in the columns of carbon granules. In No. 12,837/13, Soc. Générale des Nitrures sets out a construction for resistance furnaces in which the resistance element is made up of sector-shaped bricks arranged in alternation or bonding, and maintained by wedging. This is effected by external clamping of the extreme elements, and if necessary at certain intermediate points. The bricks are perforated along their longitudinal axis. The cavity thus formed is filled with badly conducting material. The bricks may also be grooved for this purpose. The complete resistances are used to form the interior wall of cylindrical furnaces. According to M. Perreux-Lloyd's specification No. 6,897/13, copper is produced by the electrolysis of impure copper ores, charged with sulphurous acid, with a rotary cathode and anode of perforated lead or carbon. The anode is horizontal and the anode envelops the cathode so that local couples capable of decomposing the water and depositing black copper sulphide on the cathode are prevented. By keeping the electrodes absolutely parallel, rotating the cathode and agitating the electrolyte a current density of 400-500 amperes per sq. metre can be used. The detrimental action of ferric salts thus becomes negligible.

An arrangement for the automatic regulation of machines for multiple wire drawing, or for cold rolling, having several simultaneous passes, is described by Soc. Anon. des Forges et Acieries de Huta-Bankowa, of Paris, in specification No. 10,901/13. Each driving drum, roller or reel, or each pair of rolls, is driven by a motor whose speed varies inversely as the load. Thus the material being worked affects the speed regulation without binding or slipping.

In specification No. 25,195/12, J. T. Pollard and R. Emmott describe a magnetic separator in which a series of longitudinal soft iron bars are supported at equal distances in a circle by pieces of wood. Thus, when secured, a hollow cage or tube is formed. Near the energising magnets is a stationary ring embracing a portion of the separator, and interrupted at the upper end for a short interval so as to leave a gap, below which is a tray. In No. 8,485/13, H. J. H. Nathorst claims a separator in which the drum is formed of thick iron plate without interruptions, and rotates about a shaft, not partaking in the rotation but rotatable, and forming the fastening of the electromagnets, which are thus adapted to be easily adjusted by means of the shaft. In No. 6,336/13, J. Kraus and E. Oppen describe an electrostatic separator in which the particles are separated by a permanently charged surface. The particles are carried away by a movable dielectric arranged between the attracting surface and the particles.

For instructions on Cleaning and Polishing Electrical Fittings and Electric Cookers, read

### CANNING'S HANDBOOK ON

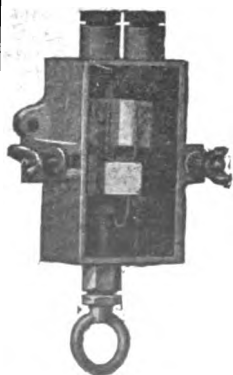
### POLISHING, ELECTRO-PLATING & LACQUERING.

Fully Illustrated. Price 2s. 3d. post free. Abroad, 2s. 6d.

W. CANNING & CO., BIRMINGHAM.

LONDON: 18/20, ST. JOHN'S SQ., CLERKENWELL, E.C.

MENTION BOOK 224

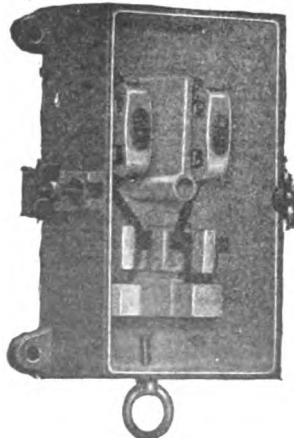


## IRONCASED SWITCHES.

M TYPE. FOR LIGHTING.  
For Workshops, Collieries,  
and exposed situations.

STRONG & COMPACT.

(LIST ON APPLICATION.)



## DORMAN AND SMITH,

Ordsal  
Electrical  
Works,  
SALFORD,

## MANCHESTER.





## METAL FILAMENT LAMP PATENTS

**O**PPPOSITION has just been entered to the grant of two patents relating to metal filament lamps. The specifications were published on October 2nd, and summarised in *ELECTRICAL ENGINEERING* of October 9th, p. 572. They are No. 13,282/12, for the manufacture of ductile masses of tungsten, by P. Schwarzkopf, S. Burgstaller, and Wolfram-Laboratorium Dr. P. Ing. Schwarzkopf Ges.; and No. 12,753/13, for filament supports, by Wolfram-Lampen Akt.-Ges. The opposition to the grant of patent No. 13,282/12 is entered by C. Gladitz & Duram, Ltd., by the Osram Lamp Works, Ltd., and by the British Thomson-Houston Co., Ltd. The opposition to No. 12,753/13 is by the Brimsdown Lamp Works, Ltd.

Patent No. 13,282/12 was applied for on June 5th, 1912, and is for producing a mass of tungsten, molybdenum, &c., of uniformly small crystals suitable for drawing into wires for metal filament lamps. The process consists in the reduction of the oxides of the metals by carbon after they have been consolidated by pressure in moulds. These oxides should be in the form of a fine-grain powder, each particle of which contains a lower proportion of oxygen than the lowest oxide of the particular metal. Sintering is effected at the same time as the reduction by the use of an adjustable current of hydrogen. The rate of removal of the oxygen, in order to regulate the size of the crystals produced, is varied by the addition of an adjustable quantity of an indifferent gas, so that the partial pressure of the oxygen is regulated. At the same time, the rate of flow of the reducing gas and the rate of travel of the pressed material, as well as the temperature, may be regulated. Furthermore, a metal or compound which is not decomposed at the temperature to which the finished body is to be submitted may be added to the pressed material. The action of the added metal (uranium is suggested) is to lower the vapour pressure without substantially lowering the melting-point of the main metal.

The Osram Lamp Works and the B. T.-H. Co. claim that the patent was anticipated by Patent No. 8,031 of April 2nd, 1910, applied for by the B. T.-H. Co. on behalf of the G. E. Co. of America. The claims are for a conductor of ductile metallic tungsten which retains its ductility after prolonged heating. A coarse powder of pure tungstic oxide is reduced by heating the containing vessel in a current of hydrogen for 5 to 15 hours or longer to 1,100° C.-1,400° C. The powder may previously be heated to 1,000° C. for about five hours. Also the powder may be pressed in reinforced steel moulds, and then heated in hydrogen for 10 to 60 mins. to about 1,200° C., so as to produce rods which are heated in a vacuum or in hydrogen to an intense white heat for about 30 mins. The heating may be effected by passing a current through the rods—usually 1,400 amperes for 15 mins., then 1,700 amperes for 15 mins., and then reducing it by about 200 amperes per min. to zero. The rods are then worked, and the surface impurities removed by heating to about 1,000° C. It is also contended that the invention is not sufficiently or clearly described.

C. Gladitz and Duram, Ltd., contend that there is anticipation by Patent No. 12,244 of May 23rd, 1912, taken out by G. Gladitz. This patent describes a construction of press moulds, which permits of pressing the bar in such a way as to avoid the possibility of cracking. The tungsten powder used is of a fluffy character, and the press mould simultaneously and instantaneously releases the compressed bar in all three directions, so that it can expand unrestrictedly.

In its opposition to the grant of Patent No. 12,753/13 to Wolfram-Lampen A.-G., the Brimsdown Lamp Works, Ltd., cites 16 patents as being anticipatory. The patent itself describes filament supports made from about 98 per cent. of oxide of tungsten, and 2 per cent. of thorium oxide. The mixture is reduced in hydrogen, and worked in the usual way to produce a pliant wire. The supports have almost as high a fusing temperature as the filaments, so that fritting or fusing together does not take place. The patents cited as anticipations are Nos. 21,430/93 by C. J. P. Robertson (Robertson's Lamp Works, Ltd.); 28,154/04, 15,462/05, and 5,129/06 by H. Kuzel; 8,499/06 by Deutsche Gaslühlicht A.-G. (Auerger); 18,812/06 by A. Lederer; 24,233/06 and 1,196/07, communicated to the B. T.-H. Co. by the A.E.G.; 20,227/07, communicated to the B. T.-H. Co. by the G. E. Co. of America; 27,710/10 by Lichtwerke G.m.b.H.; 18,467/11 by W. D. Coolidge; 5,026/12, 5,027/12, and 5,028/12, communicated to J. Hubers by Julius Pintsch A.G. The claims in No. 24,233/06 by the B. T.-H. Co. (communicated by the A.E.G.) are for filament supports composed wholly of or having a surface coating consisting of thorium or magnesium oxide containing not more than 2 per cent. of impurities. The holder, after being moulded, is heated to at least 2,000° C., and then chemically treated. The claim in No. 27,710/10 by Lichtwerke G.m.b.H. is for an elastic filament support made of an alloy of molybdenum with a small quantity of a highly infusible brittle metal such as chromium, tungsten, titanium, or vanadium.

**Electric Baths.**—The recommendation that the L.C.C. should apply next session for powers to control electric baths establishments, referred to on page 630 of our issue for November 13th, has been adopted by the Council.

## OBITUARY

**W**E announced briefly last week the death of Mr. James Howden, Chairman of James Howden & Co., engineers and boiler-makers, of Glasgow. Mr. Howden, in his eighty-

second year, succumbed on November 21st to the effects of an operation. A native of Prestonpans, he began his career as an apprentice in the works of James Gray & Co., makers of blowing engines, Glasgow, where he became chief draughtsman. He worked for a time in the office of Bell & Miller, civil engineers, and with Mr. R. Griffiths, well known for work in connection with screw propellers. In 1854 Mr. Howden started for himself, and turned his attention to rivet-making machinery, marine engines, boilers, &c., making many improvements. The old works in Scotland was started in 1862 and was moved to a larger site in the same street in 1871.



JAMES HOWDEN.

From that date onward marine engines and boilers were made for the leading steamship lines, and the Howden hot air forced draught system was developed, and ultimately attracted such a volume of business that the manufacture of marine engines was discontinued. It was in 1900 that Mr. Howden turned his attention to the building of high-speed reciprocating engines for dynamo driving, of which very many were sold. Recognising, however, that the steam turbine would soon take the principal place for high powers, he took up the manufacture of the Zoelly type of turbine, and it is interesting to note that at the time of his death his Company was completing their fourth turbine order for the Manchester Corporation, involving a unit of 80,000 h.p. One of the latest developments of the firm is a branch establishment at Govan for the manufacture of a new water-tube boiler. Associated with him in the management of the business Mr. Howden had his nephew, Mr. J. Howden Hume, and his son, Mr. W. H. Howden. The late Mr. Howden was a member of many engineering societies, to which he contributed a variety of Papers. A man of high moral principle and uncompromising attitude to anything which savoured of expediency or policy which he considered in the slightest degree below his own high standard of rectitude, he had a kindly nature which made him a friend to be desired while an opponent to be feared.

**New Street Lamps in Marylebone.**—We are requested to state that the new street lamp-posts at Baker Street Circus, described and illustrated in last week's *ELECTRICAL ENGINEERING*, page 661, were supplied by the Electric Street Lighting Apparatus Co., of 11 Victoria Street, S.W., to the designs of Mr. Haydn Harrison.

**Finsbury Technical College O.S.A. Annual Dinner.**—The eighth annual dinner of the Finsbury Technical College Old Students' Association was held at the Trocadero Restaurant on November 15th, when a large number were present. Included were Capt. H. Riall Sankey, Professor S. P. Thompson, Professor E. G. Coker, Dr. G. T. Moody, and others. The O.S.A. Bronze Medal for the best Paper read during the session 1912-13 before any recognised engineering or scientific society was awarded to Mr. E. Kilburn Scott for his Paper on "Electric Cables for Shafts in Mines" (*ELECTRICAL ENGINEERING*, March 6th, p. 129).

**Municipal Purchase of Supply Companies.**—A number of corporations are promoting Bills in the next session of Parliament to purchase the electric supply companies operating either in the whole or portions of their areas. Perhaps the most important scheme is the proposal of the Manchester Corporation to purchase the Trafford Park Power Supply, Ltd., although at present the Trafford Park Council is opposed to the proposition. The Leeds Corporation also desires to purchase the Roundhay Electric Supply Co., which supplies in a small portion of the Leeds district, and in this instance there is some difference of opinion among the members of the Council as to the wisdom of the suggestion. The Chiswick Corporation has also given notice of its intention to seek powers to purchase the Chiswick Electricity Supply Co.

## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,368.

I am putting in motor drives in a sawmill, and should be glad of an idea of the sizes of motors required. One is to drive countershafting with five circular saws on (all push benches without power feed), one 48-in. saw, three 36-in. saws, and one 40-in. saw; and the other to drive two horizontal frame saws and friction hauling gear. The motors will be for continuous current and are to run at about 800 r.p.m.—F. H. G.

(Replies must be received not later than first post, Thursday, Dec. 11th.)

### ANSWERS TO No. 1,365.

When a turbine is running, what are the indications of trouble with the blading?—J. O.

The first award (10s.) is given to "L. F." for the following reply:—

Usually the first indication of blade trouble with a turbine is an increase in steam consumption with a given load. If by any chance some of the blades become damaged, the steam leaks through the gaps in the blading, causing a higher steam consumption with decreased output. If the guaranteed steam consumption is known, any increase should be carefully noted, and after being certain that the condensing plant is in good order, and that vacuum is good together with proper superheat, a test should be arranged as soon as possible on a steady load, and if with all other conditions correct the steam consumption has increased, then the turbine case should be lifted to ascertain the cause. If there is any part rubbing inside, it can be detected by holding the end of a spanner to the ear, with the other end against the turbine case. This test will also reveal the presence of water, a thing which is likely to be fatal to the blades if allowed to collect while the turbine is standing and not properly drained off before starting up.

The second award (5s.) is given to W. H., who writes as follows:—

One of the indications of blade trouble would be vibration of the turbine; it would be impossible to tell, however, whether this was due to some other unbalancing effect, so further tests would have to be applied.

There would be a pronounced hum due to the loosening of the blades, if this were the trouble, and blade trouble of any kind would result in a considerable increase in steam consumption together with a tendency to fall away in speed on high loads or overloads. Serious blade trouble caused by loosening of the blades may also make its presence felt by wrecking the turbine, or at any rate stripping the remainder of the blades.

Neither of these replies are really complete. The signs of trouble that should be mentioned are rise in steam pressure at intermediate stages, increased steam consumption, noise and vibration.

### ANSWERS TO CORRESPONDENTS

H. J. F.—(A) 4.5 volts. (B) 1.5 volts. (C) The capacity in ampere hours will depend on the size of the cell.

## STUDENTS' "RAG" IN A SUB-STATION

THE two students who were involved in the attempt to switch off the electric light in the Albert Hall on the occasion of a meeting addressed by the notorious James Larkin, as reported in our issue for November 27th, page 665, were again before the Westminster magistrate on Friday. When the case came on, Mr. Dutton, on behalf of the Kensington & Knightsbridge Electric Lighting Co., said that, having considered the position, the Company was prepared, with the magistrate's consent, to withdraw the charge. The two defendants, he said, were young men who were struggling to pass through their examinations, and it was not desired to do anything now which would in any way interfere with their future career. It was clear that the mob of which they admittedly formed a part had not premeditated doing damage to the sub-station, notwithstanding the fact that damage to the extent of £22 9s. was done. This, however, the parents of the defendants were prepared to make good.

On behalf of the defendant Macallum, it was stated that he is an engineering student, and that his version of the affair was that he found himself forced into the sub-station with the crowd, and, being the last one to get out again, the authorities were able to detain him. The sole intention of the students, said his solicitor, had been to go to the Albert Hall to sing "God Save the King," as they objected to a man like Larkin going round the country "damning the Empire" as he had done. Loyalty, added the solicitor, had not yet been held to be an actionable offence.

Mr. Horace Smith (the magistrate) said he thought the decision of the Electric Lighting Co. was a happy and reasonable termination, and the defendants should consider themselves very fortunate in escaping in the manner they had done. He could not refrain from remarking, however, that there had in this instance been folly so great as to amount to positive wickedness. On the understanding that the amount of damage and costs would be paid, he discharged the defendants.

**Cable Explosions with Bitumen.**—The Board of Trade have appointed Sir T. Edward Thorpe, C.B., F.R.S. (Chairman); Mr. Robert Nelson, of the Home Office; Mr. W. Slingo, of the General Post Office; Mr. James Swinburne, F.R.S., and Mr. Alexander P. Trotter, of the Board of Trade, to be a Committee to consider the causes of explosions which have occurred in connection with the use of bitumen in laying electric cables, and to report as to any steps which should be taken to prevent explosions in future from the use of bitumen or similar substances. Mr. M. J. Collins, of the Board of Trade, will act as Secretary to the Committee.

**The Motor-cycle Exhibition.**—At the recent Motor-cycle Exhibition at Olympia, there was on view the first make of motor-cycle to be fitted with electric starter and complete electric lighting equipment and horn. The machine is the "Indian." A variable speed self-regulating four-pole dynamo is used in conjunction with two sets of accumulators connected for charging at 7 volts and for starting at 12 volts. The capacity is given as 70 and 35 ampere-hours respectively. When used as a motor for starting, the h.p. rating is given as 1.5. As a dynamo it begins to charge at 12 m.p.h. on high gear, and 8 m.p.h. on low gear. The maximum is reached at 16 m.p.h. on high and 12 m.p.h. on low gear. The charging is regulated by an external regulator and circuit breaker. The accumulators are contained in a case fixed to the frame under the saddle, and are used in conjunction with coils for the ignition. The lighting equipment may be obtained without the starter. Another lighting set was shown on the Motosacoché, but this was not so complete. A larger number of electrical accessories than usual was also on view at the stands in the gallery.

**The Research Committee of the Institution of Electrical Engineers.**—Arrangements are being made by the Research Committee for the investigation of the properties of tungsten and other magnet steels, the effect of heat treatment and other matters of importance in the manufacture of permanent magnets. Other subjects of investigation which are to be taken in hand are the chemical and physical properties of insulating oils, and the determination of the temperature rise in, and the permissible current density for, buried cables. These announcements are made in the issue of the Journal of the Institution of Electrical Engineers for December 1st, which also contains the full text of Mr. Duddell's inaugural address on pressure rises, illustrated by diagrams, abstracts of the Chairman's addresses at six local sections, and the Papers by Mr. S. H. Holden on standard meter specifications, and by Mr. H. H. Perry on a new tariff system.

**The Batti-Wallahs Journal.**—The quarterly journal of this energetic society contains interesting accounts of a week's sailing barge trip and a visit to the *Olympic* at Southampton by parties of members. These and other personal notes make it very evident that the society is flourishing, and that its members enjoy life.

**"INCHING"  
CAN'T  
INJURE!**

**SPECIFY**

**'IGRANIC'**

**STARTERS WITH  
PATENT "ARC PREVENTING"  
INTERLOCK.**

**IGRANIC ELECTRIC Co. Ltd.  
LONDON and BEDFORD.**

### ELECTRIC TRACTION NOTES

It is stated that the Kearney High Speed Railway Co., which had intended to apply for Parliamentary powers to construct a tube railway on this system to the Crystal Palace, has abandoned the idea, first because the Company has been invited to prepare estimates for a short length of line in one of the large provincial towns, and secondly because the Baker Street & Waterloo Railway Co. intends to apply for powers to run to the Crystal Palace, it being felt that this latter will seriously infringe the prospects of the Kearney Co. before its system has been fully demonstrated.

The York Corporation is considering the use of trailer cars to meet the rush-hour traffic.

The Baker Street and Waterloo Railway terminus at Baker Street has now been connected up with the Paddington terminus of the Great Western Railway. The interesting feature about the extension is the provision at Paddington of what is claimed to be the largest escalator in use. This consists of two moving staircases and one stationary, the moving ones having a carrying capacity of 10,800 people per hour each. The equipment is such that for dealing with rush traffic in any one direction, the second staircase can be reversed so that 40,000 persons can be moved in one direction. The Superintendent of the London Electric Railway Co. is credited with the statement that the Company will not erect any more lifts at new stations.

The Irish Local Government Board a short time ago surcharged the sum of £2,800 distributed among the Belfast tramway employees under a profit-sharing scheme. Strong protest was made, and the Board has now decided to remit the surcharge, stating that it was made in such circumstances as to make remission fair and equitable.

### TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

Some interesting trials are being made by the British and German Post Offices in connection with telephony between London and Cologne through the Anglo-Belgian cable. Speech has also been transmitted between London and Berlin. In these trials use has been made of the S. G. Brown and also the Lieben Reisz telephone relays. We hope to return to this subject in an early issue.

The Hull Corporation shares with the Portsmouth Corporation the distinction of possessing the only two municipal telephone systems in this country, but whereas the Portsmouth licence expires in 1926, the Hull licence expired on December 31st, 1911, simultaneously with the expiry of the National Telephone Company's licence. Since then negotiations have been proceeding with the Postmaster-General as to the future of the Hull municipal service, and an exceedingly strong feeling exists in the town that the Corporation should continue. These negotiations have at last culminated in an offer from the Postmaster-General to sell to the Hull Corporation the present Post Office system there, recently acquired from the National Telephone Co. The terms of the purchase are the payment of the sum of £192,423, the figure at which the undertaking was acquired from the National Telephone Co., at the same time granting the Corporation a new licence for 21 years. The Corporation is also to have a free hand in fixing rates. The outstanding feature of the Hull system has been the low charges made, which, of course, would be increased if the Post Office took over the municipal system. The Telephone Committee has been very seriously considering this offer from the Postmaster-General, and has decided to recommend the Corporation to accept it. The result would be some slight increases in the rates, which, however, will not be so great as if the Post Office took over the municipal system, and taking into account these increased charges it is estimated that after paying capital charges on

the purchase price there will be a profit of £5,330 per annum. A point which the Committee make much of in the recommendation is that the National Telephone Co. was, by the municipal competition, forced to keep its equipment in first-class condition, probably, it is suggested, in better condition than in any other town.

The development of wireless apparatus, and the arrangement of circuits, was dealt with by Mr. J. St. Vincent Plette, A.C.G.I. (Chief of the Patents Department, Marconi's Wireless Telegraph Co., Ltd.), in his fourth lecture at the City & Guilds (Engineering) College, on Thursday last. With the advent of larger powers, he explained, the question of sparking at the signalling key became very important. The difficulties were reduced by shunting the key and break with condensers, and by the use of the magnetic key in which there are two sets of contacts. The current to be broken passes round an iron core which has a vibrating armature and make-and-break contact, with the signalling contacts in parallel; thus the break always occurs at minimum current. The signals were slightly prolonged, but it was found that little difference was experienced in practice in the rate of signalling. At the present time still greater powers are necessary, and magnetic blow-out keys and revolving disc dischargers are used. The well-known skin effects with high frequency currents are particularly noticeable in wireless apparatus. For straight conductors a plank coated with zinc forms a good and cheap conductor. For the primary coils of jigger transformers, however, a number of small wires, generally six, are stranded round a hemp cord. A number of these composite conductors are then wound helically round a circular wooden former of large diameter. It is arranged that there is one complete twist per turn, so that every individual wire takes up every position relatively to the secondary. The primary jigger of the transformer for transatlantic signalling has one-and-a-half turns. As this coil is movable it is seen that the plate form of conductor would not give a uniform distribution of current. Although glass plate condensers take up less space than air condensers, they have their disadvantages, as, should a breakdown occur, they are not self-sealing. The condensers at Clifden are of the air type. The plates, which number 1,820, are each about 12 ft. wide by 80 ft. long. They are suspended from the roof of a building 350 ft. long, at distances about a foot apart. The capacity is 1.8 mfd. The two most used detectors at the present time are the magnetic band detector and the Fleming valve. Crystal detectors are also used to some extent, carborundum being quite common. The greater the difference in structure between the two sides of the crystal, the better will it work. Very often even a piece of hard coal between two spring contacts will give quite good results. With regard to the arrangement of circuits, the addition of a third one between the aerial and the detector enables tuning to be more accurately accomplished, and therefore greater selectivity obtained. By loosening the coupling, the effects of atmospheric disturbances can be reduced, while the strength of the signals is only very slightly impaired. The next lecture will be given to-day at 5 p.m.

The line between Bagdad and Bassora was down for a short while on November 25th, and on the 30th ult. communication with Cassinga (Angola) was again re-established.—The Compagnie Française des Cables Télégraphiques restored the Puerto Plata-Martinique section on the 2nd inst.—The Cape St. Jacques-Pontianak cable failed between Poulo Condore and Pontianak on the 2nd inst.

**An Electric Power Company's Development.**—An interesting feature of the proposed Bills in the next session of Parliament is the notice given by the Yorkshire Electric Power Co. to apply for powers to supply electricity in detail in those districts in its area or where the local authority at present has not an electric lighting provisional order.

**Electric Ambulance Service for London.**—The Metropolitan Asylums Board proposes to incur an expenditure of £18,680 in the establishment of an electric ambulance service throughout its area, similar to that now in use in the City of London. The London County Council is to bear a portion of the expenditure.

## "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

### Specifications Published November 27th, 1913

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

(Names in italics indicate communicators of inventions from abroad.)

22,355/12. **Waterproof Cables.** C. J. BEAVER and E. A. (Glover and Co.) CLAREMONT. The dielectric is surrounded by a conducting material, while outside of this, again, is a thin layer of hygroscopic insulation. By this means small defects in the sheathing can be detected on making the waterproof test. Two figures.

22,488/12. **Ship's Telegraphs.** S. C. ALLISON and A. S. LINDSAY. To record the transmission of messages by ship's telegraph, the deflection of a recording instrument is regulated by different combinations of the cells of a battery and resistances through contacts by a brush worked by the pointer of the telegraph instrument. Two figures.

22,546/12. **Domestic Hot-water Supply.** A. F. BERRY. The heating is effected in the ordinary hot-water tank if it is suitably lagged, or a special tank may be used. Valves are provided so that the coal-fired boiler may be put into use or not. The control is effected by a yielding member, which is first displaced against a stop as the temperature rises, and then liberated, so that it can spring forward and open the switch. A similar contrivance is used to close the switch. By additions a graduated heating may be provided. Two figures.

25,310/12. **Refractory Insulating Material.** B.T.-H. Co. (G.E. Co., U.S.A.). Silica, carbon, and rutile are heated in an electric furnace until reduction takes place. The sublimate is condensed. A mixture consisting of 15 parts silica, 12 carbon, and 20 rutile, treated in a "smothered arc" furnace, is claimed. The sublimate has a flaky, laminated structure, and contains silicon, carbon, oxygen, and titanium. Its apparent density varies from 0.06 to 0.16, and the real density is about 2.56. Two figures.

1,036/13. **Synchronous Running of Cinematograph and Gramophone.** G. W. FORD. A three-pole motor is controlled by a separate commutator. This has a bracket revolving about its axis supporting two brushes; one connects with the outer circuit through its support, spindle, and bearing, while the other is insulated, and has a collecting ring and brush. The commutator is worked by the cinematograph lantern, and the motor works the sound-reproducing instrument. Six figures.

1,340/13. **Incandescent Lamps.** NAAMLOOZE VENNOOTSCHAP PHILIP'S METAAL GLOEILAMPENFABRIEK. To remove the last traces of gas in incandescent metal wire lamps, the filament on the reel is coated with phosphorus or dipped into a bath of liquid containing phosphorus as it is unwound from the reel.

3,057/13. **Ignition.** G. E. HEYL and T. T. BAKER. Separate spark plugs in each cylinder are energised by separate secondary windings, which are themselves energised by a common primary. This constitutes an inductance in an oscillatory circuit energised by an induction coil or high-pressure magneto controlled by the engine. One figure.

6,036/13. **Rectangular Stranded Cable.** A.-G. BROWN, BOVERIE. To minimise the effect of eddy currents in the conductors for heavy-current machinery, the conductor is made up of groups of component conductors. The conductors of each group are intertwined by crankings, and the groups are twisted together by assembling at the cranked places. Six figures.

15,149/13. **Double Pressure Traction.** SIEMENS DYNAMO WORKS, F. LYDALL, and C. E. FAIRBURN. In order to change automatically the connections on a railway or tramway vehicle for working at, say, 1,200 and 600 volts, it is provided that when the vehicle enters a section where the two pressures overlap, the circuits are rearranged by an electromagnetic switch, which is excited from the low-pressure supply in opposition to a spring tending to hold it in the other position. The exciting current is broken by a relay, itself excited from the high-pressure supply. Another relay, excited only by the low-pressure supply, in turn de-energises the high-pressure relay, while an auxiliary high-pressure relay has its circuit closed on the de-energisation of the low-pressure relay. This auxiliary relay then breaks the circuit of the low-pressure relay on being energised. Two figures.

### Specifications Published To-day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free.

Summaries of some of the more important of these patents will appear in our next issue.

**Distributing Systems, Cables and Wires, Insulating Materials.** &c.: B.T.-H. Co., GARTON and WATSON [Regulation] 27,235/12; B.T.-H. Co. (G.E. Co., U.S.A.) [Distributing] 5,961/13; EARL

[Distributing] 9,278/13; METAL JOINTING Co. and HARDEN [Bulkhead fittings for metal sheathed cables] 9,752/13.

**Electrometallurgy and Electrochemistry:** WALLACE and WASSMER [Metals by electrolysis] 18,449/12; LEE and BRAME [Cleaning, electro-plating, and finishing] 26,255/12 and 26,504/12; B.T.-H. Co. (G.E. Co., U.S.A.) [Ozonators] 4,575/13.

**Ignition:** MOORE and AMBROSE SHARDLOW & Co., 3,487/13; NORRS and DODSON, 8,584/13.

**Incandescent Lamps:** ROBIN, 26,186/12; B.T.-H. Co. (A.E.G.) 27,432/12.

**Instruments and Meters:** MASCALL and CHAMBERLAIN & HOOKHAM [Meter counting trains] 16,344/13.

**Switchgear, Fuses, and Fittings:** FROGER [Dynamo pressure regulators] 26,893/12; HIRST and BROOK [Motor controllers] 28,635/12; SMITH [Ceiling roses] 534/13; ELEC. SIGN Co. and DICKSON [Automatic switches] 4,591/13; SOC. ANON. APPAREILLAGE GARDY [Fuses] 4,686/13; HODGSON [Candle fittings] 6,901/13; FROST and WRIGHT [Time switches] 9,881/13; WEISSBERG [Fuses] 11,298/13; FREITAG [Switching for the inside lamps of automobiles] 14,306/13; BLOXAM [Bosh] [Cable sockets] 16,709/13; BOYD and TANNERHILL [Fuse] 19,551/13.

**Telephony and Telegraphy:** SIEMENS BROS. & PETTIGREW [Telephone selectors] 818/13; MARCONI Co. and FRANKLIN [Aerials] 4,514/13.

**Traction:** PEACOCK [Power generators and recuperators for motor-cars] 13,936/13.

**Miscellaneous:** SAUVEUR [Bells, &c.] 26,280/12; RUSHTON [Secondary clocks] 26,309/12; ROSENBERG [Miner's safety lamp] 28,772/12; MAJOR and SMITH, MAJOR & STEVENS [Locks for lift gates] 29,778/12; RIDEAL and EVANS [Use of polarising and depolarising effects on an electric couple for estimating] 1,776/13; MANCHESTER and SPOONER [Primary batteries] 2,693/13; HITZELBERGER and NEW BRITISH EVER-READY Co. [Portable lamps] 13,175/13; SCHON [Heat insulating compound] 14,058/13.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Electrometallurgy:** KELLER [Furnaces] 20,371/13.

**Ignition:** KOPF [Spark plugs] 18,727/13.

### Opposition Entered to Grant of Patents

13,282/12. **Manufacture of Ductile Masses of Tungsten, &c.** P. SCHWARZKOPF, S. BURGSTALLER, and WOLFRAM-LABORATORIUM DR. INBIG P. SCHWARZKOPF. The opposers are C. Gladitz and Duram, Ltd., the Osram Lamp Works, Ltd., and the British Thomson-Houston Co., Ltd. See also page 684.

12,753/13. **Filament Supports.** WOLFRAM LAMPEN A.-G. The use of an alloy of tungsten and thorium is claimed. The opposers are the Brimsdown Lamp Works, Ltd., which cites 16 patents said to anticipate No. 12,753/13. See also page 684.

### Application for Restoration of Lapsed Patent

14,495/06. **Railway Signalling.** W. REID. Application has been made by W. REID and THE AUSTRALIAN SIGNAL CONTROLLER Co. PROPRIETARY, LTD., for restoration of this patent, which has been allowed to lapse. A locking gear is described. Any opposition to the restoration must be made before January 26th, 1914.

### Expired Patents

The following are the more important Patents that have become void through non-payment of renewal fees.

**Arc Lamps:** VERITY's and F. S. WORSLEY [Vertical carbon clutch lamps] 17,621/04.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** O. SCHALLER [Pressure regulation on system supplied from generators running at variable speeds] 16,781/07; FRENCH WESTINGHOUSE Co. and R. BRUN [Control of compound-wound flywheel sets for winding engines, rolling mills, &c.] 16,986/08.

**Dynamos, Motors and Transformers:** C. A. and G. L. PARSONS [Insulating turbo-dynamo commutators] 16,911/08.

**Electrochemistry and Electrometallurgy:** C. M. HALL [Production of alumina from bauxite in electric furnace] 14,572/00.

**Ignition:** I. ZUBALOF [Electromagnetic control] 16,668/03.

**Telephony:** J. E. KINGSBURY (W. E. Co., U.S.A.) [Automatic exchange] 17,209/08.

**Traction:** K. DE KANDÓ [Roller contacts for overhead collectors] 14,367/00.

**Miscellaneous:** W. D. JUDKINS (M. R. Hutchison, U.S.A.) [Vibrating horns] 18,070/06; J. R. CALVERT [Electro-medical appliance] 18,092/06; W. FAIRWEATHER (Brown Hoisting Machinery Co., U.S.A.) [Electrically-driven double-chain grabs] 18,257/06; J. T. SZEK [Primary cells] 18,082/07; L. V. E. RICHARDS [Measuring fabrics] 16,760/08.



POPE  
**'ELASTA'**  
WIRE  
LAMPS

---

## IMPORTANT ANNOUNCEMENT

---

**Q** The issue of a writ is no proof of infringement.

**Q** Pope's will, if necessary, carry their case to the highest courts.

**Q** Pope's, as practical evidence of the value of their indemnity, have set aside a substantial sum for their customers as an

## INDEMNITY TRUST FUND

Full particulars will be sent to any customer on application.

**Q** Pope 'Elasta' British-made Wire Lamps are without question remarkable for their good qualities.

**THE BUYER IS PROTECTED**  
and they  
**INFRINGE NO PATENTS**

---

**POPE'S ELECTRIC LAMP CO., LTD.**

Hythe Road, Willesden, London, N.W.

# Space will Not Allow

READING  
—  
TABLE  
—  
STUDY  
—  
PIANO  
—  
DESK  
LAMP  
—

This is only  
**ONE LAMP**,  
but can be  
adapted to the  
above uses  
and more.

PRICE  
**£1 4s.**

Including  
Flex. Plug, and  
Lamp Adaptor.

us to explain here the numerous advantages and uses of the D.G. Adjustable Reading Lamp. We have therefore compiled a small folder giving illustrations and diagrams of the Lamp, detailing the cleverly constructed Revolving Shade, and the benefits to the eyes derived from its use, the scientifically designed Reflector, etc.

Write or 'phone for a supply of this literature with your name and address overprinted free of charge.

**DRAKE  
AND  
GORHAM  
LIMITED**

**LONDON:** 1, Felix Street, S.E.

(4338, *Hop.*)

**MANCHESTER:** 47, Spring Gardens.  
(3700, *City.*)

**GLASGOW:** 50, Wellington Street.  
(2198, *Argyle.*)

**LIVERPOOL:** 37, School Lane.  
(754, *Royal.*)

## "ELECTRICAL ENGINEERING" TRADE SECTION

— Notes on Tenders Invited and Prospective Business appear on p. 691. —

### CATALOGUES, PAMPHLETS, &c., RECEIVED

**HOLOPHANE.**—Revised price-lists of Holophane fittings for spheres, reflector bowls, semi-indirect bowls, &c., have just been issued by Holophane, Ltd. (12 Carteret Street, Queen Anne's Gate, S.W.). Besides the several fittings for various purposes, there is a good selection of screw and spring clip galleries suitable for the different styles of fitting. Some glassware has also been re-priced. The new prices came into force on Monday last.

*Readers desiring copies of catalogues or pamphlets should apply to the firms in question, referring to the notice in "Electrical Engineering."*

**LAMP HOLDERS.**—A card from the Metallic Seamless Tube Co., Ltd. (Meta House, Corporation Street, Birmingham), brings to notice the company's "Star" high-voltage key-type lamp holder and the pull-chain switch holder now largely used. Reduced prices are now quoted for the "New Model" lamp holder, with insulated dome, introduced some five years ago.

**ELECTRIC SUPPLY ADVERTISING.**—We have received copies of postcards, small folders, &c., from the City of London Electric Lighting Co., Ltd. (1 and 2 Great Winchester Street), calling the attention of consumers to electric heating, ozone air purification, and vacuum cleaning.

**METAL FILAMENT LAMPS.**—A card inscribed "Right in the Public Eye," and bearing a large representation of a human eye, has been sent us. On deflecting a little tab at the side, we found that the iris and pupil of the eye disappeared, and a neat advertisement of Osram lamps was revealed. The back of this card can be overprinted by the General Electric Co. with local contractors' names and addresses.

**MERCURY VAPOUR LAMPS.**—A leaflet from the Westinghouse Cooper Hewitt Co., Ltd. (80 York Road, King's Cross), calls attention to the application of mercury vapour lamps in the textile trades.

### DUST-TIGHT LIQUID STARTERS

A NEW design of liquid starter has recently been manufactured in large quantities by the General Electric Co., of Witton and 69 Queen Victoria Street, London, E.C.,

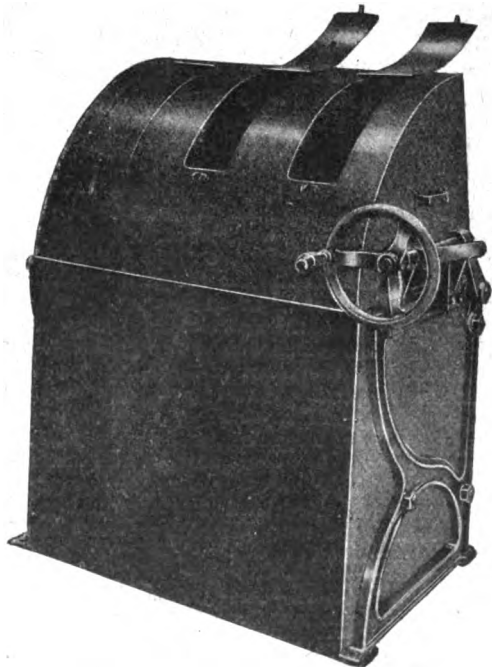


FIG. 1.—400-H.P. LIQUID STARTER.

in connection with a number of complete installations for flour mills, cement works, and other cases where the exclu-

sion of dust is important. In this starter the cast-iron tanks which contain the electrolyte are mounted on a steel framework, the supporting bars being completely covered with moulded micanite. In view of the proximity of moisture, special attention has been paid throughout to the insulating arrangements; indeed, all tie bars that are required for mechanical strength are insulated throughout their whole length. The plates are lowered into the liquid by the rotation of a handwheel. The gearing between the handwheel and the plates is very substantial, and the gear ratio is high. A rapid motion of the handwheel therefore only lowers the plates into the liquid slowly, and it is impossible for the plates to descend by reason of their own weight. For completing the circuit between moving and stationary parts, each phase or pole is provided with heavy contact blocks, in addition to sparking rollers, which protect the contacts in the event of the starter plates being raised while the motor is running without its slip-rings short-circuited. In view of the importance of keeping down the head-room of liquid starters for colliery work, the larger sizes of starters have been designed with two tanks in parallel per phase or

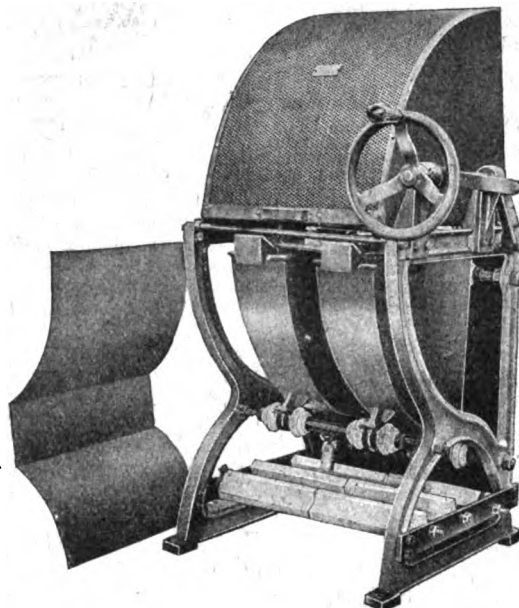



FIG. 2.—CONTINUOUS-CURRENT LIQUID STARTER WITH FIELD DISCHARGE RESISTANCE.

pole, and a considerable reduction in the head-room is thereby effected. The whole of the internal arrangements are thoroughly protected, and enclosed by sheet-steel covers. These covers entirely enclose the starter, rendering it dust-tight, and they afford protection against rough handling. The top cover may have in addition an inspection door on each pole, through which the internal arrangement can be inspected and the tanks filled. For continuous-current work with shunt or compound-wound motors a non-inductive field discharge resistance can be accommodated in the bottom of the starter. These are mounted on porcelain insulators in the fashion shown in Fig. 2. That these starters have filled the demand is evident from the fact that over 5,000 h.p. have been ordered for cement works alone.

**The Electrical Co., Ltd.**—We have received from the Electrical Co., Ltd. (122-124 Charing Cross Road), the following interesting statement of the progress of the machine department of their works:—

	1910-11	1911-12	1912-13
Machines built above $\frac{1}{2}$ h.p.	92,186	118,205	122,452
Total kw. ... ..	1,756,001	1,861,344	1,973,987
Kw. of turbines ... ..	294,017	469,942	559,908
Total kw. ... ..	2,050,018	2,351,286	2,533,895

They also tell us that over 214 gas works are using their electric motors for various operations involved in the production of gas, and that these aggregate 35,000 h.p.



**STREETLITES**

and other Lanterns and Fittings  
are the speciality of the—

**WARDLE** ENG. Co., Ltd., 196, DEANSGATE,  
MANCHESTER.

London: Nathan & Allen, Queen Ann's Chambers, S.W.

### TWO WELL-LIGHTED CINEMATOGRAPH THEATRES

THE British Thomson-Houston Co. (Mazda House, 77 Upper Thames Street, E.C.) claim that the electric lighting schemes of the Carlton Theatre, Tottenham Court Road, and the Balham Palladium, Balham High Road, are representative of all that is best and most up-to-date in cinema equipment, although the systems in use are different. The

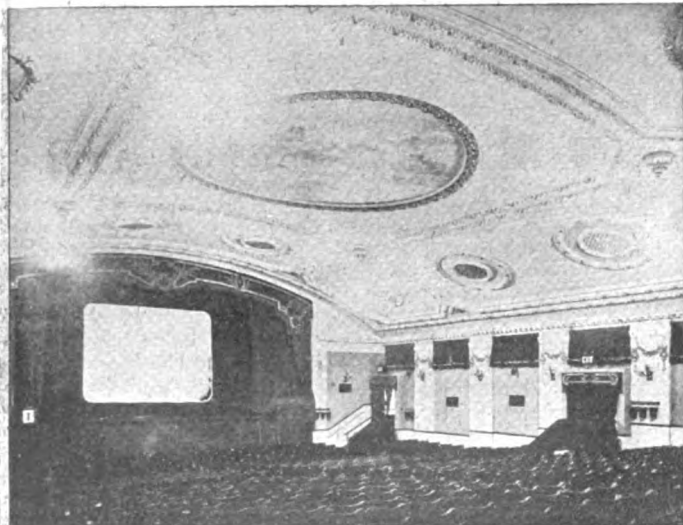


FIG. 1.—CARLTON THEATRE, TOTTENHAM COURT ROAD.

main illumination in the auditorium of the Carlton Theatre is provided by four "Eye-Rest" fittings suspended equidistantly around the central dome, and these are equipped with Mazda "X-ray" reflectors. The bowls are 24 in. in diameter, and are of moulded composition. A part of the raised ornamentation on the bowls is picked out in gold in order to harmonise with the surrounding decorations. In

addition to the indirect lighting, a certain number of direct units are used, but as these are fixed right up against the ceiling (excepting in the case of the gangway lights), they do not cause any discomfort to the eyes of the audience.

The Balham Palladium lighting is carried out on a different system, which has not hitherto been employed very largely in cinemas. Direct diffused lighting is employed. Four beautiful fittings specially designed for the purpose, each equipped with a central 16-in. Alba glass sphere and four 6-in. Alba balls, are suspended from the four corners of the large panel in the ceiling. The big sphere in each fitting contains a 200-watt Mazda lamp, and the small Alba balls contain 60-watt Mazda lamps. The lamps, of course, are entirely enclosed by the white

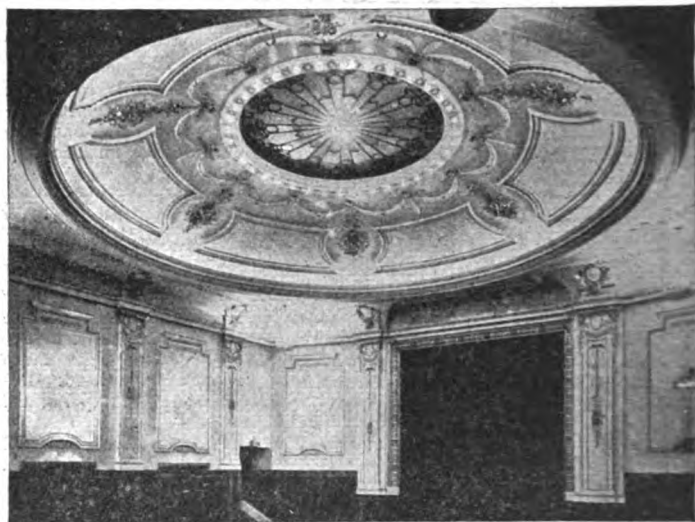


FIG. 2.—BALHAM PALLADIUM.

Alba glassware, and the illumination is well diffused. The Balham Palladium has a beautiful painted ceiling, and the lighting here was designed to illuminate this ceiling. The vestibule, corridors, staircases and offices are lighted by means of wall brackets or pendants fitted with Mazda lamps and Veluria reflectors. The auditorium illumination is controlled by a B.T.-H. metallic dimmer, which gives the necessary gradual adjustment of the light. The outside lighting is very striking. The name of the theatre is formed by lamps in a special trough reflector—the letters being about 2 ft. high. In addition to this, the whole building is outlined with strip light, and there are five flambeaux standards on the roof. In all, about 200 20-watt and five 100-watt Mazda lamps are used for the outside lighting.

### REMOTE CONTROL CIRCUIT BREAKERS

WE are now able to give some further information as to the construction of the clapper switch circuit-breaker referred to last week in *ELECTRICAL ENGINEERING*, in connection with the illustrated description of the "Igranic" motor control panels. These breakers are made by the Igranic Electric Co., Ltd. (147 Queen Victoria Street, E.C.), and form an integral part of many "Igranic" appliances. The current-carrying contacts consist of a laminated phosphor-bronze brush, pressed against a hard rolled metal surface. This construction eliminates the danger of partial contact, for whenever contact is made at all it must be over the whole surface. Furthermore, the contacts are always clean, because each time that the switch closes the flat contact surface is slightly scraped by the edges of the leaves of the laminated brush as they expand. These current-carrying contacts are reinforced and protected by easily renewable circuit-breaking contacts of carbon of large size, and so disposed as to always make contact before the metal contacts, and break after them. The pole-pieces of the blow-out magnet swing up to permit easy inspection of the contacts. Their normal position is such that the break always takes place in the most intense portion of the magnetic field.

**Osram Lamp Patents.**—The Osram Lamp Works, Ltd., announce that actions have been commenced against Harraway Bros., Kensington, for selling lamps manufactured by Pope's Electric Lamp Co., Ltd., and against The Maxim Lamp Works, Ltd., for selling Maxim Lamps. It is alleged that the lamps in question infringe the Osram patents Nos. 23,899/04 and 18,622/06. The Pope company announce their intention of fighting the case against them to the highest court, and reassure their customers as to their indemnity guarantee.



## CASING AND CAPPING

WE have received a number of replies to the inquiry made by Messrs. C. Jennings & Co. last week whether the trade prefers casing made for the capping to screw on at the centre fillet or at the edges.

Messrs. Rashleigh Phipps & Co. (147 Oxford Street, W.) say that during the past twenty-five years they have found the existing practice satisfactory of screwing the capping in the small sizes to the centre fillet, but in casing over 2 in. in width to the side fillet.

Messrs. E. Troy & Co. (194 Finchley Road, N.W.) from an eighteen years' experience screw on to the centre fillet in sizes up to 1½ in., but in larger sizes screw on to the outer edge to prevent gaping. They do not think it advisable to reduce the distance between the grooves.

Messrs. Thomas Hyde & Co. (Croydon) also prefer to screw on in the centre of 1½ in. casing, but suggest that this size be made 1/16 in. deeper in the grooves than the customary standard, so as to allow for two wires in each. For 2 in. casing they prefer screwing on the outer edges, increasing the width of these slightly and reducing the centre fillet.

Messrs. James Meighan & Son (Glasgow) and Messrs. Robson & Coleman (Newcastle-on-Tyne) also recommend the retention of the practice of screwing the 1½ in. casing in the centre and screwing the larger sizes on the outer edges. Messrs. Meighan point out the risk of careless men bursting the outside fillets if the capping were screwed on to the edges on the smaller sizes.

Electrical Installations, Ltd. (27-28 Martin's Lane, E.C.) write:—"The general procedure for sizes above 2½ in., on account of the tendency of the capping to gape open, would be to fix with screws on the outside edge." In the particular case of 1½ in. casing, we cannot see that any good is to be obtained by thickening up the outside edge at the expense of the middle fillet. There is no doubt that in practical use it would be almost impossible to fix the casing to the wall on the outside edge, and the chance of splitting when the screws are driven through the middle would be greatly increased if this centre fillet is diminished in size. The whole difficulty of gaping open has been eliminated by us by the use of 'hospital' type of capping, which has a thickness of about twice the usual capping in the centre where the screws would be fixed, and we cannot see that any improvement could be made on the standard practice of using this capping." [In this, the edges of the capping are rounded off instead of being square.]

The manager of the electrical department of one of the largest firms of builders, on the other hand, expresses his personal opinion that it is best to have the casings of the smaller sizes with a thicker timber on the sides, so that the capping can be screwed at the edges; the thickening of the sides will reduce the centre fillet, but this, he thinks, does not matter. Of course, in the larger sizes there is plenty of margin of timber to get a good screwhold. He also suggests that the cappings should be reeded in such a manner at the edges that the wireman can easily get a centering for his screw hole into the middle of the timber sides; they so often, he says, make a "boss shot," and put the screw holes so near the edge that the wood splits and leaves an unsightly job.

**The New American Duty Tariff.**—Messrs. Davies Turner & Co. (52 Lime Street, E.C.) inform us that they are still receiving inquiries from manufacturers and others showing that many business houses are still unfamiliar with the duties now payable on the goods in which they are concerned. They ask us to state that they still have a certain number of copies of their pamphlet on the subject left, and would be pleased to supply these free of charge to anyone who applies.

**"Mazda House News."**—The second issue of this periodical of the British Thomson-Houston Co. (Mazda House, 77 Upper Thames Street, E.C.) fully upholds the reputation established by the first. Among the special subjects treated are church lighting and illuminated hoardings, and there is a most interesting article on advertising, illustrated by miniature reproductions of a selection of blocks which the company are willing to lend contractors to assist them in their own campaigns. There are several effective photographs of installations carried out on the "eye-rest" indirect lighting system, and an announcement is made regarding reductions in prices of Veluria Glassware, which should increase still more the use of these already well-appreciated reflectors. The technical and commercial information is well lightened by humorous contributions, and the whole magazine, with its bright illustrations, has a pleasant air of life and vigour.

## MODERN ENGINES AND POWER GENERATORS.

By Rankin Kennedy, C.E.

The Coupon below entitles any reader to a complimentary copy of an illustrated booklet, describing what is probably the most valuable work upon this subject ever published.

The importance of the subject is growing day by day, and "The Book of Modern Engines and Power Generators" can easily prove of the greatest value to those who desire to be fully informed upon the latest developments in every branch of the subject.

The author, Mr. Rankin Kennedy, C.E., is well known as an authority on his subject, and in this work he explains in the clearest and most thorough manner the design and construction of prime movers; the term is here used in its widest sense, as it applies to all engines, whether worked by petrol, oil, steam, air, gas, water, or electricity, and as it includes all machinery and processes connected with power generators and distribution.

### ENTIRELY UP TO DATE.

Moreover, all these subjects have been brought entirely up to date. The previous Edition of the work achieved such an immediate success, that for the new and Revised Edition, the scope of the work has been widened and extended so as to cover every branch of the subject, by the addition of a great amount of new matter, and many new illustrations of very great interest and high value.

This new Edition is indeed already recognised as the standard work on its many varied subjects, including Rotary Engines, Gas Turbines, Gas Engines, Oil Engines, Petrol Engines, Suction and Producer Gas Engines, Blast Furnace Gas Engines, Marine Engines of every design and type, Compressed Air Motors, Air Compressors, Refrigerating Engines, Windmills, with electric storage, Fluid Hydraulic Engines, Water Pressure Engines, Hydraulic Rams, Water Pressure Turbines, and Water Raising Engines, Centrifugal Pumps and Air Lifts, Power Distribution and Transmission by Gearing, Water Pressure, Compressed Air and Electricity, etc., etc.

### OVER 2,000 ILLUSTRATIONS.

The work is profusely illustrated by diagrams, text-cuts, and plates. In all there are over 2,000, every one of great practical utility to the engineer.

Enough has been said to show that this work is indispensable to all electrical, mechanical, steam, and hydraulic engineers, and to all who are concerned with manufacturing, designing, draughtsmanship, electro-chemical, and metallurgical work, with automobiles, tramways and railways, boilers, shipbuilding, collieries and mines, etc.

We would advise those who are determined to keep abreast with all the latest specialist knowledge concerning every detail of their profession to send for the free booklet which is supplied by the publishers to those mentioning this paper.

## A FREE BOOKLET.

To the CAXTON PUBLISHING CO., LTD.,

97, Surrey Street, London, W.C.

Please send me, free of charge, a copy of the book describing the "Book of Modern Engines and Power Generators," and showing how it can be obtained for a first payment of 1s. 6d., the balance to be paid by small monthly payments.

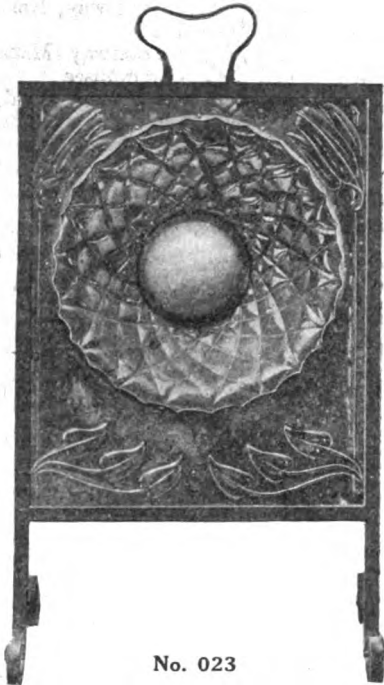
NAME .....

(Send this form or a postcard.)

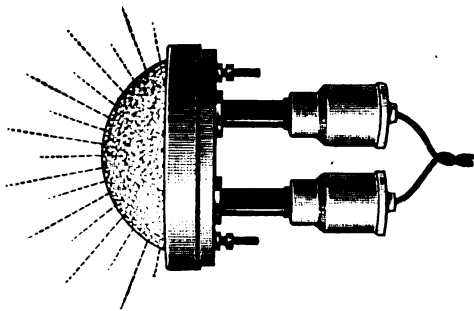
ADDRESS .....

# REDGLO

## RED HOT ELECTRIC FIRE



No. 023



Consumption 600 watts  
(Martin's Patent)

Write for Catalogue No. 27

**REDGLO, Ltd.,**  
**ROYAL LIVER BUILDINGS,**  
**LIVERPOOL**

### A STRIKING SHOW-CARD

We give here an illustration of the latest Osram lamp showcard now being issued by the General Electric Co., Ltd. (87 Queen Victoria Street, E.C.), which is the work



of one of the most eminent poster artists of the day. We are asked to state that copies will be supplied free to all electricians, ironmongers and stores upon application.

**Anglo-American Exhibition, 1914.**—We have received some particulars of the Electrical Engineering Section of the Anglo-American Exhibition which it is proposed to hold at Shepherd's Bush next year. A large Electrical Committee has been formed, of which the following form the executive committee: Messrs. W. H. Mordey (Chairman), R. Hammond (Vice-Chairman), H. R. Kempe (Hon. Secretary), W. Worby Beaumont, Major G. Harland Bowden, Messrs. A. A. Campbell-Swinton, S. P. Dobson, L. Gaster, T. E. Gatehouse, A. Gay, H. T. Harrison, K. Hedges, R. Rawlings, C. P. Sparks, R. A. Wallis Jones, and H. D. Wilkinson. There will be separate classes for plant, distribution of electrical energy, utilisation of electrical energy, telegraphy and telephony, and miscellaneous applications of electricity.



HEATHMAN'S PLAIN  
DECORATOR'S TRESTLES.  
MADE IN TWO WIDTHS  
18" AT TOP TO TAKE ONE SCAFFOLD BOARD,  
22" AT TOP TO TAKE TWO SCAFFOLD BOARDS.  
"FOR SALE  
OR HIRE"

**Ladders, Steps,  
Trestles,  
Scaffolds, &c.**  
Sale or Hire.  
**HEATHMAN & CO.**  
10, Parson's Green,  
London, S.W.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

### Generating Stations, Sub-Stations, Mains, &c.

**Accrington.**—It being considered essential that additional gas plant should be installed at the power station by October next year, the Borough Electrical Engineer has been directed to obtain tenders for the plant.

**Adelaide.**—To deal with extension of plant, a further 20,000 6 per cent. cumulative £5 preference shares are to be issued by the Adelaide Electric Supply Co.

**Bedford.**—A Local Government Board inquiry was held last week concerning a loan of £10,000 for electrical extensions. Some time ago it was proposed to instal Diesel engine plant, but this scheme has now been abandoned in favour of a steam turbine.

**Cleethorpes.**—Mr. C. S. Vesey Brown is to prepare estimates of the cost of laying mains in a large number of additional streets.

**Darlington.**—A Local Government Board inquiry was held last week concerning a loan of £21,190 for electrical extensions.

**Hoyland.**—A public electric lighting scheme is to be developed.

**Leeds.**—Sanction has been received to the borrowing of £168,000 for the electrical undertaking.

**London: L.C.C.**—Steam exhaust condenser and feed piping, water-tanks, &c., for Greenwich Power Station. December 28rd. (See advertisement on another page.)

**Shoreditch.**—The Finance Committee of the L.C.C. recommends sanction to a loan of £17,226 in connection with the linking-up scheme with the Stepney Borough Council. This is made up as follows:—Mains, £5,000; transformers, £10,000; switchgear, £1,800; and the remainder, engineer's charges and contingencies. A further loan of £75,000 has been applied for in connection with extensions at the generating station, but the Finance Committee of the L.C.C. is not yet able to deal with this.

**Morocco.**—The British Vice-Consul at Tetuan has, says the *Board of Trade Journal*, forwarded a summary of the regulations regarding electric power concessions in the Spanish zone, recently issued. This may be seen at 73 Basinghall Street, E.C.

**South Africa.**—The Johannesburg Council requires six two-phase 500-kw. rotary-converters (A.C. to D.C.) and spare parts. January, 1914. Town Clerk. Specification, &c., may be seen at Board of Trade, 73 Basinghall Street, E.C.

**Stapleford.**—The Derbyshire & Nottinghamshire Electric Power Co. has purchased land in this district for the purpose of an electric power station.

### Wiring

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Aldershot.**—New lecture hall, new library, &c., at Staff College, Camberley. Director of Army Contracts, War Office, S.W.

**Birmingham.**—New school, corner of Nansen and Naseby Roads.

**Croydon.**—Twelve houses in Ederline Avenue. J. E. Trimble, Kilmartin Avenue.—Nine houses, Kilmartin Avenue. C. S. Banks, 16 Oakfield Road.—Sixteen houses, Bingham Road. A. C. B. Duckett, 24 Sherwood Road.—Cinematograph theatre, Lower Addiscombe Road. W. B. Sinclair, 21 Charing Cross, W.C.

**Falkirk.**—Cinematograph theatre and shops (£3,000).

**Halifax.**—Cinematograph theatre, Queen Road.

**Harrogate.**—New school. Borough Surveyor.

**London: L.C.C.**—Electric lighting of the Cherry Garden Street fire station.

New school in Wilson Street, Islington.

Stoke Newington.—Public washhouses, &c. (£1,900).

**Mansfield.**—Extensions at Mansfield Forest Hospital. (£5,000.)

**Nottingham.**—Four branch libraries.

**Sale.**—Public offices. C. T. Adshead, 4 St. Anne's Square, Manchester.

**Stafford.**—Enlargement of Technical School. (£5,000.)

**Sunderland.**—Reconstruction of warehouses at Hudson Dock North (£4,250). River Weir Commissioners.

**Workshop.**—123 lamps at the workhouse, Eastgate. December 15th. Clerk to Guardians, 66 Bridge Street.

### Miscellaneous

**Ashton-under-Lyne.**—Two automatic electric passenger lifts at workhouse. Clerk to Guardians, Stamford Street.

**Coventry.**—Ten covered-top tramcars at estimated cost of £10,000.

**Leeds.**—Sanction has been received to the borrowing of £45,000 for the tramways undertaking.

**London: L.C.C.**—Electric charging apparatus is required for the Clapham, Dulwich, Hackney, Holloway, Kensington, Lee Green, and Streatham fire stations.

**New Zealand.**—The Dunedin Tramway Manager has reported in favour of petrol-electric omnibuses.

**South Africa.**—According to the *African World*, fifteen new tramcars are required by the Johannesburg Council.

In the course of his annual report, the General Manager of the South African Railways advocates the conversion to electric traction of the Wynberg and Sea Point lines, two busy suburban lines running into Cape Town.

**York.**—Tenders are invited for four trailer cars for use on the Corporation tramways. The estimated cost of the electrical equipment of the South Bank tramway extension is £1,998.

## TENDERS RECEIVED AND ACCEPTED

**London: Hammersmith.**—The Council has received fourteen tenders for the supply of arc lamps for hiring out, and these will be reported upon at a future meeting of the Council.

**Warrington.**—The following tenders have been accepted: Boiler plant, Babcock & Wilcox, £2,362; turbo-alternator, J. Howden & Co., £5,843; condenser, Worthington Pump Co., £3,344; economiser, Goodbrand & Co., £203 10s.

The Mirrlees Watson Co. have received the following orders for condensing plant:—City & Guilds (Engineering) College; Carron Co.; De Beers Consolidated Mines, Ltd. (Kimberley); The New Jagersfontein Mining & Exploration Co.; Fife Electric Power Co.; Londonderry Collieries; Holytown Colliery; Rochdale Corporation, per Messrs. James Howden & Co.; Bournemouth & Poole Electricity Supply Co.; Oldham Corporation; Maltby Main Colliery; Harland & Wolff; Fife Coal Co.

In addition to the repeat orders already referred to in our columns for Calcutta and Dublin, and the Marylebone machines described this week, the Maschinenfabrik Oerlikon has recently received orders for the following turbo-generators:—One 3,000-kw. 3,000 r.p.m. for Aberdeen; one of the same size for York; and a 5,000-kw. machine running at the same speed for the Ebbw Vale Steel, Iron & Coal Co.

## MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. G. Smith & Son, of 5 Philpot Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night, was £68 to £68 10s. (Last week, the same.)

**Bankruptcy.**—J. G. Hilton, 103 Exchange Buildings, Liverpool, has been adjudicated bankrupt.

**Agency.**—A Montreal company desires to obtain the agency of United Kingdom manufacturers of electrical supplies and fittings. Further particulars, Board of Trade, 73 Basinghall Street, E.C.

**Liquidations.**—A petition for the winding up of the Electro-mobile Co. will be heard in the High Courts on December 9th, before Mr. Justice Astbury.

**FOR  
STEAM JOINTS  
USE**



**JOHN HUDSON & CO.'S SUCCESSORS, Mansell St., London, E.**

## LOCAL NOTES

**Aberdeen: Wiring of Infirmary.**—With reference to a recent statement concerning the conditions upon which the Corporation were alleged to be willing to supply current to the infirmary, at the last meeting of the Corporation it was stated that no formal application had been received from the infirmary authorities, although the representatives had been inquiring as to the conditions upon which a supply would be given. In the circumstances, no further action is being taken in the matter.

**Chiswick: Electric Supply.**—Mr. J. F. C. Snell is advising the Council in regard to a proposal to purchase the Chiswick Electricity Supply Corporation.

**Dundee: Supply Failure at Broughty Ferry.**—In consequence of a breakdown in the Broughty Ferry supply, Mr. H. Richardson, City Electrical Engineer, has made a detailed examination of the generating plant and distribution system recently taken over from the Broughty Ferry Council, and has made a very strong report upon its condition. Mr. Richardson states that, in view of the bad state of the plant generally, cessation of the supply in Broughty Ferry, pending the completion of the arrangements he has in hand for establishing a supply station there, seems inevitable to a considerable extent. He states that the battery is absolutely useless, the pumps are inefficient, and the condenser in such a state of incrustation that it must be dealt with immediately. The back of the switchboard, says the report, is in a state of chaos, and fears are expressed that similar criticism will have to be made of the cable and distribution system generally. He does not think it possible to change the Broughty Ferry power station to a high-pressure sub-station before March, and he had hoped to struggle along with the present generating plant until then. An attempt is to be made to give the plant a general overhaul sufficient to maintain the supply.

**Friern Barnet: Demand for Electricity.**—The high price of gas in this district, viz., 8s. 4d. per 1,000 ft., led to a meeting of protest of tradesmen and ratepayers last week, and efforts are being made to secure sufficient support with a view to inducing the North Metropolitan Electric Power Supply Co. to introduce a supply of electricity.

**Haslingden: Electrical Driving in Cotton Mills.**—Mr. J. W. Crowley, of Messrs. Siemens Bros. & Co., who is specially connected with textile work, recently gave a lecture on the electrical driving of looms, ring spinning, and doubling frames at the Technical School. He stated that he did not recommend individual driving in every case, as there were many cases in which group driving offered special advantages. In the Little Harwood Shed, Blackburn, however, there were, he said, 1,140 looms, each driven by its own motor. As far as ring spinning and doubling frames were concerned, he thought there was no question of the advantages of the individual driving over group driving; but the question was an open one in respect of other classes of machinery. In answering questions at the conclusion of his lecture, Mr. Crowley said that there was a tendency on the part of textile machinery makers to treat the electrical engineer with scant courtesy when he made suggestions with regard to the driving of machinery electrically, although efforts were now being made to bring the two sides into better harmony. The electrical loom formed an interesting question, but he was afraid we were a long way off from making any big development in that direction.

**Leeds: Employees Wages.**—The Electricity Committee, in common with practically all the committees of the Corporation, is met with demands from the Employees' Union for increased wages, but a scheme which has been prepared is said not to meet with the approval of the men's leaders.

**Manchester: Electricity Works Record.**—The output of electricity from the Corporation's power station last week exceeded all previous records. The number of units delivered to the mains was 574,000, and at one time the demand on the plant was 49,000 kw.

**Minehead: Outside Lighting Scheme.**—The Minehead Electric Supply Co. has introduced a differential tariff system of charging for outside lighting purposes. The scheme applies to outside lighting of business premises only, and the total candle power installed must not be less than 200. The current required for the lamps will be taken from a special meter and charged at 2d. per unit, in addition to a fixed charge per annum of 21s. for 200 c.p.; 25s. for 250 c.p.; 35s. for 500 c.p.; 40s. for 600 c.p.; and 60s. for 1,000 c.p.

**Northampton: Municipal Electric Supply.**—The Corporation has passed a resolution instructing the Town Clerk to report

on the legal position as regards the purchase of the Northampton Electric Light and Power Co.

**Street Lighting.**—The Council has ordered an inquiry to be made into the question of public lighting with the view of possibly acquiring these portions of the undertakings of the local electric lighting and gas companies.

**Redditch: Electricity Undertaking.**—Mr. R. N. Mayne, the recently appointed Borough Electrical Engineer and Manager, in a report upon the electrical undertaking states that in his opinion the prospects are sufficiently good to warrant the Council involving a capital expenditure of some £8,000 upon additional plant. As we have already noted in these columns, there is considerable opposition on the part of some of the members of the Council to this course being followed, the prevailing idea being that an increase in charges should be made. Mr. Mayne, however, is most emphatic that this would incur the immediate loss of many of their largest consumers.

**Widnes: Transporter Bridge.**—The electrically-driven transporter bridge between Widnes and Runcorn has been reopened after a rearrangement of its electrical equipment. Originally the transporter carriage was propelled by means of two electrically driven motors driving on a rack rail, but for this there has been substituted an electrically-driven haulage system similar to that in use on the other transporter bridges at Middlesbrough and Newport (Mon.). Simultaneously the gas-driven generating plant has been displaced in favour of power from the mains of the Mersey Electric Power Co.

## APPOINTMENTS AND PERSONAL NOTES

An interesting presentation of a gold watch and chain has been made to Mr. N. W. Prangnell, of the Metropolitan Electric Supply Co., by the Electric Supply Publicity Committee, as a token of their appreciation of his management on their behalf of La Maison Electrique, at the Ideal Home Exhibition, Olympia.

The increase in the salary of Mr. C. Furness, Borough Electrical Engineer at Blackpool, referred to in our last issue, has been sanctioned by the Council.

A Charge Engineer is required by a large power company in the south of Europe. (See advertisement on another page.)

Colliery electrician required for coal-cutter repairs. (See an advertisement on another page.)

## COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &amp;c.

**Chloride Electrical Power Storage Co.**—An interim dividend of 5 per cent. free of tax has been declared on the ordinary shares.

**Portarlington Electric Light & Power Co.**—A prospectus has been issued offering 2,600 cumulative shares of £1 each at par.

**British Westinghouse Co.**—In the Chancery Division Mr. Justice Astbury has sanctioned a reduction in capital of from £1,875,000 to £1,150,000. The reasons for the reduction given on behalf of the Company were losses in respect of patents and goodwill and the arbitration between the Company and the Underground Electric Railways of London.

**Consolidated Diesel Engine Manufacturers.**—A Shareholders' Committee of Investigation has been appointed to inquire into the present position of affairs of this Company.

**The Institution of Electrical Engineers.**—As the discussion on Dr. Klingenberg's address on "Electricity Supply of Large Cities" will be concluded on December 4th, there will not be a meeting of the Institution on December 11th.

**Electricity Supply in London.**—Last session the County of London Electric Supply Co. obtained in its Romford Electric Lighting order an option to acquire a site of 23 acres close to Barking, and the question of the possible significance of this was raised at the L.C.C. meeting on Tuesday. The Chairman of the Highways Committee stated that the L.C.C. was aware of the provisions of this Electric Lighting Order, and had taken the only steps open to it, viz., to secure the insertion in it of a provision that, before any connection could be made between any station built on this site and the London supply system, the Board of Trade's consent must be obtained, the L.C.C. at the same time having the right to be heard on the matter.



# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 363 [Vol. IX., No. 50]  
*All rights reserved.*

THURSDAY, DECEMBER 11, 1913.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.  
SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES AND TECHNICAL COLLEGE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

*Other Advertisement Rates on Application.*

*Latest Time for Receiving*

Letters for Insertion, Tuesday first post.

Small Advertisements and Official Announcements, Wednesday first post.

Displayed Advertisements, Tuesday first post.

Corrections in Standing Advertisements, Monday first post.

All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 308-306, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Circling, Fleet, London."

Telephone No.: 5509 Holborn.

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

### SUMMARY

THE Committee on electrical vehicles appointed by the I.M.E.A. is being extended by the co-option of members representing all interests in the matter. (Page 694.)

THE annual dinner of the I.E.E. Students' Section was held on Monday last. (Page 694.)

DR. KLINGENBERG's address to the Institution of Electrical Engineers on "Electricity Supply in Large Cities," outlined a scheme for the supersession of 22 of the existing 64 generating stations by a few very large ones, and the gradual conversion of the remainder into sub-stations. By comparing the conditions in different cities, however, the result was arrived at that, without a more diversified load, the advantage from centralisation in the London area would be limited. This scheme did not show sufficient advantage to the public to meet with Dr. Ferranti's approval. (Page 695.)

WE give particulars of the new London Electrical Masters' Association, and also discuss the circumstances of the wiremen's strike at the Pearl Assurance Co.'s building in Holborn. (Page 696.)

By the New Year there will be 28 railways in America using 1,200 or 2,400 volts direct current on the trolley line. It is expected that this and the split phase system will be largely used in the future, although the overall efficiency of the latter is very low. (Page 698.)

THE Marconi wireless station now being erected near Carnarvon has an aerial of 82 wires of silicon bronze,

supported on masts 400 ft. high. Provision is made for 1,000 h.p. in motor generators for power purposes. —Tuning, and the behaviour of different kinds of waves for the transmission of wireless messages are considered. (Page 698.)

A PATENT relating to automatic telegraph transmitters by J. A. L. Dearlove and S. G. Brown, and one relating to C. B. telephony by the W. E. Co., are expiring after a life of fourteen years. The specifications published by the Patent Office last week include one by the B.T.-H. Co. for making a vacuum-tight seal for quartz tubes, and one also by the B.T.-H. Co., relating to the use of gas at very low pressure in the bulbs of ordinary incandescent lamps. The Marconi Co. and C. S. Franklin are protecting a closed circuit directive aerial. (Page 699.)

A CASE of damage done to incandescent lamps by the effect of a lightning discharge is discussed in our Questions and Answers columns. (Page 700.)

OUR "ELECTRICAL ENGINEERING Literary Section" contains a list of new publications, reviews of a number of technical books, and gives a selected list of recommended works on all branches of electrical engineering. (Page 701.)

A SHIP-CLEANING equipment, in which an electrically driven rotary fibre brush is used, is described. The brush is suspended from a jib on a barge, and works under water. (Page 705.)

AN article emphasises the necessity for using lamps of the proper voltage ratings. (Page 702.)

AN electrically heated comb, and a new form of laminated gearing, are described, and notes on a wiring system and the use of casing appear on page 708.

ELECTRICAL plant and mains are required at Huddersfield, Keighley, Loughborough, Battersea, Hindley, Chesterfield, Carlisle, Warrington, West Ham, and Burnley.—The Manchester Corporation requires a number of large converting sets.—Telephone material is required in Australia. (Page 709.)

MESSRS. SIEMENS BROS. DYNAMO WORKS gave a demonstration yesterday afternoon of a range of half-watt lamps which are shortly to be placed on the market. (Page 709.)

THERE is a possibility of the Hove Corporation leasing its electricity undertaking.—Mr. Richardson's report on the conditions of the Broughty Ferry electricity undertaking was discussed last week.—The Chairman of the Southampton Electricity Committee and the Borough Electrical Engineer are in conflict as to the desirability of increasing the charge for electrical energy.—The Newcastle-on-Tyne Electric Supply Co. is erecting a new power station in which coke-oven gas will be utilised. (Page 710.)

THE India Rubber, Gutta Percha, and Telegraph Works Co. declare a dividend of  $7\frac{1}{2}$  per cent. on the ordinary shares. (Page 710.)

## ARRANGEMENTS FOR THE WEEK

(TO-DAY) THURSDAY, DECEMBER 11TH.

*Institution of Electrical Engineers: Scottish Section.*

7 p.m. Annual Dinner at The Grosvenor, Gordon Street, Glasgow.

FRIDAY, DECEMBER 12TH.

*Institution of Electrical Engineers: Newcastle Section.*7 p.m. At Hugh Bell School, Middlesbrough. "Electricity Supply in Large Cities," by Dr. Klingenberg.  
*Electro-Harmonic Society.*

8 p.m. Smoking Concert at Holborn Restaurant.

SATURDAY, DECEMBER 13TH.

*Mining Institute of Scotland.*

3 p.m. At 39 Elmbank Crescent, Glasgow. Discussion on Mr. W. Dunn's Paper, "The Electric Winding Plant at South Kenmuir Colliery."

*Birmingham and District Electric Club.*

7 p.m. Annual meeting at Swan Hotel, New Street.

MONDAY, DECEMBER 15TH.

*Institution of Electrical Engineers: Newcastle Students' Section.*

7.30 p.m. At Armstrong College. "The Application of Lightning Arresters to A.C. Systems," by R. C. Philipp.

TUESDAY, DECEMBER 16TH.

*Physical Society.*

3-6 and 7-10 p.m. Exhibition at Imperial College of Science.

*Institution of Electrical Engineers: Newcastle Section.*

7 p.m. Annual dinner at County Hotel.

*Institution of Electrical Engineers: Manchester Section.*

7.30 p.m. At University. "Employment of Power in H.M. Post Office," by H. C. Gunton.

WEDNESDAY, DECEMBER 17TH.

*Institution of Electrical Engineers: Students' Section.*

7.45 p.m. At Victoria Embankment. Discussion on "Underground and Surface Transport of Passengers and Goods in London."

*Royal Society of Arts.*

8 p.m. "The Channel Tunnel," by A. Fell, M.P.

THURSDAY, DECEMBER 18TH.

*Institution of Electrical Engineers.*

8 p.m. "The Employment of Power in H.M. Post Office," by H. C. Gunton.

FRIDAY, DECEMBER 19TH.

*Institution of Electrical Engineers: Birmingham Section.*

Annual dinner.

*Institution of Civil Engineers: Students' Section.*

8 p.m. "Air Filtration and the Cooling and Ventilation of Electrical Machinery," by W. E. Gurry.

## The London Electrical Engineers.

(TO-DAY) THURSDAY, DECEMBER 11TH.—C. Company. Technical Instruction, 7 to 10 p.m.

FRIDAY, DECEMBER 12TH.—D. Company. Special Class on Crossley Engine, 7 p.m. Technical Instruction, 7.30 to 9.30 p.m.

SATURDAY, DECEMBER 13TH.—Headquarters open from 10 a.m. till noon.

MONDAY, DECEMBER 15TH.—A. Company. Technical Instruction, 7 to 10 p.m.

TUESDAY, DECEMBER 16TH.—B. Company. Technical Instruction, 7 to 10 p.m.

WEDNESDAY, DECEMBER 17TH.—Recruits only. Infantry Drill and Technical Instruction, 7 to 10 p.m.

THURSDAY, DECEMBER 18TH.—C. Company. Technical Instruction, 7 to 10 p.m.

FRIDAY, DECEMBER 19TH.—D. Company. Special Class on Crossley Engine, 7 p.m. Technical Instruction, 7.30 to 9.30 p.m.

SATURDAY, DECEMBER 20TH.—Headquarters open from 10 a.m. till noon.

**The New Street Lamps in Marylebone.**—A correction is necessary to the short note published on p. 683 of our last issue. The street lighting columns in question were supplied by the Borough Surveyor, and the fittings were decided upon by the Electricity Department of the Borough Council, and purchased from the Electric Street Lighting Apparatus Co.

**Electrical Driving of Forging and Stamping Plant.**—In a Paper read before the Rugby Engineering Society on recent improvements in power-driven forging and stamping plant on November 25th, Mr. W. Spencer gave some interesting notes on electric driving. Rows of stamps are most conveniently driven by a main shaft driven by gearing from a quick-running back shaft provided with a flywheel serving as a pulley belt, driven by a motor fixed to the stanchions. With several stamps in a battery, the power required will be less than the sum of the powers for the separate stamps by a factor varying from 0.84 for two stamps to 0.47 for five stamps. The average horse-power taken by single drop stamps varies from 2 b.h.p. for a 3 cwt. stamp to 25 b.h.p. for a 100 cwt. stamp. Compound-wound motors are recommended, wound so as to speed up by about 20 per cent. between the loaded periods; should shunt motors be used they should be 15 per cent. larger. Alternating-current motors can be used either of the slip-ring or squirrel-cage patterns. Motors should be protected against dust. Regarding compressed-air hammers, the author considers that their disadvantages when driven from a general supply of compressed air disappear when they are of the electrically-driven type, each with its own air-pump forming part of the apparatus. These may be driven through a paper pinion or a short belt and jockey pulley. The power taken varies from 3 b.h.p. for a  $\frac{1}{2}$  cwt. hammer to 35 b.h.p. for a 20 cwt. hammer.

## THE ELECTRIC VEHICLE COMMITTEE

THE second meeting of the Electric Vehicle Committee, appointed by the I.M.E.A., was held on November 14th. The members of the original Committee are as follows:—R. A. Chattock (City Electrical Engineer, Birmingham), Chairman; F. Ayton (Engineer and Manager, Corporation Electric Supply and Tramways Departments, Ipswich), Hon. Sec.; A. C. Cramb (Borough Electrical Engineer, Croydon); J. Christie (Borough Electrical Engineer, Brighton); J. E. Edgecome (Borough Electrical Engineer, Kingston-on-Thames); H. Faraday Proctor (City Electrical Engineer, Bristol); A. H. Seabrook (General Manager, St. Marylebone Council Electric Supply Department). The following are co-opted members:—F. E. Gripper (Edmundsons Electricity Corporation), representing the Provincial Electric Supply Companies; E. S. Jacob (Tudor Accumulator Co.) and W. S. Naylor (Chloride Electrical Storage Co.), representing the accumulator section of the B.E.A.M.A.; J. F. Monnot, representing Arrol-Johnston, Ltd.; R. E. Mossay (Lloyd Electric Cars), representing makers of electric vehicles; and W. H. L. Watson (Edison Accumulators, Ltd.).

An invitation to nominate a representative has been sent to the Association of Electric Power Companies, and a similar invitation has been sent to the Electrical Contractors' Association, which has appointed Mr. W. R. Rawlings for this purpose. The B.E.A.M.A. has also been asked to appoint representatives of the manufacturers of electric motors and switchgear. The London Electric Supply Companies, the Royal Automobile Club, and the Automobile Association & Motor Union have declined to be represented. Mr. Conway Jenkins has been elected to represent the F.R.A.M. Co.

The present Committee will hold office until December 31st, 1914. A technical and a commercial sub-committee have been appointed. The first is considering the adoption of a standard plug on the lines of the revised standard plug in use in America by the Electric Vehicle Association with which the Committee is affiliated. Rates for the insurance of electric vehicles and tariffs for charging are among the subjects which the commercial sub-committee has in hand, and it is hoped to arrange a conference with the representatives of the London Electric Supply Companies. The commercial sub-committee is also taking in hand the matter of publicity work.

## THE I.E.E. STUDENTS' SECTION DINNER

THE tenth annual dinner of the Students' Section of the Institution of Electrical Engineers was held on Monday evening last at the Trocadero Restaurant. The evening passed off in a most enjoyable way for all those concerned, but it is to be regretted that the attendance at these functions shows no sign of being on the increase. The usual toasts were proposed and responded to, and proved more enjoyable than the musical part of the programme, which was somewhat longer than necessary. It appears, especially from the speech made by the Chairman, Mr. S. M. Hills, that the examinations for associate membership of the Institution are still regarded with awe by many of the student members. He suggested that Papers read before the Students' Section might be taken into account by the Council when considering an application for transfer. Dr. S. P. Thompson, in one of his characteristically attractive speeches which endear him to all, whether they have had the good fortune to study under him or not, replied that such Papers are taken into account, although this is not expressly stated. The examination itself is only designed to find out whether the candidate "knows his job," and is not in the least academical. Alternatively a "thesis" may be submitted. This may be entirely new, and may deal with any electrical subject; it may be the result of researches already published, or a Paper read before an engineering society and re-written with preferably the criticism raised in the ensuing discussion embodied. Thus the choice of subject allowed is as wide as possible. The right of oral examination of the candidate on the subject of the thesis is reserved so that it may be tested whether he really wrote it himself. Mr. W. Duddell, Mr. A. H. Seabrook, and Mr. W. M. Mordey also added to the knowledge and enjoyment of the other diners. The Hon. Secs., Messrs. E. T. Driver and R. A. MacMahon, the Chairman, Mr. S. M. Hills, Messrs. R. E. Dickinson, and E. L. M. Emtage and the Committee of the Students' Section may be congratulated for engineering such a pleasant evening.

## ELECTRICITY SUPPLY FOR LONDON

DR. G. KLINGENBERG delivered a valuable Address, bearing the title, "Electricity Supply in Large Cities," to a large gathering of engineers interested in electricity supply at the meeting of the Institution of Electrical Engineers on Thursday last. The Address was also discussed at Newcastle on Monday, at Edinburgh on Tuesday, and it is down for discussion at Middlesbrough on Friday.

There were only four speakers at the meeting in London, and, contrary to expectation, but little of interest was said, though there was ample scope offered. Dr. Klingenberg began by comparing the state of electricity supply in Berlin, Chicago, and London, and he concluded that if all the sixty-four generating stations were shut down and a few large new generating stations substituted, a saving of about 40 per cent. on all working costs with an increase of the total capital now invested of less than 20 per cent. would result. He would provide greater London with three duplicated sets of inter-connected ring mains and use the existing generating stations as sub-stations. A supply at 50 cycles per sec. three-phase would ultimately become universal. At first a large generating station of 83,000 kw. capacity would be built on a coalfield, or on the outskirts of the city, i.e., about ten miles from the centre, on the river. In the latter case, 20,000-volt single core cables would be used to feed the sub-stations, and in the former case the main transmission would be at 100,000 volts three-phase by pole line, or cable, with a transforming station to step the pressure down to 20,000 volts on the outskirts. This supply would feed twenty-two of the twenty-five 50-cycle stations now in existence while the remaining three, having capacities over 18,000 kw. each, would be retained. These would be required to assist during the peak load periods for about eight months of the year. Gradually the whole distribution system would be changed to three-phase 50 cycles, and the other generating stations changed into sub-stations, and finally the three remaining alternating-current generating stations would themselves be shut down as the extensions progressed. If the new large generating station were situated about ten miles from the centre of the city Dr. Klingenberg estimated that the conversion of the existing 50-cycle and direct-current distribution networks on the lines indicated could be carried out at a cost of about £15 10s. per kw. installed. Allowing a 10 per cent. capital charge on the new generating station, 8 per cent. on the twenty-five old 50-cycle generating stations, and 8 per cent. on the distributing system, the total costs per kw.-hour sold would be reduced from about 2.345d. to 1.97d. At the same time the capital would be increased from £9,191,500 to £10,905,000, i.e., by £1,713,500.

During the discussion, Dr. S. Z. de Ferranti explained that, owing to the position of affairs in London at the present time, many engineers capable of discussing critically Dr. Klingenberg's proposition were unable to do so, but it was his opinion that no change of the magnitude suggested would be brought about unless some great advantage to the public was shown. The new scheme would have to be so comprehensive that the cost of electricity to the consumer would be brought down to a low figure, sufficiently low to make the use of electricity universal, and then the capital cost would be so great that the large commitments of the past would sink into insignificance. In conjunction with Mr. J. F. C. Snell, Dr. Ferranti pointed out the necessity of any new large generating station being built where a constant plentiful supply of cooling water could be obtained. No station employing any thermal process of energy conversion could be erected on the coalfields without this condition being fulfilled. Mr. Snell's opinion is that it would pay to continue and to extend eight of the sixty-four existing generating stations in London, to extend about ten other stations to a limited degree, and to supersede the remainder. He thinks that there is now no chance of London getting the traction load for many years to come, and without it the conditions of supply cannot be greatly improved, as Dr. Klingenberg showed in his Address, unless this very important demand, which should have been acquired about eight or nine years ago, is supplied from the same system as the other classes of load. There should be built a new bulk generating station on the Thames from ten to fifteen miles from the centre of the city, and the whole supply should be under one authority, with the existing concerns retained as distributors. Mr. W. C. P. Tapper, Electrical Engineer and General Manager of the Stepney Borough Council, who also spoke in the discussion, appeared to regard it as disadvantageous as regards business to do away with direct-current networks for the power load, especially on account of the effect of the power factor on the size of mains and generators. Perhaps, however, it would not be

too unreasonable to hope that, by the time Dr. Klingenberg's proposals, or something on the same lines, become a *fait accompli*, the various methods of improving power factors will have been sufficiently perfected.

Some of the other points dealt with in Dr. Klingenberg's Address may be summarised as follows: In Berlin and Chicago there are six generating stations of an average size of 23,000 kw. and 37,000 kw. capacity respectively, while in London the average size of the sixty-four generating stations is only 4,670 kw. To meet present-day requirements in large cities feeder cable pressures should not, he said, be lower than between 20,000-30,000 volts, so that as much as 10,000 kw. can be transmitted through one cable when the cost of the cable per kilometre per kw. transmitted is reduced to about 2s. 6d. The cost of this part of an installation would then become of less relative importance than hitherto. Dr. Klingenberg made use of the expression "utilisation" or "utility factor," a term apparently regularly employed on the Continent, to indicate what is known here as the plant load factor, namely the ratio of the average load sold to the plant capacity. The power consumption per head of population is about 310 kw.-hours per ann. in Chicago, 170 in Berlin and 110 in London. While the total capital costs per kw. of the same cities are about £60, £47 10s., and £73 respectively. The "utility factors" are about 33 per cent., 18 per cent., and 12.2 per cent. in these towns. In Chicago the traction load predominates (approx. 70 per cent.), in London the lighting load predominates (approx. 60 per cent.), and in Berlin the power, lighting, and traction loads are in a more even ratio. A study of all the conditions prevailing led the lecturer to the conclusion that by centralisation alone the load factor in London could not be appreciably improved; what was necessary was to alter the nature of the consumption. It was also shown that for values of the utility factor between 10 and 30 per cent., the selling price could be reduced by more than 8 per cent. for each advance of 1 per cent. made in utilisation without extensions or alterations to existing plant.

Dr. Klingenberg said that the reason why he suggests cable transmission at 100,000 volts three-phase are that, as the neutrals of the system would be earthed, the pressure between earth and conductors would be only 60,000 volts, and single-core, lead-covered cables laid direct in the ground with mechanical protection would be employed. "It should be borne in mind," he said, "that with such high pressures and the attendant high strain on the insulation, the idea of employing cables cannot be entertained unless the energy to be transmitted is very considerable and the sections of the cable become large in consequence. The recent development towards large power stations and long-distance transmission has therefore advanced conditions in favour of high-tension cables, so that for installations of this kind under certain circumstances as are encountered in large cities, cables appear to be equally satisfactory or even superior to overhead transmission lines." It appears that, with a coal freight at 3s. 6d. per ton, and with a normal utility factor, it would be cheaper to build a new bulk-supply generating station near the city than at the coal mines.

**Edison Battery Cars.**—Certificates have been issued by the Royal Automobile Club in respect of two tests of an Arrol-Johnston-Edison electric coupé entered by Edison Accumulators, Ltd. (283 Duke Street, Piccadilly, W.). The first trial was abandoned, due to mechanical trouble with the back axle, but the result of the second trial on Nov. 11th is given in the certificate as follows:—"The trial, which was to show the distance travelled on one charge, was held on Brooklands Track. The weight of the car was 3,064 lb. (27½ cwt. approx.)—i.e., front axle, 1,487 lb.; back axle, 1,577 lb. The running weight, with passengers, was 3,429 lb. (30½ cwt. approx.). The car ran without stopping 54.85 miles at an average and even speed of 15.99 miles per hour. It then stopped on the slope of the track (behind the Members' Hill)."

**The Physical Society's Annual Exhibition.**—This exhibition, which is to be held on Tuesday next, Dec. 16th, at the Imperial College of Science, South Kensington, will be open in both the afternoon (from 3 to 6 p.m.) and in the evening (from 7 to 10 p.m.). Prof. the Hon. R. J. Strutt, F.R.S., will give a discourse at 4.30 on "Spiral Electric Discharges," and Mr. Louis Brennan will show some experiments with soap films at 8.30 p.m. Some thirty firms will be exhibiting, and there will also be certain experimental demonstrations. Invitations have been given to the Institution of Electrical Engineers, the Institution of Mechanical Engineers, the Faraday Society, the Optical Society, and the Röntgen Society. Admission will be by ticket only, and members of the societies just mentioned and of the Physical Society desiring to attend the Exhibition should apply to the Secretary of the Society to which they belong.

## THREATENED STRIKE OF ELECTRICAL WORKERS

### New Electrical Masters' Association : Strike at Pearl Assurance Building

SOME important developments affecting the wages and conditions of wiremen in London are taking place in connection with a demand by the Electrical Trades Union for an increase of the standard rate of wage from 9½d. to 11d. per hour, for an accepted code of working rules, and for corresponding increases to other grades of electrical workers. The matter was first brought into prominence last month, when a letter dated November 11th was sent by the London Secretary of the Electrical Trades Union to some 600 electrical contractors and building firms in the Greater London area, pointing out that the conditions of living in London during recent years involve considerable extra expense, and quoting the Board of Trade figures of a general increase in living expenses of 15 per cent.

The difficulty was at once apparent that there was no masters' association in London which could negotiate with the Electrical Trades Union, for the Electrical Contractors' Association is unable by its Articles of Association to deal with matters relating to wages. It was thereupon decided to call a meeting of the electrical contractors, electric supply companies, and municipal bodies employing electrical wiremen, in order to discuss the question. This meeting took place at the Institution of Electrical Engineers on Wednesday last week, and the outcome was the formation of the London 'Electrical Masters' Association, the membership of which will consist of "Persons, firms, companies or corporations employing men engaged in any class of electrical work, and whose registered address is within the area of Greater London." The objects of the Association are, *inter alia*, to enter into agreements with trades unions or other organised bodies of employees, and to act as a body of reference to adjust any complaints or differences. The organisation will consist of a standing committee, and the first members of this are:—J. H. Bowden (Borough Electrical Engineer, Poplar), Chairman; L. H. Hordern (Westminster Electric Supply Corporation); F. J. Walker (St. James & Pall Mall Electric Light Co.); D. Mackness (Trollope & Colls); H. Marryat (Marryat & Place); A. R. Phipps (Rashleigh Phipps & Co.); W. R. Rawlings (Rawlings Bros.); L. L. Robinson (Borough Electrical Engineer, Hackney); H. B. Read (Edmundson's Electricity Corporation); H. F. Simon (Electrical Installations, Ltd.); F. H. Starling (Blackburn, Starling & Co.); D. H. Strode (Strode & Co.); G. E. Taylor (G. E. Taylor & Co.); Duncan Watson (Duncan Watson & Co.); L. G. Tate (Secretary).

This Standing Committee met on Monday, and appointed the following Sub-Committee:—Duncan Watson, F. J. Walker, E. Radford, H. F. Simon, and F. H. Starling, with the Chairman and Secretary *ex-officio* members.

Consideration has been given to the letter of November 11th, already referred to, and a reply has been sent, stating that the Committee will be prepared to meet representatives of the Union at a conference to be held during the month of January if the following conditions are agreed to:—

- (a) That there shall be no stopping of work or interference with non-Union men now or while the matter is under discussion.
- (b) That where any interference has already taken place, the same shall be immediately stopped and work resumed.
- (c) That the rule adopted by most trades as to interference with other trades be included in any agreement come to, namely:—

No exception shall be taken to the employment or non-employment of a man on the ground that he is or is not a member of the Trades Union, neither shall any exception be taken to the employment of a man in any other trade on the ground that he is or is not a member of a Trades Society.

#### STRIKE AT PEARL ASSURANCE CO.'S BUILDING.

In the first week of its existence the new Association is faced with the task of solving some important questions which have arisen in connection with the strike of electrical wiremen at the Pearl Assurance Co.'s new building in Holborn. Messrs. Duncan Watson & Co. are carrying out the electrical installation there, and were employing upon it sixteen men, half of whom were members of the Electrical Trades Union. On Tuesday morning of last week, however, without any warning, the firm was notified that unless all the men joined the Union the others would be withdrawn at midday. Mr. Duncan Watson flatly refused, and the Union kept its word, at the same time inducing some 165 men in other trades to follow suit. The non-Union men, who are the permanent employees of Duncan Watson & Co., however, are still at work, and so far as the other trades are concerned, the respective Unions, we understand, disclaim all responsibility. Some time ago, on the same building, a dispute arose between the Electrical Trades Union and Messrs. Duncan Watson & Co. over the employment of pipe-fitters for the piping and conduit work, under the control of a competent foreman, it being convenient to do this before any of the wires were

drawn in. The Union claimed that electrical wiremen should be employed on this work, but the firm resisted, and the matter died out. It may not be without significance that the present strike is the eighth which has taken place amongst the various workmen employed on the Pearl building.

These are the facts of the latest strike on this building, but it is not the first time that Messrs. Duncan Watson & Co. has had disputes with the Union. In an interview with Mr. Duncan Watson, our representative was informed that two years ago, on a contract for the Home Office at Wormwood Scrubs, seven charges were made against Mr. Watson's firm of not paying the recognised rate of pay. A Home Office investigation found six of these not proved, whilst as to the seventh, independent arbitration decided that, in the absence of any recognised rate of pay for men fixing transformers—which was the work in question—the man complained of should, they thought, have been paid an extra ½d. per hour for 3½ hours out of three days' work on the job! At that time we are assured that the firm paid 10d., 9½d., and 9d. per hour to its men, according to qualifications, and that at present the rates paid are 10½d., 10d., 9½d., and 9d. per hour.

Mr. Watson stated that he has considerable evidence that following the Wormwood Scrubs incident, the Union, or someone connected with it, for a long time sent communications to a number of his clients making allegations against the firm. This practice, however, was abandoned later. Mr. Duncan Watson is emphatic that he never has, and does not now, make it a condition of employment that a man should not belong to the Union, but he is equally emphatic that he shall be free to employ non-Union men when he pleases. In this he has the whole-hearted support of the new Masters' Association, as will be seen from the letter set out above. Facilities have even been given to the men to hold meetings on the firm's premises—in the absence of the principals—to discuss the whole position, and the Secretary of the Trade Union has been present. Later, one or two of the Union men admitted they knew nothing of the rules of the Union, which, by the way, we understand are regarded as unsatisfactory by the officials, and are under revision.

Mr. Watson agrees that there are matters which require adjustment as between the masters and men in the electrical trade, but regards, in the first place, absolutely necessary that grading of workmen must be recognised in the absence of any apprenticeship system. In all the allied trades the men are paid according to qualifications, and he suggests that a recognised system of grading could be drawn up by a joint committee of employers and employees, with an independent chairman. Under such a system no employer could pay a man less than the recognised rate for his grade, especially if some system of apprenticeship and registration could be evolved, which he does not think impossible. Another matter which he thinks should be provided against is the making of statements which might be of a libellous character by the Unions to clients of contractors, these being made in the full knowledge that the Unions are "without the law."

It is felt that the present action of the Union was an attempt to get practically all wiremen into the Union before the proposed meeting of employers took place. It is significant, however, as we pointed out in connection with the recent Home Office strike (see ELECTRICAL ENGINEERING of August 28th, p. 486, and September 11th, p. 512), that very few of the leading London contractors employ any large number of Union men, and as the relationship between the non-Union employees and their employers has in most cases been of the most harmonious character, there is a determination on the part of the masters to resist any such interference. The whole position at the Pearl building is now under consideration by the Masters' Association, and it is no longer a matter between the Union and Messrs. Duncan Watson & Co.

**Institution of Electrical Engineers.**—The following is the result of the ballot for new members at the meeting on Thursday:—*Member:* W. P. Allen. *Associate Members:* Capt. D. S. Collins, R.E., Capt. B. C. Gardiner, R.M.L.I., Lieut. H. de C. Toogood, R.E. *Graduates:* H. D. Carter, R. E. Hume-Williams, W. G. P. Wall. *Students:* T. C. Angus, F. L. Ballard, S. N. de Moura, M. Dewhurst, R. Fruhe-Sutcliffe, C. F. Lane, J. M. Parikh, C. W. Parry, A. B. Reynolds, W. Young. *Candidates transferred. Student to Associate Member:* B. B. Pradhan. *Student to Associate:* H. A. Carney. *Student to Graduate:* H. Price.

**Electric Smoke Abatement.**—The *Electric City Magazine* of Chicago describes a novel application of the electric discharge in smoke prevention. The principle of the method is to charge the soot particles from a corona discharge as the smoke passes through a settling chamber in the stack. They then cling together and fall by their own weight instead of being carried out into the atmosphere. It is stated that an expenditure of 300 watts will clean effectively a flow of from 800 to 1,000 cubic feet per minute of the densest black smoke. The wires are arranged on insulators, so that the smoke passes through about four feet of carbon discharge. The draught is not interfered with, and the ozone produced tends to purify the gases.



# FOR XMAS TRADE

## "GEEKO"

### ELECTRICAL NOVELTIES

**New List** (No. 01734) **Just Published**

POST FREE ON REQUEST.

Containing Prices and Particulars of an extensive range of "Geeko" Electrical Novelties suitable for Xmas Presents, etc. Profusely illustrated with latest designs in Pocket Lamps, Torches, Hand Lamps, Cycle Lamps, Lanterns, Floral Table Decorations, Electric Models, Electric Clocks, Cigar Lighters, Electric Candles, Massage Vibrators, Hair Dryers, Advertising Novelties, etc., etc.

"Geeko" Electrical Novelties are becoming more and more popular, especially at this season of the year. Retailers should therefore get busy—a display of "Geeko" Novelties in your window or on your counter will assist your sales.

## THE GENERAL ELECTRIC COMPANY, Ltd.



**HEAD OFFICE:** 67, QUEEN VICTORIA ST., LONDON, E.C.

Telephone: LONDON WALL 3600 (20 lines). Telegrams: "ELECTRICITY, CENT, LONDON."

*Branches:* Manchester, Birmingham, Glasgow, Newcastle, Cardiff, Dublin, Belfast, Bristol, Swansea, Liverpool, Leeds, Sheffield, Nottingham, Hull, Southampton, &c.



## ANNOUNCEMENTS RELATING TO PATENTS.

*Small Prepaid Advertisements with regard to Patents, &c., are inserted on this page, facing our Patent Record, at 1d. per word (minimum 5s.); three insertions for the price of two. Rates for displayed and card advertisements on application.*

*Advertisement matter, accompanied by a remittance, should be addressed to the Kilowatt Publishing Co., Ltd., 203 Temple Chambers, London, E.C.*

The Owner of Patents Nos. 24,696/10 relating to "Improvements in apparatus for the production, strengthening, and reception of ELECTRICAL VIBRATIONS," and 13,968/11 relating to "Improvements in ELECTRIC CAPACITATIVE-INDUCTIVE COUPLINGS," is desirous of negotiating with interested parties for the granting of licenses thereunder on reasonable terms. For information apply to MESSRS. LLOYD WISE & Co., Chartered Patent Agents & Consulting Engineers, No. 10 New Court, Lincoln's Inn, London, W.C.

## John E. Raworth,

Queen Anne's Chambers, Chartered Patent Agent  
30, Broadway, Westminster, London, S.W.

## REMOVAL.

Mr. J. G. LORRAIN, M.I.E.E.,  
M.I.Mech.E., Chartered Patent  
Agent, has removed his office from Norfolk House, Norfolk  
Street, Strand, W.C., to  
Staple Inn Buildings, High Holborn, London, W.C.

## ELECTRIC TRACTION NOTES

The last issue of the *General Electric Review* (New York) is devoted to a consideration of electric traction. Mr. W. B. Potter (Chief Engineer, Railway and Traction Department, American G.E. Co.) says that the mercury arc rectifier in small sizes has proved so successful that with further development it is probable the capacity of the rectifier will be increased and made suitable to meet railway requirements. The principal field of usefulness will doubtless be in sub-stations, where, under favouring conditions, it would replace the rotary-converter or motor-generator set. There is also the possibility of rectifiers being used in connection with D.C. motor equipments on locomotives supplied with single-phase current. For steam railway electrification, with present knowledge of the several systems and their possibilities, the choice seems to lie between the high voltage D.C. system and the split-phase system, each of which will have its particular field of usefulness, with the probability that in the majority of instances the economic advantage will be in favour of direct current. Mr. J. A. Dewhurst points out that by the beginning of next year there will be twenty-eight railways using high pressure, 1,200 or 2,400 volts, direct-current, in the United States. The total route mileage will be 1,946 miles. Seventeen of these routes are completely new, six were formerly, wholly or in part, worked by steam, three were worked single phase, and three at 600 volts D.C. Mr. C. E. Eveleth, working out the average all-day efficiencies under main-line conditions for twelve different systems, comes to the following results:—The maximum efficiency of 59 per cent. is shown by three-phase 25-cycle transmission at 100,000 volts with three-phase geared motors, and by a similar system using single-phase current. The next best system, with an efficiency of 58 per cent., is one using three-phase 25-cycle transmission and D.C. motors. Single-phase 25-cycle transmission with single-phase geared motors come next, with 57 per cent. efficiency. The split-phase systems are at the bottom of the list. With single-phase transmission at 25 cycles and split-phase geared motors the efficiency is 49 per cent., making the system eighth. The ninth system, with an efficiency of 47 per cent., uses three-phase transmission at 60 cycles and single-phase geared motors. Two systems having 46 per cent. efficiency come next. These use three-phase 60-cycle transmission with three-phase geared motors and single-phase 25-cycle transmission, split-phase geared motors driving through side rods. The lowest of the systems considered shows 43 per cent. efficiency only. In this, 60 cycles three-phase transmission and split-phase geared motors are used. High-pressure D.C. railways are not considered.

## TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

In the *Wireless World* reference is made to the Transatlantic station of the Marconi Company, which is being built near Carnarvon, to work direct with New York. The transmitting aerial consists of 32 wires of silicon bronze, supported by ten tubular steel masts each 400 ft. high, on heavy concrete foundations. The earth system consists of two wide circles of plates sunk in the ground. Extensions to this system are buried underground immediately beneath the aerial, and extending as far as the eastern extremity of the site. The main building contains the permanent transmitting section and an experimental section. The permanent section consists of a large machinery hall for two main motor-generator sets of 500 h.p., taking power from the North Wales Power Co.'s water-power station near Llanberis, and the main switchboards. The motor-generator sets used in conjunction with the transmitting plant are situated in an annexe. Adjacent to this hall are the two silence chambers containing the two transmitting discs, and behind these are the transformer room and offices, &c. The experimental section adjoins the main machinery hall on the west side, and will contain various machines to be used for special work in connection with Mr. Marconi's latest device for generating continuous waves. Power is delivered on the site through a small sub-station, where it is transformed down from 30,000 volts to 440 volts, for the main motors in the machinery hall. The plant at this station will be controlled and operated from the receiving station at Towyn, Merioneth, and land wires are now being installed to connect these two stations.

Mr. J. St. Vincent Pletts, A.C.G.I. (Chief of the Patents Department, Marconi's Wireless Telegraph Co., Ltd.), dealt with tuning and the production and behaviour of different kinds of wave trains at his fifth lecture on Wireless Telegraphy at the City & Guilds (Engineering) College, on Thursday last. To obtain very great selectivity double tuning is sometimes used, i.e., the telephone circuit is also tuned to the group frequency. In this case it is necessary for a very pure note to be used. This is generally obtained by the use of the rotating disc discharger which runs synchronously with the primary alternator, generally by being mounted on the same shaft. The use of direct current also gives very good results. It is possible to wipe out all the waves in the primary after the first half-pulse period, and the secondary oscillates in its own natural frequency. The coupling employed in this case is about 20 per cent., and between two or three oscillations take place before the spark is quenched. This method, however, does not allow for double tuning, nor can such great powers be dealt with. The use of continuous waves requires an arc, high frequency alternator or similar method, such as that of getting a single-phase current of triple frequency from a three-phase transformer, the iron of which is highly saturated. Ordinary detectors cannot detect continuous waves, so a vibrating contact known as a ticker is included in the circuit. Tuning is not possible, and also atmospheric waves cannot be so easily distinguished from the signals. Continuous waves are of most use for wireless telephony, but there is great difficulty experienced with the microphone. Dr. Goldschmidt's suggestion of using a microphone in the exciting circuit of his alternator is very hopeful. Of the methods which have been employed to eliminate atmospheric disturbances, the best is that in which two Fleming valves or two crystal detectors are used in parallel, connected in opposite directions and appropriately polarised so that one valve will rectify small alternating currents and the other will not. If a large voltage is applied, the current through the two valves is of almost equal value. Instead of a noise in the telephone, a portion of the signal is simply wiped out.

At the Council Meeting of the I.E.E. last Thursday, Dr. Alexander Graham Bell was elected an Honorary Member.

The question of the distribution of the remaining £60,000 of the National Telephone Co.'s assets will be dealt with by Mr. Justice Sargant in the Chancery Division on Monday.

The Sitka-Valdez cable failed on the 3rd inst., and on the 4th all communication to all places in the Mexican State of Chihuahua by all routes ceased.—The Cape St. Jacques-Pontianak cable is also interrupted between the former place and Paulo Condore.—The Eastern Telegraph Co. on the 9th inst. announced that the new cable between Aden and Colombo is open.—The c.s. *Mackay-Bennett* is overhauling the shore ends at Waterville of the Commercial Cable Co.

# "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

## Specifications Published December 4th, 1913

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

**Names in italics indicate communicators of inventions from abroad.**  
18,300/12. **Seal for Quartz Envelope and Metallic Conductor.** B.T.-H. Co. (*G. E. Co., U.S.A.*). A low expansion glass is mixed with progressively larger quantities of silica to make a series of melts. The glass is finely powdered, and ground quartz added. The different glasses resulting are used successively from the quartz tube till a glass having the same expansion as tungsten is available. A tungsten or molybdenum leading-in wire fused into this makes a vacuum-tight seal. Two figures.

25,418/12. **Indicating Speed of Trains.** H. F. C. WHITEHEAD. The vibrations resulting from the passage of a vehicle over rail joints are used to close an electrical circuit and mark a moving paper. Four figures.

25,861/12. **Vehicle Lighting.** J. DE COSTER. The charging of the accumulator by the dynamo and the lighting circuits are controlled from a switchboard. To prevent over-charging, a single resistance coil is inserted in the dynamo field circuit. A multi-way switch is used to cut the dynamo out, and to connect it in circuit with or without the shunt resistance. Two figures.

27,432/12. **Incandescent Lamps.** B.T.-H. Co. (*A.E.G.*). A quantity of gas at very low pressure is kept constant throughout the life of the lamp by previously impregnating a definite porous body with the gas-producing material, and inserting this in the lamp, e.g., a very small tube of silicic acid and an organic binder are boiled in chloride of copper, then dried and drawn into wire, which is mounted in the lamp.

4,514/13. **Directive Aerials.** MARCONI Co. and C. S. FRANKLIN. A closed circuit is arranged in a vertical plane with a number of equidistant condensers inserted so that each compensates for the inductance between itself and the next condenser. The two extreme parts of the aerial are separated by half a wave-length, so that it becomes a powerful radiator and absorber, and has good directional properties.

14,711/13. **Military Projectors.** J. Y. JOHNSON. (*F.I.A.T. Fabbrica Italiana Automobili Torino and Soc. Anon. Officine Galileo, Italy*). Mirrors movable on both horizontal and vertical axes are used. An upper mirror is mounted on a telescopic support, and the height is adjusted from the ground. The mirror is controlled from a distance independently of the lighting generator through a motor. Thus the mirror can be lowered, re-elevated, and rapidly put into service again in case of damage. Two figures.

## Specifications Published To-day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free.

Summaries of some of the more important of these patents will appear in our next issue.

**Arc Lamps:** PEARCE and WILKINSON [Globes] 6,965/13.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** WILSON [Storage battery charging] 26,752/12; LAKE (*Randall and Cook*) [Wire covering machines] 27,221/12; PUCEL [Alarms for protection of conduits and mains] 3,335/12; GILES [Lightning arresters] 6,359/13.

**Dynamos, Motors and Transformers:** BOSH [Mounting brush holders] 9,264/13; ANDREWS and KETCHUM, 17,725/13.

**Electrometallurgy and Electrochemistry:** LOBECK [Sterilising milk] 18,834/12; SHELMEIDINE [Sterilising milk] 26,743/12; HELFENSTEIN [Arc furnace] 2,577/13; HELFENSTEIN ELEKTRO-OFEN-GES. [Furnace with upper charging chutes] 9,590/13; KRUPP A. G. [Furnace electrodes] 17,925/13.

**Heating and Cooking:** SCHOFIELD [Wash-boilers, &c.] 21,209/12; WHISH [Composite material for heating elements, rheostats, &c.] 23,429/12; JORDAN [Radiators, also thermogalvanometers] 26,631/12; MICHIE and PAGET [Heating and lighting] 3,864/13.

**Ignition:** SEROPIAN [Self-starter] 26,603/12.

**Incandescent Lamps:** QUAIN, 26,548/12.

**Instruments and Meters:** HAMILTON and FERRANTI, LTD. [Prepayment mechanism] 26,358/12.

**Switchgear, Fuses and Fittings:** FERRY, BIGWOOD and BROTHERTON TUBES & CONDUITS [Conduit junction boxes] 26,953/12; MARTYN [Terminals] 79/13; RAILING and MAURICE [Slade carrier] 1,286/13; WILDEY [Contacts] 1,471/13; CONNER [Switching for automobile lamps] 3,987/13.

**Telephony and Telegraphy:** DEGENHARDT [Automatic telephones] 26,499/12; LODGE [Unidirectional H.P. discharges] 29,268/12; SIEMENS BROS. (*Siemens & Halske*) [Telephone exchanges] 9,169/13; UDE [Telephone fixtures] 10,556/13; SIEMENS & HALSKE [Telephone circuits] 12,061/13 and 19,928/13, STERLING

TELEPHONE & ELEC. Co. and ALLCOCK [Radial selector switches] 15,566/13; RAPPENECKER [Transmitters for telegraph copying apparatus] 19,939/13; TIETGEN [Multiple telephony] 20,822/13.

**Miscellaneous:** B.T.-H. Co. (*A.E.G.*) [Distant transmission of positions] 27,312/12; MERRYLEES [Non-conducting coverings] 27,344/12; BAILEY & NAVALTUM [Aluminium solder] 27,835/12; MORISOT [Compresses] 29,176/12; ROZE DES ORDONS [Wireless clock-synchronising] 6,192/13; WOLF [Miners' safety lamps] 6,700/13; ERSTE SUDDEUTSCHE MANOMETERBAU ANSTALT UND FEDER TRIEBWERKFABRIK J. C. ECKHARDT [Indicating when a vehicle is in or removed from its shed] 8,508/13; DUNNE [Automatic alarms] 10,900/13; MARKS (*Maschinenbau-Anstalt Humboldt*) [Rotary magnetic separators] 11,430/13; GES. FÜR NAUTISCHE INSTRUMENTE [Gyro-compasses] 11,988/13; PEDERSEN [Gearing] 22,579/13.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Distributing Systems, &c.:** KETTERING [Control for] 7,546/13.

**Heating and Cooking:** CAMPBELL [Heating units and resistance coils] 15,014/13.

**Ignition:** RUSHMORE [Starting-motors] 29,932/12; MAILLAN [Distributing] 26,028/13.

**Switchgear:** COLAS [Contacts] 26,268/13.

**Telephony and Telegraphy:** SIEMENS & HALSKE [Circuit arrangements for connectors with multiple connections] 21,222/13.

**Miscellaneous:** DUIVEN [Preparation of electric baths] 25,668/13.

## Grant of Patent Allowed

9,673/12. **Direction "Tell-Tales."** J. C. CLARKE and CHADBURN'S (SHIP) TELEGRAPH Co. Subject to amendment, the Comptroller has allowed the grant of this patent, which is for a means of indicating whether orders transmitted by a ship's telegraph are carried out.

## Expiring and Expired Patents

The following Patents expire during the current week, after a life of fourteen years:—

24,450 of December 8th, 1899. **Automatic Telegraph Transmitters.** J. A. L. DEARLOVE and S. G. BROWN. An improved construction of automatic curbing transmitter for submarine telegraph circuits is described. The transmitting levers have arms to co-operate with the toothed end of a spring carried by an oscillating lever, so that when the needle of one lever enters a perforation in the tape this lever makes contact with a contact point carried by the oscillating lever and connected to a battery terminal, while the other transmitting lever makes contact with a fixed contact point connected to the other battery terminal. The reversing levers are pivoted to a movable plate, and have their free ends connected by an insulating link, and are oscillated by a rocking contact arm pivoted to the movable plate and flexibly connected to a rotary crank pin. A driving motor with centrifugal governor is also described.

24,718 of December 12th, 1899. **Common Battery Telephony.** J. E. KINGSBURY (*W.E. Co., U.S.A.*). A highly inductive shunt of low resistance is inserted across the terminals of a subscriber's receiver or transmitter so that a special signalling battery is not required. There are 16 claims dealing with the necessary circuit connections for ordinary, "exchange extensions," and "private extensions."

The following are the more important Patents that have become void through non-payment of renewal fees.

**Arc Lamps:** W. G. HEYS (*Scott Elec. Co., U.S.A.*) [Flame arcs with inclined carbons] 18,742/07.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** H. H. LAKE (*G. Semenza, Italy*) [Capped insulators for H.P. lines] 18,408/06; E. C. R. MARKS (*Federal Electric Co., U.S.A.*) [Insulating bushes] 18,659/06.

**Dynamos, Motors and Transformers:** SIEMENS DYNAMO WORKS (*Siemens-Schuckert*) [Commutator cooling] 17,417/08.

**Heating and Cooking:** W. A. PHILLIPS and F. R. BACON [Resistor for heaters, rheostats, &c.] 17,340/08.

**Incandescent Lamps:** A. LEDERER [Pressed tungsten filaments] 18,738/06.

**Telephony and Telegraphy:** MARCONI Co. and E. PRIDDLE [Trembler] 16,656/05; G. W. GIBBERD and O. A. ELIAS [Disinfecting telephones] 17,612/08.

**Traction:** SIEMENS BROS. (*Siemens & Halske*) [Relay for D.C. track circuits] 17,348/08.

**Miscellaneous:** W. FAIRWEATHER (*Arnold Magnetic Clutch Co., U.S.A.*) [Clutch for throwing load gradually on to A.C. motors] 17,741/04; C. WIENER [Perforated sheet music recording and reproducing] 17,269/08.

**DO YOU USE  
LARGE  
MOTORS?**

**INSIST ON**

**'IGRANIC'**

**MULTIPLE LEVER  
STARTERS!**

**IGRANIC ELECTRIC Co. Ltd.  
LONDON and BEDFORD.**

## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONER:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competition replies in this column.

**ANSWERER:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,367.

The composition of an oil-resisting alloy is required, suitable for cast metal tanks, for use with oil-immersed apparatus; the alloy must have been found successful in practice, and be inexpensive to make. Any special foundry precautions should be stated. "H. R."

(The time for replies to this question has been extended to next post, Tuesday, December 18th.)

### ANSWERS TO No. 1,366.

During a sharp thunderstorm the telephone on the ground floor in a private house using electric light from the supply mains was struck by lightning. It was afterwards found that five of the metal filament lamps had their filaments completely shattered. The lamps were not in use at the time; there was not the least sign of blackening, no fuses whatever were blown, nor was there any trace of damage to the electric lighting installation. How would you account for this failure of the lamps? "F. T."

The first award (10s.) is given to "R. A. M." for the following reply:

The absence of lamp blackening indicates that the filament failure was caused by mechanical stresses, and not by excessive current. The effect of the lightning discharge would be to create electromagnetic and electrostatic fields of varying intensity in the neighbourhood of the telephone wiring, in wires, and of the instrument itself, it being assumed that the lightning went to earth at the protective gear contained in the house.

A sudden induced voltage of the filaments might be the result of stresses due to (1) electromagnetic induction of (2) electrostatic induction.

The first induced voltage of (1) it would be necessary to consider the filaments as being connected to a single wire, and so the effect of the lightning stroke would be to create a sudden induced voltage of the filaments.

The second induced voltage of (2) it would be necessary to consider the filaments as being connected to a single wire, and so the effect of the lightning stroke would be to create a sudden induced voltage of the filaments.

clude that the electrostatic effect above-mentioned is responsible for the phenomenon.

The second award (5s.) is made to "MARP," who, after dismissing the possible cause of concussion due to the sound wave of the thunderclap, proceeds as follows:—

The probable explanation is that the large quantity of atmospheric electricity which was necessary to have produced the disturbance of the telephone circuit, gave rise to an electric "field" of considerable strength for some yards round the centre of the disturbance. The action of this "field" was such as to cause the filaments to repel one another, like the leaves of a gold-leaf electroscope, and the consequent strain was sufficient to shatter them. To realise that such an effect can, and does, take place, it is only necessary to electrify a small strip of brown paper (by first heating slightly to expel moisture, and then drawing briskly through the folds of a piece of flannel), and then to bring it within an inch or so of an electric lamp. The filaments will be seen to open out quite perceptibly; in fact, with a carbon lamp they can be caused almost to touch the sides of the bulb. Imagine such an effect to be increased a hundred-fold and to occur with the rapidity of a lightning flash, and picture the result.

Among other replies received, that of "H. H." proposes a slightly different explanation, and is given below:—

The trouble experienced by "F.T." is one of many peculiar effects produced by lightning. In this case the telephone line, when struck by lightning, had a high-frequency static charge induced in it, which would discharge to earth, and at the same time it would induce a lower frequency oscillation or surge into the lamp circuit with disastrous results. It is not stated whether the lamps which were broken were a group consisting of one circuit, which is most likely the case, and also nearest to the telephone line. Similar cases to this have occurred when a wireless telegraph transmitting station has been close to houses where electric light is installed, and where fuses have blown and the wiring burnt out when the wireless station has been transmitting. Cases have also been known where high voltages have been induced even when the main switch has been open, showing that the high voltages were being induced from the antennae.

## ANSWERS TO CORRESPONDENTS

"W. A. R."—You certainly cannot assume that it would be possible for you to import lamps direct from Germany and sell them in this country without risk of patent proceedings being taken against you.

**The Northampton Polytechnic Institute.**—The annual prize distribution and students' conversation was held last Friday when the prizes and certificates were presented by Mr. J. S. Cope, Chairman of the London County Council. There was an organ recital, and choral concert, and a series of lectures were given, including one by Mr. S. Field, head of the Chemistry Department, on artificial nitrites, illustrated by demonstrations of new electric batteries by Mr. E. Kitchin, Esq. All the laboratories were open to inspection. The conversation was continued on Saturday evening, when the lecture on artificial nitrites was repeated, and an orchestral concert was given.

**Essay Competition.**—The London Natural History and Antiquarian Field Club announces that a medal and prize will be awarded for the best Paper on "The Influence of Natural Forces on the Economic Production of Electricity in the Future, Home and Foreign Purposes," during the Session to be held at the Northampton Polytechnic Institute, and submitted before March 1st, 1914. For particulars, and to see the rules, apply to Mr. H. Fielding, London County Council, 100, Abchurch Lane, London, E.C. 4.

**The Royal Institution.**—Among the Friday evening lectures to be given by Mr. H. Fielding, Esq., on the subject of "The Influence of Natural Forces on the Economic Production of Electricity in the Future, Home and Foreign Purposes," during the Session to be held at the Northampton Polytechnic Institute, and submitted before March 1st, 1914. For particulars, and to see the rules, apply to Mr. H. Fielding, London County Council, 100, Abchurch Lane, London, E.C. 4.



## "ELECTRICAL ENGINEERING" LITERARY SECTION

### NEW PUBLICATIONS

*We shall be pleased to post any of the undermentioned works to any address in the United Kingdom, Colonies, or Abroad at the prices given. Orders should be addressed to the Kilowatt Publishing Co., Ltd., 203-6 Temple Chambers, Temple Avenue, London, E.C., accompanied by a remittance.*

"The Management of Public Electric Supply Undertakings," by A. H. Seabrook. 192 pp. 9½ in. by 6½ in. (London: *Electrical Times*, Ltd.) 7s. 6d. net; abroad, 7s. 11d.

"Switchgear and the Control of Electric Light and Power Circuits," by A. G. Collis. 85 pp. 6½ in. by 4½ in. 47 figures. (London: Constable & Co., Ltd.) 1s. net; by post, 1s. 1½d. (*Electrical Installation Manual*.)

"Electric Circuit Theory and Calculations," by W. P. Maycock. 855 pp. 7½ in. by 5 in. 120 figures. (London: Whittaker & Co.) 3s. 6d. net; abroad, 8s. 11d.

"Wireless Telegraphy and Telephony without Wires." By C. R. Gibson. 156 pp. 8 in. by 5½ in. 19 figures. (London: Seeley, Service & Co., Ltd.) 2s. net; by post, 2s. 3d.

"Overhead Electric Power Transmission." By A. Still. 310 pp. 9½ in. by 6½ in. 115 figures. (New York: McGraw-Hill Book Co.; London: Hill Publishing Co., Ltd.) 12s. 6d. net.

"Transformer Practice." By W. T. Taylor. 278 pp. 9½ in. by 6½ in. 191 figures. (New York: McGraw-Hill Book Co.; London: Hill Publishing Co., Ltd.) Second edition. 10s. 6d. net.

"Electricity in the Service of Man." Vol. II., Section 1, Technology of Electricity. By R. M. Walsley. 686 pp. 9½ in. by 6½ in. 691 figures. 11 plates. (London: Cassell and Co., Ltd.) 7s. 6d. net; abroad, 8s. 6d.

"Dynamo and Motor Attendants and their Machines." By F. Broadbent. 160 pp. 7½ in. by 5 in. 82 figures. (London: S. Rentell & Co., Ltd.) 7th edition. 1s. 6d. net; by post, 1s. 9d.

"The Principles of the Application of Power to Road Transport," by H. E. Wimperis. 130 pp. 7½ in. by 5½ in. 24 figures. (London: Constable & Co., Ltd.) 4s. 6d. net; abroad, 4s. 9d.

"Electric Lighting": A Practical Guide to the Wiring of Houses and the Installing of Electric Light Plants, by A. H. Avery. 150 pp. 7½ in. by 5 in. 65 figures. (London: Cassell & Co., Ltd.) 2s. net; by post, 2s. 8d.

"Telephone Cables": A Handbook of the Design, Construction, and Maintenance of the Telephone Cable Plant, by J. C. Slippery. 147 pp. 7 in. by 4½ in. 97 figures. (Pittsburgh: J. C. Slippery.) 10s. 6d. net.

The "Mechanical World" Pocket Diary and Year-Book for 1914. 443 pp. 6½ in. by 4½ in. 71 figures. (Manchester: Emmott & Co., Ltd.) 6d. net; by post, 8½d.

"Formulae and Tables for the Calculation of Alternating-current Problems." By L. Cohen. 282 pp. 9½ in. by 6½ in. 68 figures. (New York: McGraw-Hill Book Co.; London: Hill Publishing Co., Ltd.) 12s. 6d. net.

"Naval Warfare," by J. R. Thursfield; with an Introduction by Rear-Admiral Sir C. L. Ottley. 151 pp. 6½ in. by 5 in. (Cambridge: The University Press.) 1s. net; by post, 1s. 2d. (*Cambridge Manual*.)

"Natural Sources of Energy," by A. H. Gibson. 181 pp. 6½ in. by 5 in. 17 figures. (Cambridge: The University Press.) 1s. net; by post, 1s. 2d. (*Cambridge Manual*.)

"Electric Lighting Accounts," by G. Johnson. 171 pp. 8½ in. by 5½ in. (London: Gee & Co., Ltd.) Second edition. 7s. 6d. net; abroad, 7s. 11d. (*Accountants' Library*, Vol. XXIX.)

"Handbook of Technical Instruction for Wireless Telegraphists," by J. C. Hawkhead. 295 pp. 8½ in. by 5½ in. 170 figures. (London: Marconi Press Agency, Ltd.) 3s. 6d.; abroad, 3s. 11d.

"Deutscher Kalender für Elektrotechniker." 1914. Edited by G. Dettmar. Part I. 648 pp. 6½ in. by 4 in. 229 figures. Part II. 347 pp. 6½ in. by 4 in. 154 figures. (Munich: R. Oldenbourg.) 5s. net; by post, 5s. 6d.

"Electro-thermal Methods of Iron and Steel Production." By J. B. C. Kershaw. With an Introduction by J. A. Fleming. F.R.S. 239 pp. 9 in. by 5½ in. 92 figures. 50 tables. (London: Constable & Co., Ltd.) 8s. 6d. net; abroad, 9s. 1d.

"Statistik über Starkstromanlagen," prepared by the Schweizerischer Elektrotechnischer Verein and the Verband Schweizerischer Elektrizitätswerke. 194 pp. 14 in. by 9 in. (Zurich: Fachschriften-Verlag & Buchdruckerei A.-G.) 9s. net; by post, 10s.

"Insulation and Design of Electrical Windings," by A. P. M. Fleming and R. Johnson. 224 pp. 9 in. by 5½ in. 102 figures. (London: Longmans, Green & Co.) 7s. 6d. net; abroad, 8s. 1d.

"Leitfaden der drahtlosen Telegraphie für die Luftfahrt," by M. Dieckmann. 214 pp. 8½ in. by 6 in. 150 figures. (Munich: R. Oldenbourg.) 8s. net; by post, 8s. 6d.

"Die Theorie Moderner Hochspannungs-Anlagen," by A. Buch. 358 pp. 9½ in. by 6½ in. 118 figures. (Munich: R. Oldenbourg.) 14s. net; by post, 15s.

"Alternating Currents and Alternating-Current Machinery," by D. C. Jackson and J. P. Jackson. 968 pp. 9 in. by 5½ in. 526 figures. (New York: The Macmillan Co.; London: Macmillan & Co., Ltd.) New edition, 28s. net; abroad, 24s. 1d.

"Jahrbuch der Elektrotechnik," for 1912. By K. Strecker. 228 pp. 9½ in. by 6½ in. 16 figures. (Munich: R. Oldenbourg.) 8s. net; by post, 8s. 8d.

"Mechanical World" Electrical Pocket Book for 1914. 240 pp. 6½ in. by 4 in. 129 figures. (Manchester: Emmott & Co., Ltd.) 6d. net; by post, 8d.

"Automatic Telephony," by S. Turner. 32 pp. 7½ in. by 4½ in. 18 figures. (London: S. Rentell & Co., Ltd.) 6d. net; by post, 7d.

### REVIEWS OF BOOKS

**The Management of Public Electric Supply Undertakings.** By A. H. Seabrook. 192 pp. 9½ in. by 6½ in. (London: *Electrical Times*, Ltd.) 7s. 6d. net.; abroad, 7s. 11d.

Mr. Seabrook's tireless energy and love of organisation are well known to all our readers who take an interest in public electric supply undertakings, and the notable results which he has achieved at West Ham and Marylebone certainly qualify him to speak with authority on central station management. The substance of the book before us was embodied in a series of lectures given last winter at the East London College, which were reported in *ELECTRICAL ENGINEERING* at the time. Many will be glad, however, to have the author's views in book form, and no one, whether they see eye to eye with him from all points of view or not, will lay down the volume without having been deeply interested. Mr. Seabrook will not mind our saying that he shines more as a manager than as a *littérateur*. Sometimes he is needlessly diffuse in his explanations, and sometimes his style is a little jerky, and this feature is intensified by the unkind treatment he has received from the printers, who have arranged almost all the sentences as separate paragraphs, with white spaces in between. We will not dwell here too much on the scheme of the contents, as those who followed the reports of the original lectures will know pretty much what ground is covered. We must remark, however, that there is a great deal of general matter, such as the relations of employer to employed, which has little to do with electric supply in particular, but is common to all businesses, and, indeed, common knowledge, if not simply common sense. Nevertheless, Mr. Seabrook treats it all with a characteristic freshness, and we do not regret having seen it expounded as part of his philosophy. In the part of the book relating specifically to electric supply management, he gives us a detailed account of the methods which he employs at Marylebone, where the keynote is system, thoroughness and possibility for the chief to get in touch with the smallest details when required. Many will regard his multiplicity of printed forms and rubber stamps with distaste, and even amusement, but it must be remembered that no two undertakings are the same. Methods which suit one would not suit another. Again, much depends on the personalities of the men in control. Some staffs can do their work better fenced in with elaborate formalities, and would become untidy and purposeless without them, while others would chafe in such a harness, and require a freer system. The portion relating to the sales department will be read with great interest by all supply managers, and those who



New and Standard

Books Published by

## CROSBY LOCKWOOD & SON.

**ELECTRIC WIREMEN'S WORK.** A Text Book in three Sections, suitable for Installation Inspectors, Electricians, Wiremen, Students, and others engaged in the Electrical Trades. By J. H. HAVELOCK, A.M.I.E.E. Fully Illustrated, with numerous Tables. [Nearly ready.]

**WIRELESS TELEGRAPHY: Its Theory and Practice.** A Handbook for the use of Electrical Engineers, Students and Operators. By J. ERSKINE-MURRAY, D.Sc. Fourth Edition. 10s. 6d. net.

**THREE - PHASE TRANSMISSION.** A Practical Treatise on the Economic Conditions governing the Transmission of Electrical Energy by Underground and Overhead Electrical Wires. By WM. BREW, M.I.E.E. 185 pages, 82 Illustrations. Demy 8vo, cloth. 7s. 6d. net.

**ELECTRICAL ENGINEERING.** A First Year's Course for Students. By TYSON SEWELL, A.M.I.E.E. Fifth Edition, revised, with Additions. Large Crown 8vo, cloth. 460 pages, with 278 Illustrations. 5s. net.

**FACTORY ACCOUNTS: Their Principles and Practice.** By EMILE GARCKE and J. M. FELS. Sixth Edition, revised and enlarged. Demy 8vo, cloth. 314 pages. 6s. net.

**ELECTRIC TRACTION AND TRANSMISSION ENGINEERING.** By SAMUEL SHELDON and ERICH HAUSMANN. 317 pages. 127 Illustrations. Large crown 8vo, cloth. 12s. net.

**ELECTRIC WIRING, DIAGRAMS & SWITCH-BOARDS.** By NEWTON HARRISON. Crown 8vo, cloth. 5s. net.

**ELECTRICAL & MAGNETIC CALCULATIONS.** By A. A. ATKINSON. Crown 8vo. 9s. net.

**ELEMENTARY ELECTRICAL ENGINEERING.** In Theory and Practice. A Class Book for Junior and Senior Students and Working Electricians. By J. H. ALEXANDER. 220 pages. 181 Illustrations. Crown 8vo, cloth. 3s. 6d.

**WIRELESS TELEPHONES: and How they Work.** By J. ERSKINE-MURRAY. Second Edition. 1s. 6d. net.

**DYNAMO MOTOR, AND SWITCHBOARD CIRCUITS FOR ELECTRICAL ENGINEERS.** A Practical Book dealing with the subject of Direct Alternating, and Polyphase Currents. By WILLIAM R. BOWKER. Second Edition, revised. Medium 8vo, cloth. 109 Diagrams. 7s. 6d. net.

**ELEMENTARY ELECTRICAL CALCULATIONS.** A Manual of Simple Engineering Mathematics. By T. O'CONNOR SLOANE. 314 pages. 43 Illustrations. Crown 8vo, cloth. 9s. net.

**STANDARD ELECTRICAL DICTIONARY.** By T. O'CONNOR SLOANE. 7s. 6d. net.

**ALTERNATING AND DIRECT CURRENT DYNAMOS.** A Text-Book on their Construction for Students, Engineer Constructors and Electricians-in-Charge. By TYSON SEWELL, A.M.I.E.E. 328 pages. 230 Illustrations. Large Crown 8vo, cloth. 7s. 6d. net.

**ELECTRIC MOTORS: Their Action, Control, and Application.** By F. B. CROCKER and M. ARENDT. 10s. 6d. net.

**ELECTRIC POWER CONDUCTORS.** By W. A. DEL MAR. 9s. net.

**WIRELESS TELEPHONY: in Theory and Practice.** By ERNST RUHMER. Translated from the German by J. ERSKINE-MURRAY. Demy 8vo, cloth. 10s. 6d. net.

Complete Catalogue post free on application.

London: Crosby Lockwood & Son  
7, Stationers' Hall Court, E.C., & 5, Broadway, Westminster, S.W.

are not weary of the subject will appreciate the chapters on tariff systems. Mr. Seabrook has conferred a benefit on his brother central station men by giving freely of the results of his experience, and has interested them with a revelation of his philosophy. Whether all will find his methods suitable for adoption, or will agree with all his views, is another matter. His object in writing the book will have been more than half achieved if he infuses his enthusiasm into his readers and makes them always realise that sound business methods are as essential in electric supply undertakings as in any other enterprise.

**Switches and Switchgear.** By R. Edler. Translated by Ph. Laubach. 401 pp. 9 in. by 6 in. 365 figures. (London: Constable & Co., Ltd.) 15s. net; abroad, 16s.

This is an English translation of a standard German work on switchgear, and is essentially a professor's book rather than a workshop or drawing office treatise. Numerous standard pieces of apparatus have been selected, and their theory and principles of design have been carefully explained and developed by the aid of elementary mathematics, though occasionally the calculus crops up. Of course, a work of this character cannot hope to deal with up-to-date apparatus, as the theory must limp painfully after the actual application, but at the same time the principles enumerated should be sound for all time.

To English readers quite a number of apparatus appears strange and unfamiliar, particularly the air-break H.T. switches for pole-mounting; nevertheless they have done and are still doing excellent service on Continental overhead systems. They are described at considerable length, but although low-tension switches of various kinds are also described, the heavy current types are rather inadequately treated. Oil switches are despatched in eleven lines, and their advantages over other types are set out under ten heads, from the last of which we extract: "Oil switches can be used, indeed, in places not entirely fireproof; even, perhaps, in places where there is direct danger from fire." British and American engineers have other views.

The design of fuses is well treated, particularly those of the tubular pattern, but relays and circuit breakers are dismissed rather hurriedly. Over 220 pages are devoted to motor starters, controllers and their resistances, their theory being clearly set out in an elementary manner.

The work should be useful to students and teachers, but will be of only limited interest to practical workers.

**Electrical Meters.** By C. M. Jansky. 870 pp. 9½ in. by 6½ in. 278 figures. (New York: McGraw-Hill Book Co.; London: Hill Publishing Co., Ltd.) 10s. 6d. net.

The word meters is used in the title to cover all classes of indicating and recording, as well as integrating instruments. The author, in his preface, discounts one very obvious criticism by the following sentence:—"Since, in this country, instruments of foreign make are used to such a limited extent, this work is confined almost entirely to instruments made in the United States, and to American practice." As the result, one looks in vain for a description of such an instrument as the ohmmeter, so indispensable in this country, and the use of which is becoming much more common in the States. Again, the deflectional electro-dynamometer ammeter, so much used in Germany, and to a smaller extent in this country, is barely alluded to. A serious drawback from the point of view of the student, to whom the work is professedly addressed, lies in a certain looseness of expression, verging in some instances on inaccuracy. Thus the author says: "The square root of the mean square value is called the effective value, and is the value given by all alternating-current instruments." Although certainly "a consummation devoutly to be wished," it is unfortunately not always attained. The author seems to have made good use of the space at his disposal, although at the same time it would hardly appear necessary to inform the reader in a book on so special a subject that "the resistance of a conductor is analogous to the resistance a water-pipe offers to the flow of water." Again, some seven pages are devoted to a description of the mercury ammeter, which, whilst undoubtedly a very ingenious instrument, hardly warrants so lengthy a description. On the other hand, only half a page is allotted to the extremely important subject of current and potential transformers upon which concise information is badly wanted.

The sections devoted to induction-type ammeters, voltmeters and wattmeters are particularly good and should serve to make clear the principles upon which these instru-

ments work. The chapters at the end dealing with testing and with the errors to which various instruments are susceptible will also be found interesting, if possibly somewhat diffuse. The usefulness of the volume would have been much increased had references been given to the source of some of the information, and also as indicating where further details could be obtained. Such remarks as, "According to one writer," and so forth, are somewhat unsatisfactory. The author's method of classification leaves something to be desired. He classes as "Electro-Magnetic" instruments of the moving iron, permanent magnet moving coil and induction types, while "Electro-Dynamic" instruments are "those whose actuating forces are due to currents flowing through the coils without iron cores." It might be asked in which category he would place a moving coil instrument provided with an electro-magnet in place of a permanent magnet; or again, a dynamometer instrument having an iron core. As regards the latter, it seems a pity to emphasise the distinction between dynamometer instruments with and without iron, now that it has been shown by Drysdale and others that, provided proper precautions are taken, iron can be introduced without in any way interfering with the electrical properties of the instrument. To those in search of a single volume containing information on the whole subject of "Meters," both Indicating, Integrating and Graphic, but exclusively of American origin, this book should prove valuable. To the English "student" it will hardly appeal.

**Overhead Electric Power Transmission.** By A. Still. 310 pp. 9½ in. by 6½ in. 115 figures. (New York: McGraw-Hill Book Co.; London: Hill Publishing Co., Ltd.) 12s. 6d. net.

THE author of this book is a well-known authority on transmission line problems, and in the present volume he has succeeded in combining theory and practice in a most praiseworthy manner. The calculations for the design of overhead transmission lines are worked through with the aid of only the most elementary mathematics, and, in each case, the practical aspects of the problem are thoroughly discussed. Thus in applying Kelvin's Law for the determination of the most economical conductor section, the author deals fully with the unit value, which should be taken for the energy lost in transmission in different circumstances, the most difficult, but yet the most important, factor in the argument. The influence of the transmission line voltage on the relative cost of the rest of the power system is also discussed. Approximate methods of calculating the regulation of transmission lines, the influence of the line characteristics on resonance effects and surges, and other similar problems are clearly dealt with. The chapter on insulation and lightning protection is most interesting reading, but the author devotes far too small a space to the theory of the suspension insulator, the peculiar distribution of potential along the string of units being only vaguely referred to. Some curves illustrating this would have been most helpful. It is refreshing to find an American author who is not wholly wedded to the aluminium arrester for line protection. Mr. Still warns the reader against certain unpleasant effects produced by the aluminium arrester, and suggests that in many cases the less costly arrangement of a series of horn-gaps, with graded resistances, would be equally effective. A short description is given of the Thury high-tension direct-current transmission system, and the advantages and disadvantages are enumerated. The effects of wind and ice loading of overhead wires are thoroughly discussed, and general rules are laid down for calculations. The appendix includes the calculation of the inductance of unsymmetrically-arranged three-phase conductors, and of the stresses in flexible tower lines, also a model specification for overhead lines.

**Switchgear and the Control of Electric Light and Power Circuits.** By A. G. Collis. 85 pp. 6½ in. by 4½ in. 47 figures. (London: Constable & Co., Ltd.) 1s. net; by post, 1s. 1½d. (Electrical Installation Manual.)

To write a satisfactory treatise on switchgear, including an insight into the intricacies of modern methods of generator and feeder protection in some seventy small pages of large type is not an easy task, and, as might be expected, conciseness is carried rather to excess in the endeavour to cover the whole field. Mr. Collis, however, only wishes this little manual to be regarded as an introduction to his large detailed work recently reviewed in our columns, but it must be said that the way in which he has managed to touch upon many branches of the subject in so small a space is wonderful. He makes good use of diagrams of connections, and divides the subject-matter up under headings in a

convenient way, dealing successively with direct-current switchboards, alternating-current switchboards, and feeder protection. The book is more than a mere *résumé* of standard practice, such as might be given in the form of a series of standard diagrams, and contains not a little comment and expression of opinion, such as should help those desiring a general view of this subject to look at the matter from a reasonable point of view. In dealing with mining switchgear we notice that the author is not in favour of wide flange joints for rendering cases flame-proof. Here his view is certainly at variance with many authorities of wide experience. He strongly urges that all contacts be broken under oil, and quotes extensive experiments of his own to meet such objections as have been advanced against the use of oil switches for direct currents. These experiments entitle him to speak with some authority on oil switches in general, and his remarks in the A.C. section of the book on the enormous pressures that may be developed when circuits carrying large powers are broken under oil are very interesting. He rightly points out the futility of the usual methods of rating the breaking power of circuit breakers in relation to their normal load without taking into account the nature of the rest of the circuit. Various forms of protection are briefly described, but we should have liked to see the Merz-Price system dwelt on a little more, and distinguished by name from other balance systems, and this part of the work extended somewhat even at the expense of the more elementary portions. With many, Mr. Collis views the extreme complication of protective gear as a passing fashion, and rejoices that simplicity in switchgear is coming to its own once more.

**Electric Circuit Theory and Calculations.** By W. P. Maycock. 355 pp. 7½ in. by 5 in. 120 figures. (London: Whitaker & Co.) 8s. 6d. net; abroad, 8s. 11d.

Those who are "weak in figures" may find in this work much of interest and use, but the larger number of students of installation work may prefer something more concise. The book, we are told, is intended for the beginner, and no one would doubt that for a moment, as there is a self-contained section on elementary arithmetic, and the multitudinous examples given in the electrical part are worked through step by step each time. But little space is devoted to the magnetic circuit, though power calculations for D.C. and A.C. motors are dealt with, and much useful information for those not well versed in the subject may be found on insulators, cables, distributing systems, heating, light, illumination, insulation testing, &c. The author strives to emphasise the meanings to be attached to different technical terms in common use, and in so doing rather spoils the literary merits of an otherwise well written, if prolix, book. It seems wrong to assume that the reader is more likely to have a knowledge of elementary electricity and magnetism, and yet not know how to multiply and divide decimal fractions. Broadly speaking, the requirements of the City and Guilds, Grade I. and Final, examinations in electric wiremen's work are met, though it is not the object of the book to prepare for examinations only.

**Wireless Telegraphy and Telephony without Wires.** By C. R. Gibson. 156 pp. 8 in. by 5½ in. 19 figures. (London: Seeley, Service & Co., Ltd.) 2s. net; 2s. 8d.

The author of this work has previously written a number of books on popular science which have been well received, and the volume now under consideration will no doubt add to his reputation in this field. The matter is well arranged and reproduced, and clear diagrams and photographs are given. Considering the ground covered, a remarkably clear and concise account of the rise of wireless to its present important position is given, and as no knowledge of electrical matters is assumed, the author deftly enables the reader to form a mental picture of the chief actions which are taking place. For this purpose he is early introduced to the rudiments of the electron theory as we know it to-day. In addition to a full index, a glossary of the terms used is given, as well as a *résumé* of the more important discoveries and events relating to wireless from 1881 to 1918.

**The Principles of the Application of Power to Road Transport.** By H. E. Wimperis. 130 pp. 7½ in. by 5½ in. 24 figures. (London: Constable & Co., Ltd.) 4s. 6d. net; abroad, 4s. 9d.

We have here in book form the substance of a series of lectures given at Finsbury Technical College by the author recently, and a readable and useful manual to put our ideas in order regarding the mechanics of locomotion. Mr. Wimperis has made a special hobby of this subject, and

## Whittaker's Practical Handbooks

### THE DESIGN OF ALTERNATING CURRENT MACHINERY.

By J. R. BARR, A.M.I.E.E., late lecturer in Electrical Engineering at Heriot-Watt College, Edinburgh, and R. D. ARCHIBALD, A.M.I.C.E., A.M.I.E.E., head of the Electrical Engineering Department, Dundee Technical College. With 340 Illustrations and 17 Large Working Drawings. Med. 8vo. **12s. 6d.** net (postage 5d.).

### PRINCIPLES OF DIRECT CURRENT ELECTRICAL ENGINEERING.

By JAMES R. BARR, A.M.I.E.E. With 294 Illustrations. **10s.** net (postage 5d.).

### ARMATURE CONSTRUCTION. A Practical Handbook for Electrical Engineers.

By H. M. HOBART, M.I.C.E., M.I.E.E., and A. G. ELLIS, A.C.G.I. With 420 Illustrations. **15s.** net (postage 5d.).

*The Diagrams of Polyphase Windings and Multiplex Continuous-Current Windings are printed in different colours in this book.*

### ELECTRIC WIRING, FITTINGS, SWITCHES AND LAMPS (CIRCUITS).

A Practical Book for Electric Light Engineers and Contractors, Consulting Engineers, Wiremen and Students. By W. PERREN MAYCOCK, M.I.E.E. Fourth Edition, entirely re-written. With 600 Illustrations. **6s.** net. (postage 4d.).

### ELECTRIC LIGHTING AND POWER DISTRIBUTION.

An Elementary Manual of Electrical Engineering. By W. PERREN MAYCOCK, M.I.E.E.

Vol. I. Seventh Edition. Revised. With 331 Illustrations. **6s.** net (postage 5d.).

Vol. II. With 407 Illustrations. **6s. 6d.** net (postage 5d.).

### CENTRAL STATION ELECTRICITY SUPPLY.

By A. GAY, M.I.E.E., and C. H. YEAMAN, A.I.E.E. Second Edition, re-written and revised. With 278 Illustrations. **10s. 6d.** net (postage 4d.).

### SINGLE-PHASE COMMUTATOR MOTORS.

By F. PUNGA. With 81 Illustrations. **4s. 6d.** net (postage 4d.).

### ELECTRIC WIRING DIAGRAMS.

Illustrating Circuit-connections for Supply Mains, Distribution Boards, Transformers, Lamps, Heaters, Motors, Bells, Private Generating Plant, &c., &c. With brief Explanations of the Diagrams. By W. PERREN MAYCOCK, M.I.E.E. With 246 Illustrations. **2s. 6d.** net (postage 3d.).

Catalogue Books on Electricity, Engineering, etc., Post Free.

**WHITTAKER & CO.,** 2, White Hart St., LONDON, E.C. Paternoster Sq.

with the aid of his ingenious accelerometer has done much valuable quantitative work regarding horse power developed, absorbed and utilised in automobiles. The methods adopted are explained here, and the whole mechanics presented with remarkable clearness. A great part of the book is devoted to matters connected with petrol cars, but in the last chapter petrol-electric systems and trolley omnibuses (which we are glad to see are not called "trackless") are dealt with briefly.

**Natural Sources of Energy.** By A. H. Gibson. 131 pp., 6½ in. by 5 in. 17 figures. (Cambridge: The University Press.) **1s.** net; by post, **1s. 2d.** (Cambridge Manual.)

IN this addition to the series of semi-popular "Cambridge Manuals of Science and Literature," Prof. Gibson, of Dundee, takes up the question of depletion of our coal resources, and discusses the suitability of other available sources of energy. What will happen, he thinks, is that the price of coal will rise steadily until it reaches a point at which other sources of energy, at present more costly and less convenient, will be able to compete on equal terms. With regard to oil fuel, he says that probably the oil-bearing strata will be exhausted long before the coalfields. The supply of natural gas will also give out quite soon, and he does not expect that peat will relieve the demand for coal and oil to an appreciable extent. After some notes on the transformation of energy generally, he discusses the utilisation of fossil fields in more detail, and passes on to deal successively with the possibilities of sun power, vegetable fuel, such as alcohol, the internal heat of the earth, water power, tidal power, and wind power. The only one he rules out entirely is the internal heat of the earth, but he is sceptical also as regards windmills. Finally, he arrives at the comforting conclusion that even when the fossil fuels are exhausted, ample supplies of energy, renewable year by year, will remain for all the conceivable activities of the human race. The general distribution of activity on the earth's surface will, however, be much modified, and isolated communities must inevitably suffer.

**Dynamo and Motor Attendants and their Machines.** By F. Broadbent. 160 pp. 7½ in. by 5 in. 82 figures. (London: S. Rentell and Co., Ltd.) 7th edition. **1s. 6d.** net; by post, **1s. 9d.**

The popularity of this well-known handbook for the dynamo attendant is such that a seventh edition has followed rapidly on the sixth, so rapidly that Mr. Broadbent complains that he has scarcely had time to adopt all the suggestions for improve-

ments that he would have liked. Nevertheless, there has been some considerable revision and a little condensation of the old matter, and the range of the book has been extended to include motors as well as dynamos. The book is thoroughly practical and easily intelligible, and contains much that should be of use to those who are not trained experts but have charge of electrical machinery.

**The "Mechanical World" Pocket Diary and Year Book for 1914.** 443 pp. 6½ in. by 4½ in. 71 figures. (Manchester: Emmott and Co., Ltd.) **6d.** net; by post, **8d.**

One of the principal new features of the 1914 edition of this excellent little pocket-book is the re-written section on steam turbines, by Mr. R. M. Neilson. Various other mechanical matters have had their treatment extended and brought up to date, and year by year the volume grows in size, becoming an even more wonderful sixpennyworth than before. Electrical engineering is dealt with in a companion pocket-book.

**"Mechanical World" Electrical Pocket Book for 1914.** 240 pp. 6½ in. by 4 in. 129 figures. (Manchester: Emmott and Co., Ltd.) **6d.** net; by post, **8d.**

For several years now the *Mechanical World* Electrical Pocket Book has been issued in a separate volume from its companion on mechanical and general engineering matters, and it has grown considerably in size since its first separate issue. Even since last year several sections have been re-written and new sections added. Thus the treatment of telephones, electrical equipment of ships, lifting magnets, dry batteries, sparking distances in air, and burglar alarms is new, the section on electricity in coal mines has been re-written, and additions and extensions have been made to the matter on transmission lines, accumulators, starters, instruments, bells, and lighting. It will thus be seen that every endeavour has been used to keep this wonderful sixpennyworth thoroughly up to date. Perhaps a little more might have been said of the Edison accumulator, owing to its growing importance. Probably this will be done in the next edition, which will doubtless also contain information as to the "half-watt" lamp, which presumably only made its appearance after the work had gone to press.

**Statistik über Starkstromanlagen.** Prepared by the Schweizerischer Elektrotechnischer Verein and the Schweizerischer Elektrizitätswerke. 194 pp. 14 in. by 9 in. (Zurich: Fachschriften-Verlag und Buchdruckerei A.-G.) **9s.** net; by post **10s.**

We have here a painstaking collection of statistical information regarding the public electric supply undertakings of Switzerland, arranged in convenient tables prepared by the Swiss Elektrotechnischer Verein and the Union of Swiss Central Stations. The information in the main tables, however, does not relate to later than 1911. The first table gives general particulars of 248 undertakings, some with their own generating stations, and some taking current in bulk. In the second table the technical particulars of the actual generating stations are set forth, and in the third are found details of substations and distributing systems. Outputs, load factors, and tariff systems form the subjects of the fourth set of tables, in which generating and distributing stations are classified separately. We have next in Table V. details of the numbers of consumers and proportions of the lighting, heating, and power-load, while miscellaneous remarks are included in Table VI. In all we have 114 different columns each for a different item of information. There is also a supplementary table containing the leading particulars of 518 further stations, brought up to 1913, of which either full details could not be obtained, or which started since 1911. At the end some totals and aggregate statistics are given, but these are a little misleading, as they do not include the stations in the supplementary table.

**Deutscher Kalender für Elektrotechniker, 1914.** Edited by G. Dettmar. Part I., 648 pp., 6½ in. by 4 in. 229 figures. Part II., 347 pp., 6½ in. by 4 in. 154 figures. Munich: R. Oldenbourg.) **5s.** net; by post, **5s. 6d.**

HEER DETTMAR has made good use of his facilities as Secretary of the Verband Deutscher Elektrotechniker, and produced a handbook of exceptional value to the German electrical engineer. The thirty-first issue for 1914 has been brought thoroughly up-to-date as regards the rules and standards of the V.D.E., and the help of further experts has been obtained in bringing the text in line with current practice. Thus Dr. Teichmüller has largely re-written the section on high-voltage transmission and the corona effect, while an entirely new section on lightning and surge protection is contributed by Dr. Petersen. The notes on the electrical fixation of atmospheric nitrogen might be revised with advantage in the next issue. An index and a useful diary are included.

**Scientific and Technical Books.**—A new illustrated catalogue containing over 100 pages has just been produced by Crosby Lockwood and Son (7 Stationers' Hall Court, E.C.). The scientific, technical, and industrial books published by Crosby Lockwood and Son are dealt with, and the publishers will be pleased to send a copy post free to all who may be interested.



## "ELECTRICAL ENGINEERING" TRADE SECTION

— Notes on Tenders Invited and Prospective Business appear on p. 709. —

### CATALOGUES, PAMPHLETS, &c., RECEIVED

**METAL FILAMENT LAMPS.**—A small folder from the Edison and Swan Electric Lighting Co., Ltd., gives the latest reduced prices of Royal Ediswan drawn-wire lamps, and is accompanied by a useful set of address labels for use when corresponding with the firm.

**CALENDARS, &c.**—We have received from Bruce, Peebles and Co. one of their useful desk companions for 1914, consisting of a large blotting pad combined with a reference diary and calendar. In the reference work is also a collection of abridged specifications and approximate price-lists of the firm's manufactures, and illustrations of their works and plant made by them.

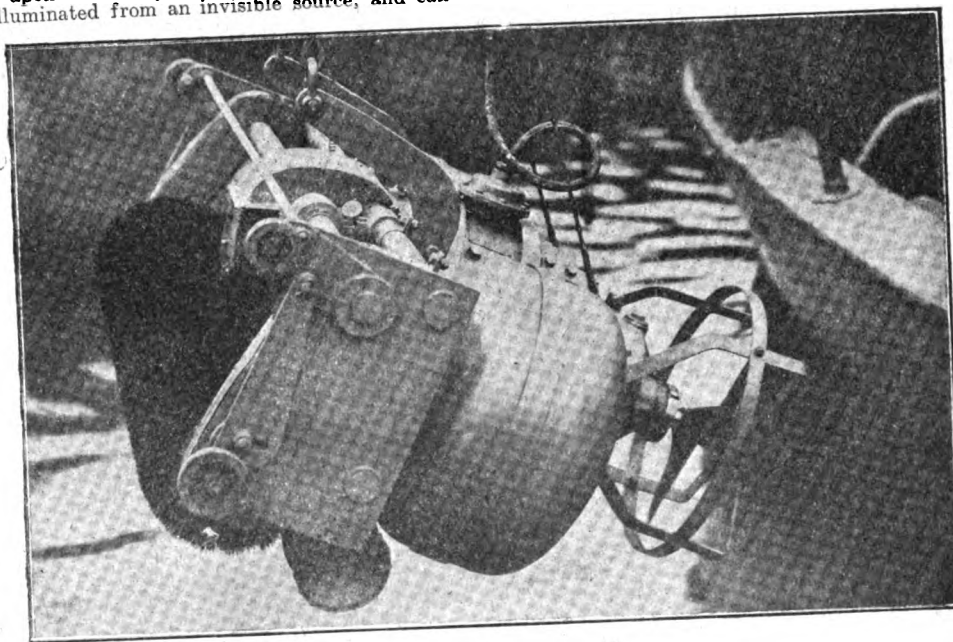
**CHRISTMAS NOVELTIES.**—A list just published by the Electrical Co., Ltd. (122-124 Charing Cross Road, W.C.), deals with novelties in signs and illuminations for Christmas. A very attractive sign for display in shops after closing time consists of  $\frac{1}{4}$ -in. plate glass, upon which any inscription can be painted. The inscription is illuminated from an invisible source, and can

call attention to "Robertson" heating lamps, "Pixielite" strip, and "Velveduct" drawn conduit tube.

**CAR LIGHTING DYNAMOS.**—A list from the Electric Battery Co. (62 Eagle Street, High Holborn, W.C.) describes the E.B.C. dynamo car lighting system, which is under the patents of Mr. S. L. Price. In this system the dynamo is provided with a centrifugal clutch, which disengages when the speed rises above the maximum for which the dynamo is designed, while instead of a minimum voltage cut out, a free-wheel arrangement is used, permitting the machine to run as a motor when the speed drops too low for it to maintain its voltage. A neat switchboard is provided with an ammeter and a voltmeter, and accumulators and lamps are also included in the list.

### A SHIP-CLEANING PLANT

WE were afforded the pleasure last week of inspecting the compact ship-cleaning equipment being put on the market by the Torpedo Submarine Ship Cleaner Co., Ltd. (Cecil Chambers West, 76 Strand, W.C.), during its successful use for cleaning the hull of a 3,000-ton steamer, which had made two return trips to South Africa since the previous cleaning. As cleaning operations are carried out in a few hours under water,



SUBMERSIBLE SHIP-CLEANING GEAR.

be hung at any convenient spot in the window like a picture. It is made in two sizes, 12 in. by 6 in. and 16 in. by 10 in. Kaleidoscopic and watertight reflector rosette signs are also listed, as well as decorative flexible illumination chains for electric lamps or candles, and suitable for carbon and "Aegma" lamps.

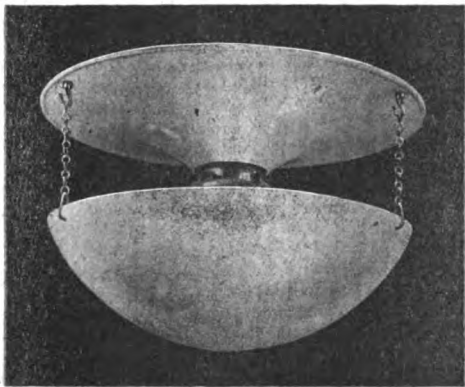
*Readers desiring copies of catalogues or pamphlets should apply to the firms in question, referring to the notice in "Electrical Engineering."*

**HEATING AND COOKING.**—The eleventh edition of the electric heating and cooking list issued by the General Electric Co., Ltd., contains several new appliances not listed in previous additions. The "Magnet" glowing radiators or fires are now made in two types, panel and rod, with a current consumption up to 3,000 watts. Two new designs of lamp radiators in simple and dignified finishes are also shown. Two new types of electric toasters, well finished and nickel-plated, are listed, as is the portable cooker, first shown at the Ideal Home Exhibition. This is constructed of stout sheet metal mounted on a rigid framework, and polished bright. Another novel device is an electrically warmed footstool, while a useful adapter for enabling heating apparatus to be run from a lamp socket without interfering with the lighting is shown. Other leaflets

while the vessel is unloading, the great waste of time necessary for dry-docking and cleaning by hand is avoided, while by cleaning at the completion of each voyage there is never much reduction in speed of the vessel owing to accumulated growth on the hull. Four men only are required. The cleaning is effected by an electrically-driven revolving brush, which is pressed forward against the ship's side by a propeller driven from the motor which rotates the brushes. The complete plant is carried on a flat-bottomed wooden barge 30 ft. long by 12 ft. beam. An electric winch and controlling gear are situated amidships, while aft is the engine-room. Here there is a four-cylinder petrol engine driving a 10-kw. 230-volt compound-wound interpole dynamo at 800 r.p.m. Here also is a 10-h.p. compound-wound motor driving the propeller of the barge, which can attain a speed of 5 knots. The winch has four barrels, and is driven by a  $3\frac{1}{2}$ -h.p. compound-wound motor. It has four drums, one for the cable conveying power to the brushing motor, two for hoisting, and one for "topping," i.e., raising and lowering the jib. An interlocked controller giving five speeds is used. The actual cleaning gear (see illustration) consists of a gun-metal and aluminium bronze framework, carrying a revolving brush 1 ft. diameter and 5 ft. long, having fibre bristles  $2\frac{1}{4}$  in. long. These are made in three strengths, according to the growth on the vessel. The motor, which is of the interpole shunt-wound type, runs at 2,500/2,700 r.p.m., and is geared to the propeller through a combination of epicyclic and worm and chain gearing, reducing the speed of the brush to 250/280 r.p.m. The same motor drives

# INVERLITE

Semi-inverted fittings give that restful glow so essential to good work. They are used in many technical schools, drawing and general offices, and are giving excellent results.



Price 9s., List

## WARDLE

ENGINEERING CO., LTD.,

196 DEANS GATE, MANCHESTER

London: NATHAN & ALLEN, Queen Anne's Chambers, S.W.

the brush at a speed of 150/170 r.p.m. The thrust of the propeller ensures that the brush is in all positions pressed well against the side of the vessel. By means of two air chambers the weight of the submersible part is reduced from 800 lbs. in air to 180 lbs. when submerged. The electrical equipment was carried out by Bruce Peebles & Co., Ltd. "Cab-tyre" sheathed cable is used. The method of cleaning is to moor the barge fore and aft alongside the vessel to be cleaned, from which it is kept about 6 ft. away by means of booms. The jib is then lowered till it touches the vessel's side. The brush motor is then started. The depth to which the brushing gear is immersed is registered by means of a gauge on the wind, and even if the brushing gear overshoots the bilge keel it is pressed against the vessel. As soon as a vertical strip is cleaned the barge moves along nearly a brush's length, and the next strip is cleaned, and so on. Means are provided for adjusting the pressure of the brush on the vessel, as well as for adjusting the angle of suspension and for altering the action of the winch if necessary. It is a valuable property of the brushing gear that as it works under water the actual swirling action of the water helps in great measure the thorough removal of all foreign matter from the vessel being cleaned, and yet the brush is soft enough not to cause any damage.

### DRY HAND FIRE EXTINGUISHERS

WE have recently had the opportunity of examining a new dry hand fire extinguisher, known as the "Clou" fire extinguisher, which is being put on the market at 244 High Holborn, W.C. This acts by throwing a special powder on to the seat of the fire, which is remarkably effective in extinguishing in cases of flames from burning petrol oil, celluloid, &c., where the use of liquids has not quite the same effect. The form of the containing vessel from which the powder is thrown is such that all the contents are not discharged all at once, but the powder can be shot on to the fire in a steady stream. For short-circuits the system has much to recommend it. We are told that the apparatus is extensively used abroad, and has been taken up by the German Navy and Aircraft Department. A striking demonstration, when a motor-car fire was rapidly extinguished, was given at the Aldwych site a few days ago.

### THE IMPORTANCE OF RUNNING LAMPS AT THE PROPER EFFICIENCY

IT is pointed out by the British Thomson-Houston Co. (Mazda House, 77 Upper Thames Street, E.C.) that the question of the actual efficiency at which an incandescent lamp is run has up to now received too little attention. Simply because an incandescent lamp was rated at a certain efficiency by the manufacturer, it was sometimes assumed that this rating would hold, regardless of the conditions under which the lamp operated. The point was often overlooked that the manufacturer's rated efficiency, candle-power, watts, life, &c., only hold when the lamp is used at rated voltage. The entire question of the satisfactory operation of an incandescent lamp of given quality depends upon the one term

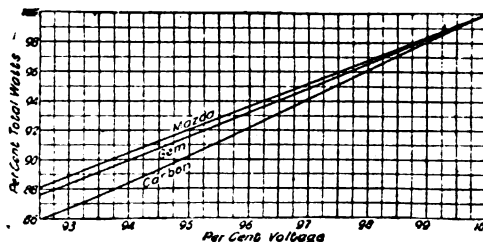


FIG. 1.—PERCENTAGE DECREASE IN WATTS CONSUMPTION WHEN MAZDA, GEM, AND CARBON LAMPS ARE UNDER-RUN.

"voltage." It is important that the average voltage at the holder should be the same as the voltage marked on the lamp. Speaking generally, for every 1 per cent. increase of impressed voltage on a given lamp the wattage will increase 1.6 per cent. This means an increase of 1.6 per cent. in wattage for each volt (on 100-volt circuits) that the circuit voltage is increased or the lamp voltage lowered. This 1.6 per cent. increased wattage represents 1.6 per cent. increased revenue. While excessive over-voltage might result in early lamp failures there can be no cause for complaint when lamps are run at rated voltage with a satisfactory commercial life. Let us consider the advantage to the central station of running a 60-watt Mazda lamp at high efficiency instead of at low efficiency. In 500 hours' burning a 60-watt Mazda lamp consumes 30 kw.-hours. If this lamp were operated at 96 volts instead of 100 volts, there would be a loss to the central station of 1.8 kw.-hours. With 10,000 lamps in service, and assuming 500 hours to be the average annual burning period, and the

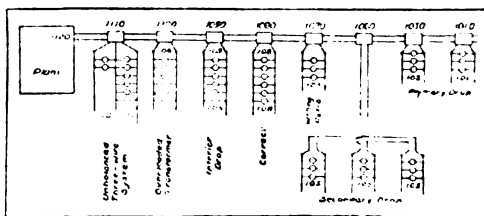


FIG. 2.—B.T.H. Co's DIAGRAM INDICATING THE USUAL REASONS FOR LOW-SUPPLY PRESSURES.

charge per kw.-hour to be 4d., this would represent an annual loss in revenue of £300. In the majority of cases the purchase of lamps of correct voltage would have prevented this loss in revenue without any increased cost. That is, it would represent 10 per cent. dividend on a £3,000 investment. Provided the low efficiency operation was due to loss in transmission, the lighting company would have been justified in investing £3,000 to obtain this additional revenue. Improving voltage conditions in this manner would not only increase the consumption of lamps, but would have just as important an effect on other apparatus, such as flat irons, toasters, fans, &c. Investigations show that many lamps are operated at from 3 to 4 volts below their rated voltage. The efficient operation of lamps secures the maximum revenue for the central station, the maximum light, economy and satisfaction for the consumer. To ensure efficient results, the central station must keep its voltage constant, and the consumer must use lamps marked with the actual voltage of the supply.

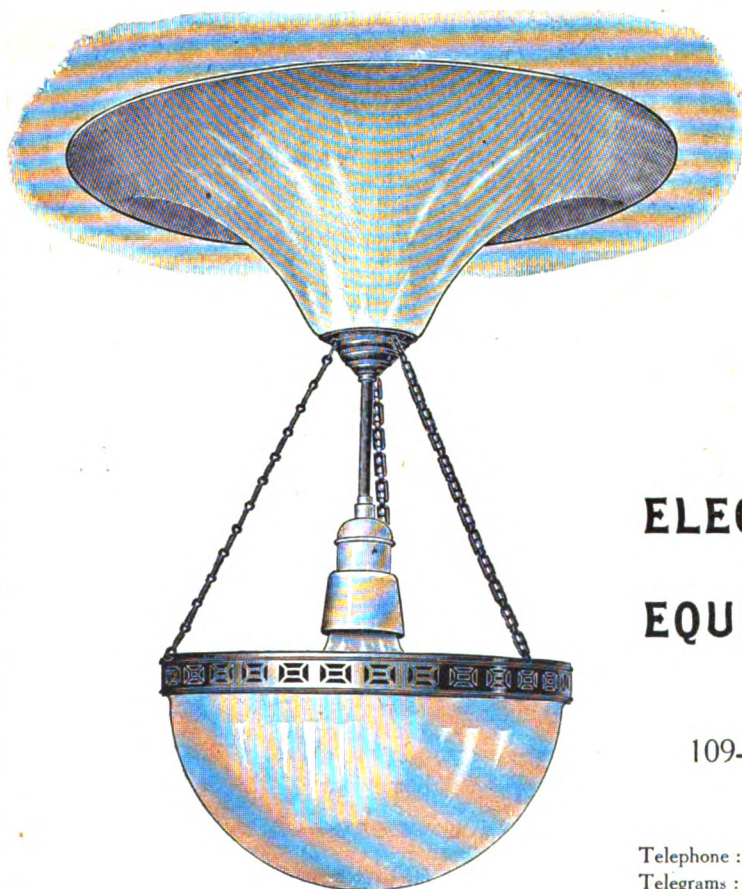
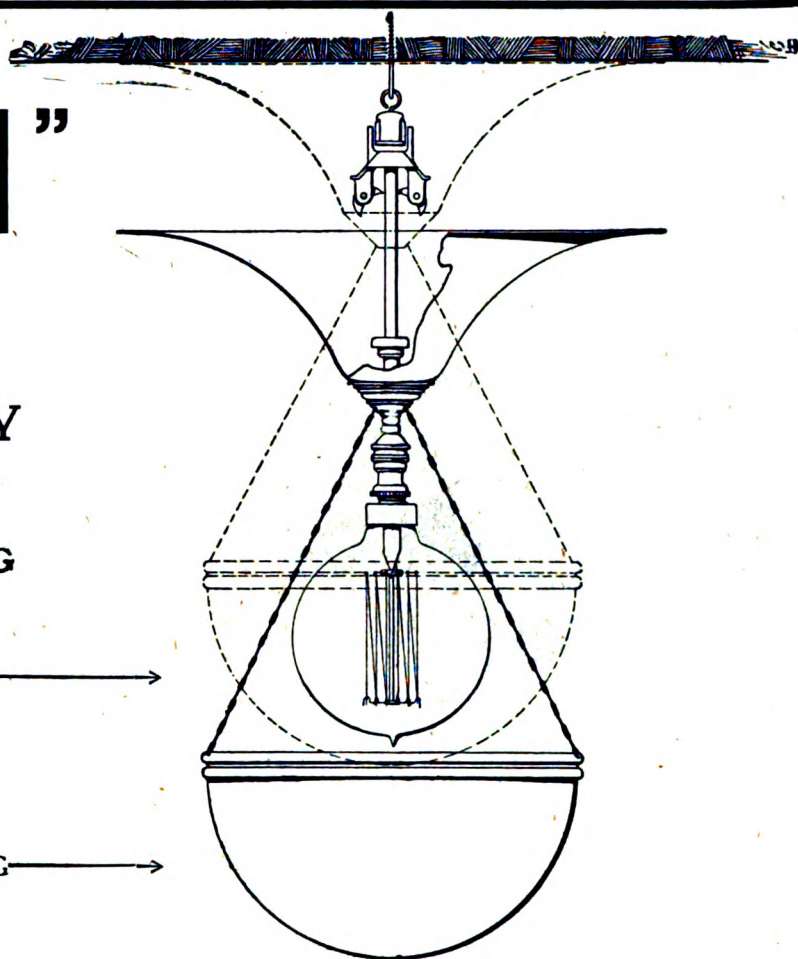
# THE "SATURN" LAMP

PRE-EMINENTLY  
PRACTICAL

NOTICE THE RAISING  
& LOWERING GEAR

NORMAL POSITION →

LOWERED FOR CLEANING →



NORMAL POSITION.

SIMPLEST TO INSTAL  
EASIEST TO CLEAN  
LAMP BREAKAGE  
OBVIATED

SEND FOR LIST S 6

TO THE

**ELECTRICAL ENGINEERING  
AND  
EQUIPMENT Co., LTD.,**

BANK BUILDINGS,  
109-111 NEW OXFORD STREET,  
**LONDON, W.C.**

Telephone : Gerrard 133.

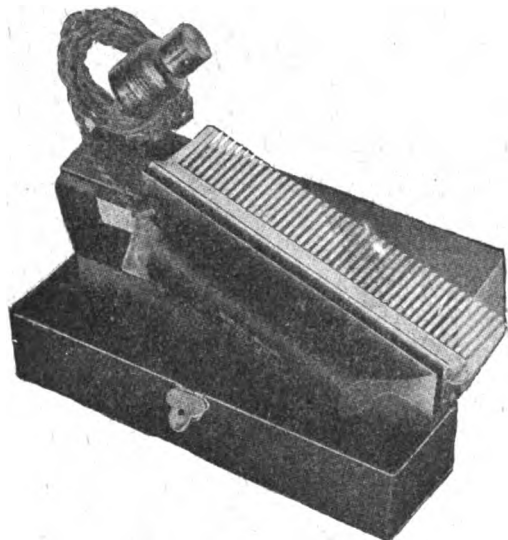
Telegrams : "Thermotype" Westcent, London.

*When corresponding with Advertisers, please mention "Electrical Engineering."*



### AN ELECTRIC COMB AND HAIR DRYER

WE illustrate here a new appliance known as the "Plexsim" electric comb, which has been brought out by Simplex Conduits, Ltd. (116 Charing Cross Road, W.C.), and has been specially designed as a seasonable gift of an original nature. Large stocks have been prepared, and the firm is arranging to supply electricity undertakings and contractors

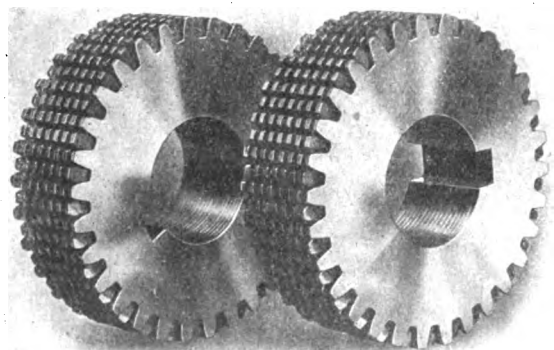


PLEXSIM ELECTRICALLY HEATED COMB.

with leaflets over-printed with their names and addresses. The heated base of the comb dries the hair in a short time.

### LAMINATED GEARING

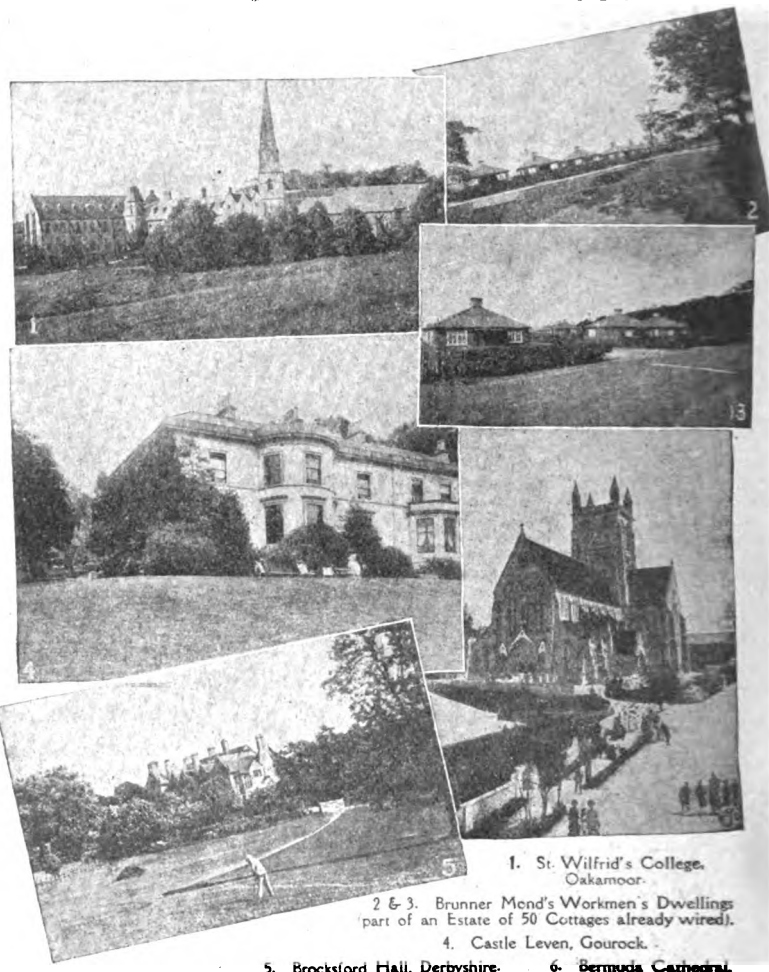
WE have recently had the opportunity of examining samples of a gear which is claimed to possess all the advantages of silence that are obtained by raw-hide or helical wheels and silent chains, while even lower in price than ordinary straight cut metal gears. Obviously such a gear, if it lives up to expectations, should have a wide application for motor pinions, gear driving in general machinery, and in automobile work. A typical pair of pinions is shown in the figure, from which it will be seen that each pinion or wheel is made up of toothed laminations with alternate layers staggered half a pitch, and separated by distance washers a few thousandths of an inch thick to give clearance and to avoid binding. By this means the force of the blows of each tooth



coming into contact is lessened—theoretically it should be halved—and a larger number of teeth are in contact at the same time than with ordinary gearing. Again, the laminated construction prevents the metallic ring, which is so large a factor in producing the noise in solid gears. The individual laminations are punched in a notching press, one tooth at a time, like armature stampings, and great accuracy can be obtained at a much less cost than with the elaborate modern gear-cutting machinery required to give solid gear anything approaching quietness. There is no objection to case hardening the teeth, and of course practically any metal can be used. The inventor of this gearing is Mr. A. E. Terry, of Herbert Terry & Sons (Redditch), and we are told that special works are being equipped for its manufacture in Sheffield.

### THE HENLEY WIRING SYSTEM

A NEW two-colour brochure has just been produced by W. T. Henley's Telegraph Works Co., Ltd., dealing with their well-known wiring system, and containing views of a number of buildings where it has been employed. A few of these illustrations are reproduced here. The booklet is written in a non-technical style, and should be useful to contractors in securing new customers for this already popular



SOME BUILDINGS WIRED ON THE HENLEY SYSTEM.

system. We are informed that since this publication has been issued it has been decided to install the Henley wiring system in the workmen's model dwellings now being built on the Duchy of Cornwall Estate, and the wiring is already being put in to those which are sufficiently advanced.

### CASING AND CAPPING

WE have received two more letters in reply to Messrs. C. Jennings & Co.'s inquiry, published in our issue of November 27th.

Messrs. Rawlings Bros., Ltd. (82 Gloucester Road, S.W.) say that their objection to the usual wood casing is that the capping has always been made too thin. They would favour a reduction in the width of the centre fillet so as to give more wood on the edges, with a thicker capping, and especially thicker edges to receive the screws. If Messrs. Jennings, they say, care to send their designs, they will be pleased to criticise them from their point of view.

Mr. Ralph Nance (Cardiff), on the other hand, finds that the standard sizes of casings at present on the market are quite satisfactory, with fixing screws for the capping on the centre fillet on the  $1\frac{1}{2}$  in. size, and on the outer edges on the larger sizes. He approves, however, of the suggestion made by one of our correspondents last week that a groove should be arranged in the capping to mark the position of centre of the fillet underneath, for the fixing screws. Mr. Nance adds:—"I find that a lot of contractors still fix capping with nails, and in taking out old work the nails are often found to have bent and run into the wires. Possibly the nails follow the softest part of the wood."



## TENDERS INVITED AND PROSPECTIVE BUSINESS

### Generating Stations, Sub-Stations, Mains, &c.

**Burnley.**—Mains extensions at an estimated cost of £500 are contemplated.

**Carlisle.**—A Local Government Board inquiry is to be held concerning a loan of £23,400 for new generating plant and mains.

**Chesterfield.**—A Local Government Board inquiry was held last week concerning a loan of £7,000 for new plant and mains.

**Hindley.**—A Local Government Board inquiry has been held concerning a loan of £2,500 for putting into force an agreement for electric supply with the Lancashire Electric Power Co.

**Huddersfield.**—A Local Government Board inquiry was held last week concerning a loan of £60,000 for electrical extensions. It is proposed to put down a 4,000-kw. three-phase generating set and an additional 2,000-kw. single-phase set in two years' time.

**Keighley.**—In connection partly with the supply to Bingley, the following new plant is required:—800-kw. converting plant with switchgear, £2,500; two water-tube boilers, &c., £6,000; mains to Bingley, £2,000; additional mains for general purposes, £4,000.

**Littleborough.**—A loan of £4,000 for additional mains has been applied for.

**London: Battersea.**—A loan of £4,500 is to be taken up for electrical extensions.

**Lytham.**—Mr. J. H. Tonge, the Council's Consulting Engineer, has received instructions to proceed with the work of preparing plans, &c., for the electric supply scheme.

**Malvern.**—A new generating set is required.

**Manchester.**—Four 1,000-1,250-kw. converting sets, one 1,000-kw. set and two 650-800-kw. sets. Chief Electrical Engineer. December 19th.

**Warrington.**—A loan of £14,550 is to be applied for in connection with extensions to the electricity undertaking.

**West Ham.**—A Local Government Board inquiry was held last week concerning a loan of £21,500 for electrical extensions. There was some opposition.

### Wiring

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Bath.**—An expenditure of £15,000 is to be spent on the general reconstruction of the Grand Pump Room Hotel.

**Belfast.**—Alterations to central and branch fire stations.

**Broadstairs.**—New school.

**Canterbury.**—Additions at Asylum. Architects, Jennings & Gray, 4 St. Margaret's Street.

**Folkestone.**—Enlargement of Hotel Metropole (£10,000). Gordon Hotels Co.

**London.**—New business premises on site of 134 New Bond Street. Architects, Inman & Son, Bedford Row, W.C.

**Manchester.**—Rebuilding of Rusholme Exhibition Hall after fire.

**Stafford.**—New music hall.

**Stoke-on-Trent.**—New police station at Fenton.

**Wallasey.**—New fire station (£5,000).

### Miscellaneous

**Australia.**—The Deputy Postmaster-General, Melbourne, requires coils, relays, lamps, &c., for telephone purposes. Further particulars, 73 Basinghall Street, E.C.

The Victorian Railway Commissioners require a 15-ton electric crane. Further particulars as above.

**Manchester.**—A supply of metal filament lamps is required by the Tramways Department. General Manager, December 16th.

**New Zealand.**—Tenders are invited by the Christchurch Council for cable, testing instruments, transformers, meters,

insulators, &c. Further particulars at 73 Basinghall Street, E.C.

**Sunderland.**—Twelve months' supply of electrical materials for the Guardians. Clerk, 17 John Street.

**York.**—A supply of arc-lamp carbons, incandescent lamps, meters, time switches, motors and general stores is required by the Electricity Department. Engineer and Manager, December 22nd.

**Yorkshire.**—Mr. Stephen Sellon, who is advising the Urban District Councils constituting the Dearn Valley Light Railway Board, estimates the cost of the proposed tramway scheme at £151,891, in addition to land and buildings.

## TENDERS RECEIVED AND ACCEPTED

**Caledonian Railway Co.**—The Edison & Swan United Electric Light Co. has secured an important contract for the supply of electric lamps to this Railway Co.

**Canadian Northern Railway Co.**—Siemens Bros. Dynamo Works, Ltd., has obtained a contract for the supply of marine traction type of Tantalum lamps for use on this Company's Atlantic steamship vessels.

**Chesterfield.**—The following tenders have been accepted:—Car bodies, Brush Electrical Engineering Co., £469 each; car electrical equipments, British Westinghouse Co., £282 each; electric track brakes, British Westinghouse Co., £55 each.

**Llandaff.**—The tender of the British Insulated & Helsby Cables, Ltd., for cables, has been accepted at £3,161.

**Manchester.**—The following tenders have been accepted:—Bruce Peebles & Co., 1,800-2,200-kw. converter; Ferranti, Ltd., twelve months' requirements of static transformers; W. T. Glover & Co., Liverpool Electric Cable Co., Charles Macintosh & Co., and Johnson & Phillips, cable.

**Melbourne.**—A contract for 33,300 lamps has been placed with Pope's Electric Lamp Co.

**Metropolitan Railway Co.**—A contract has been placed with Siemens Bros. Dynamo Works, Ltd., for a twelve months' supply of Tantalum and Wotan lamps.

## MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. G. Smith & Son, of 5 Philpot Lane, E.C., inform us that the price of electrolytic copper, bars, c.i.f. port of arrival, quoted on Tuesday night, was £66 15s. to £67 5s. (last week, £68 to £68 10s.).

**Premier Electric and Hardware Co.**—We have received the following letter from Mr. J. MacConnell, Director of the Premier Electric & Hardware Co., Ltd. (9-10 Cheapside, Golders Green, N.W.):—

"My attention has been drawn to the publication in various trade journals of certain legal proceedings affecting a business entitled 'The Premier Electric & Hardware Co.' of Golders Green, and which may injuriously affect the Premier Electric & Hardware Co., Ltd., of which I am a director. This latter company purchased the goodwill and assets of the Premier Electric & Hardware Co., which was a private business trading under that title, but the limited company has no relationship whatever with that concern, but, on the contrary, is a limited liability company registered under the Companies Acts."

**Bankruptcies.**—The last day for receiving proofs in the bankruptcy of J. D. Dixon, Electrical Engineer, 65 Mill Street, Crewe, is December 18th. The trustee is Mr. F. T. Halcomb, King Street, Newcastle, Staffs.

**Agency.**—Krupka & Jacoby, Ltd. (26 to 36 Chapter Street, Westminster), have appointed Andrews & Co. (198A St. Vincent Street, Glasgow) as their agents in Scotland.

**Liquidations.**—Safety Light, Ltd., is to be wound up voluntarily. Mr. P. J. Goodchild, of 62 London Wall, E.C., is liquidator. A meeting of creditors is to be held to-day at Winchester House, Old Broad Street, E.C., at noon.

A meeting of creditors of the Prested Miners' Gas-Indicating Electric Lamp Co. will be held at 33 Carey Street, W.C., at 11.30 a.m. on December 17th.

**Half-watt Lamps.**—Messrs. Siemens Bros. Dynamo Works gave a demonstration at their lamp-works at Tyssen Street, Dalston, N.E., yesterday afternoon of a range of "Wotan" ½-watt lamps shortly to be placed on the market. We hope to publish an account of this in our next issue.

## THE RECORD ELECTRICAL Co., Ltd.

LONDON OFFICE:  
CAXTON HOUSE,  
WESTMINSTER, S.W.  
Telephone:  
2057 Victoria.

Telegrams & Cablegrams:  
"Infusion,"  
London.

**CIRCUIT  
BREAKERS.**

RECORD'S PATENT.

Write for Prices & Particulars.

WORKS:  
BROADHEATH,  
MANCHESTER.  
Telephone:  
164 Altrincham.  
Telegrams & Cablegrams:  
"Infusion,"  
Altrincham.

## LOCAL NOTES

**Bexley: Bulk Supply.**—The Woolwich Electricity Committee has informed the Council that no advantage will be gained by any further consideration at the present time of certain proposals which have been made with regard to bulk supply. If the Bexley Council is able to offer amended terms at any subsequent time, the Woolwich Council will be pleased to consider them.

**Dublin: Development of Electricity Undertaking.**—In giving a lecture before the Institution of Civil Engineers of Ireland last week on the City of Dublin electricity supply system, Mr. Mark Ruddle, the City Electrical Engineer, mentioned that, whereas in 1903 the public lighting was limited to 81 arc lamps in the centre of the city, this had now been extended to practically the whole of the city. The Electricity Committee had decided, he said, to allocate £500 annually towards street lighting extensions, and at present the first batch of 45 lamps are under test in some of the principal streets. There are now many hundreds of arc lamps in use for street lighting purposes in Dublin.

**Dundee: Supply Failure at Broughty Ferry.**—A spirited discussion took place at the last meeting of the Corporation in connection with Mr. Richardson's report upon the condition of the Broughty Ferry electricity undertaking, referred to on page 692 of our last issue. In defence of the late Manager of the Broughty Ferry undertaking, it was stated that Mr. Richardson, with several of the late Broughty Ferry Council officials, some time ago went over the works and agreed as to what extent repairs should be carried out pending the conversion of the power station to a sub-station in connection with the Dundee supply. A request by one of the Councillors for a Committee of Investigation was not acceded to, and eventually Mr. Richardson's report was adopted.

**Hove: Purchase of Company's Undertaking.**—According to the *Sussex Daily News*, pourparlers are now going on between the Corporation and a syndicate with a view to the latter working the electricity undertaking, which has just been acquired from the Hove & District Lighting Co. This line of action was foreshadowed on page 672 of our issue of November 27th.

**Liverpool: Electric Supply.**—Objection was taken at the last meeting of the Corporation to a proposal by the Electric Supply Committee to instal mains and machinery at an estimated cost of £2,000 mainly for the purpose of supplying a consumer, the revenue from whom would be £300 per annum. An amendment referring the proposal back was defeated by a large majority, it being explained that the agreement in question is for two years, and that the Electrical Engineer is satisfied that it is a good business proposition.

**London: Islington: Street Lighting.**—In accepting a tender of the Gas Light & Coke Co. for considerably increasing the candle-power in those streets already lighted by gas at a very much reduced price, the Lighting Committee report that they have inserted a provision that they may, should occasion rise, substitute electric lighting for gas lighting in any of the thoroughfares covered by this new contract should electric mains be laid there in the future. Judging by the Lighting Committee's report which was accepted at the Council meeting on Friday, it would seem that the Gas Co. has been acting under the stimulus of a proposal to prepare an electric lighting scheme for these particular streets.

**Woolwich: Switchboard Attendants' Hours.**—A proposal by the Electricity Committee to extend the forty-eight-hour week to all employees in the generating station who are now working a fifty-six-hour week has been adopted by the Council.

**Manchester: Trafford Supply.**—An agreement for the purchase of the Trafford Power & Light Supply (1902), Ltd., has been sealed, but is, of course, subject to Parliamentary sanction.

**Newcastle-on-Tyne: New Power Station.**—The Newcastle-on-Tyne Electric Supply Co. is extending its Dunston power station by the erection of another building on the other side of the river, and an agreement has been entered into for purchasing coke-oven gas from the Teams By-Product Co., Ltd., which is now installing a large battery of coke ovens on a site close by.

**Municipal Wiring and Fitting.**—The Electrical Section of the Local Chamber of Commerce has resolved to oppose the I.M.E.A. Bill on the wiring and fittings clauses when this comes before Parliament.

**Southampton: Electricity Undertaking.**—From a report

prepared by the Electricity Committee, it appears that considerable differences of opinion have manifested themselves between the Chairman of the Committee and the Borough Electrical Engineer, Mr. H. F. Street. The Chairman has presented to the Committee a lengthy report upon the financial aspect of the undertaking, and recommends that the  $\frac{1}{2}$ d. per unit taken off private lighting two years ago should be reinstated, and that the charge for heating and cooking should be increased to 1d. per unit. Mr. Street says he finds it necessary, reluctantly, to disagree with at least 90 per cent. of the Chairman's views, and is emphatic that neither the time nor the necessity for increasing the price of electricity for lighting purposes has arrived; indeed, it may never arrive. The Committee is not making any recommendation to the Corporation, inasmuch as the proposal of the Chairman was defeated by six votes to two, two members of the Committee not voting; but the matter is to be placed before the Corporation for it to take such action as it deems necessary.

**Swansea: New Plant.**—A new 1,200-kw. turbo-alternator was put into operation last week.

## APPOINTMENTS AND PERSONAL NOTES

Mr. G. Middlecoat, of the Southampton Corporation Electricity Works, is resigning his position with the Corporation and joining the staff of the Edison & Swan United Electric Light Co., Ltd. (Ponders End, Middlesex).

Mr. E. E. Eccles, Manager of the Foyers Works of the British Aluminium Co., has been appointed Assistant General Manager to the Company in London.

Mr. J. M. Robb, Assistant Electrical Engineer at Cheltenham, has been granted an increase in salary from £3 10s. to £3 15s. per week.

The Manchester Electricity Committee has appointed Mr. H. W. Smyth as Charge Engineer at the Stuart Street generating station, at a salary of £175 rising to £190 per annum.

Mr. G. R. Naylor, Electrical Engineer to the Nelson Corporation, has had his salary increased from £180 to £200 per annum. The salary of Mr. J. Stanworth, Mains Superintendent, has also been increased.

A first-class electrical engineer is wanted, with experience in installation and maintenance of power and lighting systems. (See advertisement on another page.)

The Swindon Corporation requires an electrical engineer to work under the Borough Electrical Engineer. Salary £120 rising to £180 per annum. Applications to Town Clerk by the 27th inst.

An improver wanted at the Swindon Electricity Works. (See advertisement on another page.)

Switchboard attendant required by the Stepney Electricity Department. Salary, 25s. per week. (See an advertisement on another page.)

## COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &amp;c.

**India Rubber, Gutta Percha & Telegraph Works Co.**—There was a net profit of £55,551 for the year ending September 30th, to which is added £5,904 brought forward from the previous account. A final dividend, making  $7\frac{1}{2}$  per cent. for the year, is recommended on the ordinary shares. The report states that there has been a considerable falling off in the amount of submarine cable manufactured, although the Company's steamers have been well employed. We regret that Mr. R. Kaye Gray has been obliged, through ill-health, to resign his position as Managing Director. Messrs. C. H. Gray and W. E. Gray have been appointed Managing Directors to succeed him. Mr. R. Kaye Gray has been appointed Extraordinary Director.

SEARCHLIGHTS  
THE LONDON ELECTRIC FIRM CROYDON

# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 364 [Vol. IX., No. 51]  
*All rights reserved.*

THURSDAY, DECEMBER 18, 1913.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES AND TECHNICAL COLLOCS ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

*Other Advertisement Rates on Application.*

### Latest Time for Receiving

Letters for insertion, Tuesday first post.

Small Advertisements and Official Announcements, Wednesday first post.

Displayed Advertisements, Tuesday first post.

Corrections in Standing Advertisements, Monday first post.

All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 308-306, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Circuiting, Fleet, London."

Telephone No.: 5509 Holborn.

Orders to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

A NATIONAL Illumination Committee of Great Britain has been established in connection with the International Illumination Commission. (Page 717.)

Two types of relay are being used by the British and German telephone departments in connection with the speaking tests between London and Cologne and Berlin. One of the relays is the latest form of Mr. S. G. Brown's invention, which is on the microphone principle, and the other is the Lieben-Reisz lamp relay, in which the telephone currents are strengthened in their passage through a glass tube containing mercury vapour by the action of a Wehnelt cathode. (Page 713.)

A PAPER by Mr. H. C. Gunton, read before the Manchester Local Section of the Institution of Electrical Engineers on Tuesday, and to be discussed at the London meeting to-night, describes the various uses of electric power in the Post Office. (Page 714.)

THE County of London Electric Supply Co. is promoting an important Bill with a view to modifying the purchase powers of the London County Council, and enabling agreements to be entered into between the various London companies for the reorganisation and consolidation of London's electric supply. (Page 715.)

SPLENDID work has been rendered by volunteers in the Leeds electricity works during the strike. On Friday, in spite of the strike, the works carried its record load. (Page 715.)

THERE were interesting displays of instruments at the Physical Society's Exhibition on Tuesday. These included some new designs for electric vehicles, and

some of the moving coil pattern of pocket size. (Page 715.)

THE sizes of motors required for driving saw-mills are discussed in our "Questions and Answers" columns. (Page 716.)

A LETTER from the author of a book reviewed in ELECTRICAL ENGINEERING last week makes clear for what class of reader the book is intended. (Page 717.)

THE Electrical Trades Union has refused to negotiate with the London Electrical Masters' Association on the terms laid down by the latter. We publish a letter from the Union repudiating certain statements made by Mr. Duncan Watson in the interview published in our last issue. (Page 717.)

APPLICATION is being made to amend a patent relating to A.C. track circuit signalling by J. B. Struble, and a patent relating to enclosed flame arc lamps by A. Blondel. A Marconi patent for aerial receiving circuits, and a Muirhead patent for details of the construction of automatic telegraph transmitter perforators expire during the next few days after a full life. A specification by A. C. Michie and R. A. S. Paget relating to the embedding of heating wires in refractory material was published by the Patent Office last week, as was one relating to unidirectional H.P. discharges by Sir. O. J. Lodge and L. Lodge. (Page 718.)

A CONFERENCE of Metropolitan tramway authorities is to discuss the House of Commons Traffic Committee's recommendations.—It is rumoured that the finances of the Underground Electric Railways Co. and its allied companies are to be rearranged. (Page 719.)

THE payments to the Turkish Government in respect of the Constantinople telephone system will be 15 per cent. of the receipts plus 14s. per mile of line.—The Egyptian Government is negotiating for the purchase of the business of the Telephone Co. of Egypt.—Mr. J. St. V. Pletts dealt with directive aerials and wave meters in a lecture on wireless telegraphy last week. Without the directive aerial duplex working would not be possible. (Page 719.)

An illustrated article describes some new forms of recording instruments. (Page 720.)

An improved pattern of quartz heater and a capstan controller are described, and a process for coating metals with lead is referred to on page 721.

SOME particulars of the "Wotan" half-watt lamps, and the sizes in which they will be placed on the market are given on page 721.

A PATTERN of earthed wall plug for use in private houses is described, and a fittings showroom and a large electric sign are illustrated on page 722.

MAINS are required at Wolverhampton and Monmouth; electric lighting plant at Kirkby Stephen, Ashton-under-Lyne, Holmfirth, Portsmouth and Devonport.—Meters are required at Lowestoft;

traction motors, &c., at Bradford; a street lighting scheme is to be put into effect at Swinton. (Page 723.)

THE Southampton Corporation has taken no action in the dispute between the Borough Electrical Engineer and the Electricity Committee's Chairman.—The Teignmouth Council has abandoned the idea of a municipal lighting scheme.—The new Association of Electric Station Engineers is to discuss working conditions with the Dewsbury Electricity Committee. (Page 724.)

A NEW issue of capital is being made by the Tramways, Light and Power Co. (Page 724.)

### ARRANGEMENTS FOR THE WEEK

(TO-DAY) THURSDAY, DECEMBER 18TH.

*Institution of Electrical Engineers.*

8 p.m. "The Employment of Power in H.M. Post Office," by H. C. Gunton.

FRIDAY, DECEMBER 19TH.

*Institution of Electrical Engineers: Birmingham Section.*  
Annual dinner.

*Institution of Civil Engineers: Students' Section.*

8 p.m. "Air Filtration and the Cooling and Ventilation of Electrical Machinery," by W. E. Gurry.

### The London Electrical Engineers.

(TO-DAY) THURSDAY, DECEMBER 18TH.—C. Company. Technical Instruction 7 to 10 p.m.

FRIDAY, DECEMBER 19TH.—D. Company. Special Class on Crossley Engine 7 p.m. Technical Instruction, 7.30 to 9.30 p.m.

SATURDAY, DECEMBER 20TH.—Headquarters open from 10 a.m. till noon.

MONDAY, DECEMBER 22ND, TO SATURDAY, DECEMBER 27.—Headquarters open for Regimental business only.

MONDAY, JANUARY 5TH.—A. Company. Technical Instruction, 7 to 10 p.m.

TUESDAY, JANUARY 6TH.—B. Company. Technical Instruction, 7 to 10 p.m.

WEDNESDAY, JANUARY 7TH.—Recruits only. Infantry Drill and Technical Instruction, 7 to 10 p.m.

THURSDAY, JANUARY 8TH.—C. Company. Technical Instruction, 7 to 10 p.m.

FRIDAY, JANUARY 9TH.—D. Company. Technical Instruction, 7.30 to 9.30 p.m.

Special Class on Crossley Engine, 7 to 8 p.m.

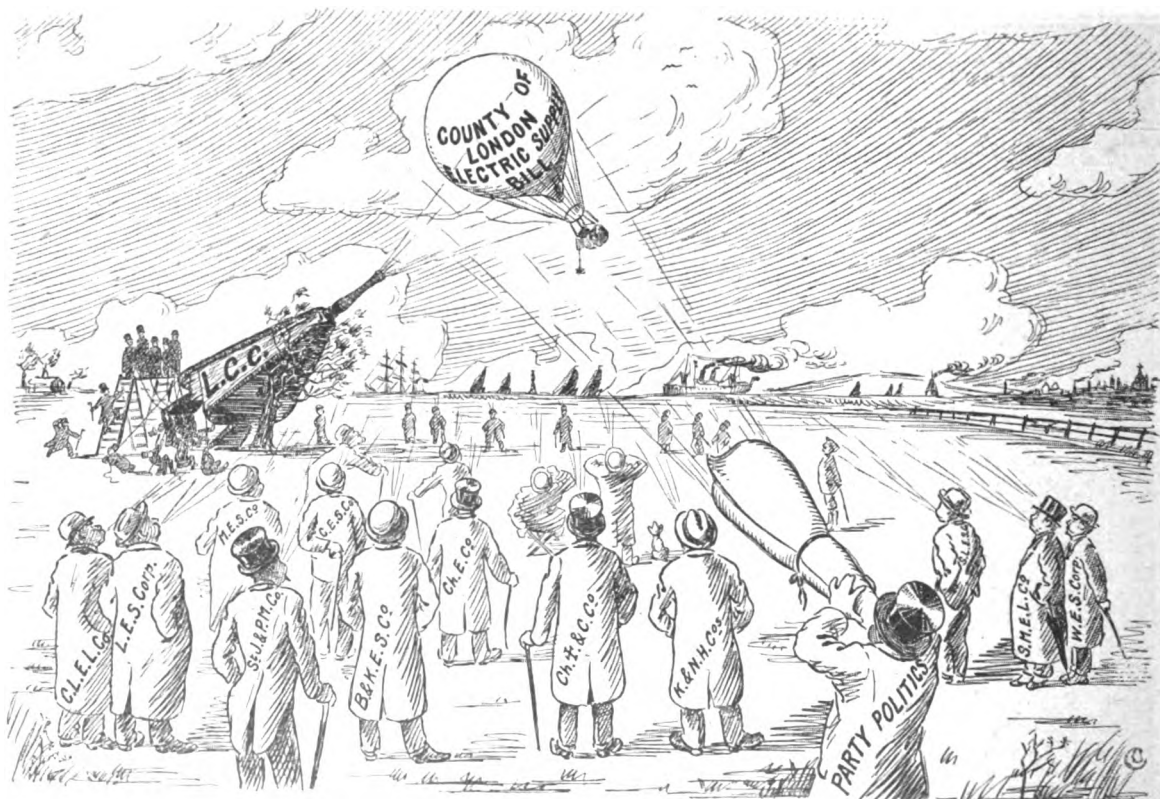
SATURDAY, JANUARY 10TH.—Headquarters open from 10 a.m. till noon.

**Meter Approved.**—The Board of Trade has approved of the Electrical Company's single-phase meter, type LJC, and also the means for fixing same.

### NATIONAL ILLUMINATION COMMITTEE OF GREAT BRITAIN

A PROVISIONAL COMMITTEE, formed of representatives of the Illuminating Engineering Society, the Institution of Electrical Engineers, the Institution of Gas Engineers, and the National Physical Laboratory, held a meeting on November 29th last, at which arrangements were made for the formation of a National Illumination Committee to be constituted according to the Statutes of the International Illumination Commission, with the primary object of affiliating Great Britain to that Commission. The Provisional Committee recommended that the National Committee should consist of five representatives of each of the three technical societies, and two representatives of the National Physical Laboratory. This recommendation has been adopted, and the following have been nominated as members of the Committee:—By the Illuminating Engineering Society, Mr. Leon Gaster, Mr. F. W. Goodenough, Professor Silvanus P. Thompson, and Mr. A. P. Trotter (this Society has not yet nominated its fifth representative); by the Institution of Electrical Engineers, Mr. F. Bailey, Mr. W. Duddell, Mr. K. Edgumbe, Mr. Haydn Harrison, and Professor J. T. Morris; by the Institution of Gas Engineers, Mr. E. Allen, Mr. J. Bond, Mr. W. J. A. Butterfield, Dr. H. G. Colman, and Mr. H. Watson; and by the National Physical Laboratory, Dr. R. T. Glazebrook and Mr. C. C. Paterson. The first meeting of this National Committee took place on the 2nd inst., when the following were chosen as officers:—Chairman, Mr. E. Allen (Liverpool); Vice-Chairmen, Mr. W. Duddell and Mr. A. P. Trotter; and Hon. Sec. and Treasurer, Mr. W. J. A. Butterfield, of London. Great Britain is entitled to two delegates on the Executive Committee of the International Illumination Commission, and Dr. H. G. Colman and Mr. W. Duddell were accordingly appointed by the Committee as the delegates from this country.

**London Electricity Supply.**—The L.C.C. has issued its usual annual statement giving complete statistics of London electricity supply, both as regards companies and local authorities. These relate to the year 1911-12, but the figures may have some significance in connection with the general statement of the position of electric supply undertakings in London, which is given in the Return, having in view the promotion of the County of London Electric Supply Co.'s Bill next session.



TO TEST THE WIND. Will it "raise the wind" also?



## EXPERIMENTS WITH TELEPHONE RELAYS ON LONG INTERNATIONAL LINES

THE British and German telephone departments have been engaged in some extremely useful experiments with telephone relays, and trials have been made between London and Cologne through the Anglo-Belgian submarine cable, and incidentally also between London and Berlin. The line from London to Brussels through the cable is telephonically equivalent to twenty-two miles of "standard cable," through which, of course, telephony is quite satisfactory. Extending the line to Cologne, however, increases the length to an equivalent of thirty miles of standard cable; London to Berlin is equivalent to a further twenty miles of standard cable. It was found that by inserting a telephone relay at Brussels, the speech between London and Cologne was equal to that through only twenty miles of standard cable, and that therefore even between London and Berlin speech could then be heard. The chief experiments were between London and Cologne, however, and we believe that they are being continued.

Two types of relay were employed. The first one is the Brown relay—a later form of the ingenious telephone relay described by Mr. S. G. Brown before the Institution of Electrical Engineers two-and-a-half years ago (*ELECTRICAL ENGINEERING*, Vol. VI., May 12th, 1910, p. 305).

In this newer type, known as the "G" pattern, the secondary contact is a microphone chamber containing carbon granules instead of the minute "conduction space" between a platinum

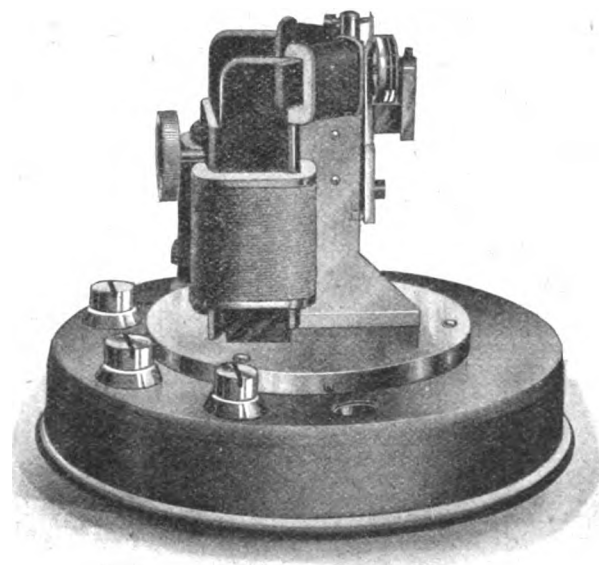


FIG. 1.—GENERAL VIEW OF S. G. BROWN'S RELAY.

point and disc used in his earliest pattern, and subsequently replaced by an iridium point and hard carbon plate in his relays for wireless telegraphy. A general view of the instrument is seen in Fig. 1, and an elevation in Fig. 2. In the latter *N* is a permanent magnet, on the pole-pieces *H* of which are wound two coils carrying the current received from the line. A steel reed *P* can be adjusted by the screw *W*, and has the front of the microphone chamber *M* fixed to its upper end which faces the pole-pieces of the permanent magnet, making an almost complete magnetic circuit with a very small air gap. The microphone chamber contains two carbon-faced electrodes, and is nearly filled with fine carbon granules. The tension of the reed is adjusted by the screw *W* until the reed is on the point of dropping against the pole-pieces, so that its elasticity is nearly balanced by the magnet pull. *S* is a stop screw to prevent the reed from falling against the magnet faces. *K* is a regulating winding in series with the microphone; it prevents any considerable drop in the steady current when the relay is strongly operated, and also, by its telephonic action, intensifies the magnifying power of the instrument.

The relay is used with a condenser in series on the primary side; and the circuit of the secondary side is made up by a battery, the primary of an induction coil, and the microphone chamber.

We are informed by Mr. Brown that the relay will magnify the current about 20 times, and that its use corresponds to a saving equivalent to the loss in 30 miles of standard cable.

If used in the middle of an ordinary simplex line, a relay has, of course, the disadvantage that it can only work in one direction, and in early experiments the line has been duplexed. There is, however, difficulty of maintaining good balance on a duplexed

telephone line, owing to variations in insulation resistance, and varying terminal conditions, and duplexing, of course, also halves the transmitted and received currents. Mr. Brown therefore now uses a highly sensitive simplex automatic switch to reverse

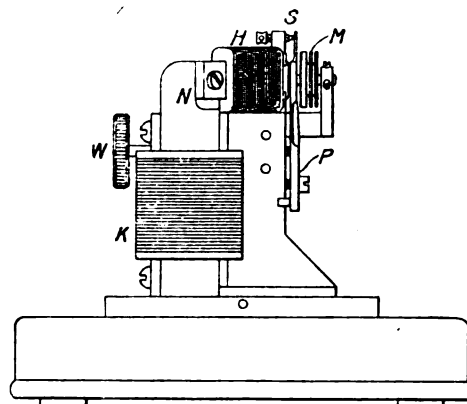


FIG. 2.—ELEVATION OF S. G. BROWN'S TELEPHONE RELAY.

the relay connections according to the direction of the received speaking currents.

The second relay experimented with by the two postal administrations is the Lieben-Reisz relay, which acts on an entirely different principle.

The amplification of the waves of the telephonic current is in this case effected by passing the received current between two electrodes in a tube of mercury vapour, and by passing a high-voltage current between the lower of these electrodes and an auxiliary one above both. This current has variations corresponding to those of the telephone currents impressed upon it. The construction of the relay is shown in Fig. 3 and the general connections in Fig. 4. An increase in the magnitude of the impressed waves of about 30 times can be obtained, and by connecting two or more relays in cascade series, as shown in Fig. 4, the effects are multiplied. The glass vessel *G* is exhausted to a value of 0.001 mm. of mercury, and the anode *A* has a large surface, as it consists of a specially wound aluminium wire 2 mm. in diameter, and *H* is the auxiliary electrode. The latter is made of aluminium, and has a number of uniformly spaced openings  $3\frac{1}{2}$  mm. in diameter. For the cathode, *K*, a glowing oxide cathode of Wehnelt pattern is employed, which here consists of a platinum wire wound in zig-zag fashion on a glass bearer, and overlaid with a thin layer of barium and calcium oxide. This is brought to a bright red heat of approximately 1,000° C. by a current of 1.8 amperes from a 30-volt battery. In order not to diminish further the discharging potential, which is reduced appreciably through the employment of the Wehnelt cathode, the space in the glass vessel is filled with mercury vapour at approximately 0.001 mm. pressure (the vapour pressure of mercury at 20° C.).

In order that the circuit of the current to be strengthened has the necessary auxiliary potential impressed upon it from the electrode *H*, the heating battery is connected to a high resistance potentiometer. The coil carrying the current to be strengthened is connected, either directly or through a transformer, in the conductor leading from the sliding contact to *H*. As a source of energy for the principal current circuit, D.C. mains or a small battery of 200 to 250 volts are most suitable. In order to choke

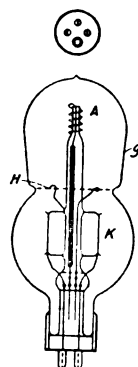


FIG. 3.—LIEBEN-REISZ RELAY.

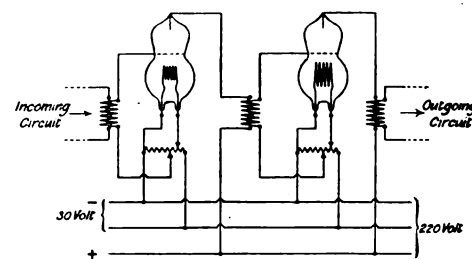


FIG. 4.—CASCADE CONNECTION OF LIEBEN-REISZ RELAYS.

the current fluctuations caused by the commutator of the machine, if the D.C. mains are used an impedance coil of about 3 henrys is connected in series with one pole and a condenser of 10 mfd. between the poles. The circuit connections are shown in Fig. 5. The transformer *T*<sub>1</sub> is not necessary in theory, but it is used in practice to keep the 250-volt circuit from the con-

nected apparatus. For the strengthened alternating currents the impedance is reduced by a 2 mfd. condenser.

With the right arrangement of the auxiliary potential the bluish-green glows in the two parts of the lamp divided by the auxiliary electrode are equally bright, and the cathode dark space on the upper half of the perforated electrode measures about 4 mm. Adjustment of the auxiliary potential is provided for, and when correct the glow in the upper half of the lamp should be extinguished. The temperature of the Wehnelt cathode can also be adjusted by the resistance  $R$  (Fig. 5). If the temperature is too low, the current in the gas, which normally should be 0.02 ampere, is not sufficient, and if too high the lamp burns unsteadily, thus necessitating a continuous regulation of the auxiliary potential. If this and the cathode temperature are adjusted correctly, the lamp will burn steadily for several hours. The relay should only be placed in rooms where

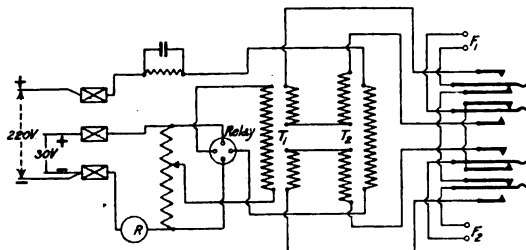


FIG. 5.—CONNECTION FOR DUPLEX WORKING THROUGH A SINGLE RELAY.

the temperature is not above 35° C., as temperatures above this will raise the pressure of the mercury vapour so much that the negative potential of the auxiliary electrode does not suffice to keep down the flow of ions through the openings of the lattice, the cathode dark space, and consequently the resistance of the gas diminish and the working of the relay is prevented.

In Fig. 5 is shown a connection for duplex working. The relays are placed in the middle of the loop joining the two distant points. By using transformers of suitable design it is possible to connect lines of unequal length and of varying characteristics.  $F_1$  and  $F_2$  are the lines connecting the two subscribers.

## ELECTRIC POWER IN THE POST OFFICE

A PAPER on "The Employment of Power in H.M. Post Office," by Mr. H. C. Gunton, was read on Tuesday evening before the Manchester Local Section of the Institution of Electrical Engineers, and will also form the subject of to-night's discussion at the London meeting of the Institution.

The author outlined the main power supply system from the Post Office generating station at Blackfriars (see *ELECTRICAL ENGINEERING*, Vol. VI., p. 724, November 17th, 1910), and the three substations at King Edward Building (Vol. VI., p. 745, November 24th, 1910), G.P.O. West, and Carter Lane, mentioning how a battery at G.P.O. West could maintain the whole supply by running the converters reversed. The present load is small, but its favourable character renders it possible to supply energy at 1½d. per unit. In the provinces the tendency is to replace isolated generating plants by municipal supply, in some cases with batteries in the substations.

The author then passed on to detail some developments in pneumatic tube work and lifts. Of the latter there are many varieties which are electrically driven, and comparing electric and hydraulic lifts the author writes: "The capital cost of an electric lift is usually greater than that of an hydraulic lift, except in the case of a very long travel. The average maintenance cost of an electric lift is not likely to be so great as that of an hydraulic lift, but for all practical purposes they are taken to be about the same. The greater the number of stops and the shorter the travel between floors, the less favourable is the case for the electric lift as regards the cost of operation."

Other applications of electrical power referred to are the driving of conveyors in sorting offices and telegraph instrument rooms, stamping and obliterating machines, bag cleaning machines, &c. Electric fans are largely used for ventilation, designed usually to change the air of the various floors at a rate varying from a minimum as produced by unaided ventilation to a maximum forced circulation of 2.5 to 3 changes of air per hour. Considerable difficulty has been experienced with the ventilation of telephone exchange switchrooms, owing to the high switchboards interfering with the natural circulation of the air. Most satisfactory results have, however, been obtained by installing suspended fans of the revolving type between the switchboards to circulate the air, in addition to fans in the windows for the extraction of air.

An interesting point in connection with telephone exchange power plant is the necessity for generators specially designed

to give silent working when supplying the telephone-exchange circuits direct without any battery in circuit. Their chief features are ring-wound armatures with a large number of commutator segments, uniform distribution of the field, good balancing both mechanically and electrically, good commutator surface and a special type of high-conductivity brushes; large choke coils of special design are also used in conjunction with the machines. The machines are built in sizes from 1 to 40 kilowatts.

The Paper then dealt with electric lighting of Post Office premises, and it was mentioned incidentally that about 4,300 kw. was absorbed for the purpose, and that a saving of £8,000 per annum had resulted from the introduction of metal filament lamps.

The next subject taken up was the projected Post Office Tube Railway (see *ELECTRICAL ENGINEERING*, August 14th, p. 471).

It is proposed to operate the trains by three types of current: high speed (H.S.), intermediate speed (I.S.), and low speed (L.S.). Between the stations H.S. current will be applied. At the approach to a station the wagons will pass over a short gap in the conductor rails, and brakes (which will be electrically released when the train is taking current and applied when the train is not taking current) will be applied. The next section of conductor rail will normally be "dead," and will be of such a length as to allow the wagon to come to rest, the brake remaining on. In the case of a wagon which is required to stop at the station, a L.S. current will be applied to this brake section and the train will move to the station platform, and will finally be brought to rest owing to the application of the brakes when it reaches its sub-section of the station platform, the conductor rails of that sub-section having been made "dead" for its reception. In the case of a through train, I.S. current would be applied to the brake section, and the wagon would run at this speed through the station, would pass over a short gap in the conductor rails, and then without a stop on to the sections of the track energised by H.S. current. In the event of its being possible to accept, without delay, either a stopping train or a through train, the braking section, or a certain portion thereof, would be energised with I.S. or L.S. current respectively before the train reached that section, in which case the train would merely be retarded down to the speed corresponding to the current applied, and would either pass up to the platform or straight through the station. A wagon will be dispatched from the station by making alive the conductor rails of the sub-section on which it has been standing with I.S. current, if it is being sent on to a main line, or with L.S. current for shunting operations.

The control of the wagons will not need the continuous attention of the switchman, who, by means of small levers in the cabin, will set points for the particular route desired, and will energise certain sections of the conductor rails with the appropriate current. The wagon will then come to rest at the proper section of the platform, or will run through the station without further attention. The operation of the points will be interlocked with the application of the current, and there will be a complete interlocking arrangement between the different routes.

In conclusion, reference was made to the Edison battery trucks described in *ELECTRICAL ENGINEERING* (November 6th, p. 618), which are being experimented with.

**The German Society of Illuminating Engineers.**—The first meeting of the "Deutsche Beleuchtungstechnische Gesellschaft" was held in Charlottenburg on November 8th last, and the official record of the proceedings is published in the *Elektrotechnische Zeitschrift* of December 11th. Herr Schanz again expressed alarmist views as to the possible ill-effects of ultra-violet rays from metal filament lamps but his fears were effectively disposed of by numerous authorities in the discussion. A useful Paper on the determination of the colour of light was read by Professor Bloch.

**The Electrical Trades Benevolent Institution.**—The report of the committee and accounts for the year 1912, together with the report of the last annual general meeting, the festival dinner, the list of subscribers, &c., and the rules, has just been issued in booklet form. In 1912 the income was not quite so large as in the previous year, due to the fact that the Institution was, in the year 1911, the recipient of a legacy and also of the balance of the amount from the 1905 Olympia Exhibition. In the course of the year 1912 only one corresponding donation was received, viz., that from the British Electrical and Allied Manufacturers' Association of £250. The total income for the year 1912 is £954 10s. 9d., as compared with £1,107 15s. 10d. for the year 1911. There has, however, been a very marked improvement in the number of persons subscribing as well as in the amount of subscriptions, which is now more than four times that of last year, while the ordinary donations are considerably more. The result of this year's work has been a net income of £754 5s. During the year under review, eight grants were paid out, amounting to £71 3s. 6d., and £200 5s. was accounted for as salaries, fees, and expenses. The Institution has prepared printed forms of codicil to facilitate making bequests.

## LONDON ELECTRIC SUPPLY

THERE has been a good deal talked and written during the past week as to the great scheme for the reorganisation of the electric supply of London foreshadowed by the Bill which has just been deposited in Parliament on behalf of the County of London Electric Supply Co. and others, and a few of the daily papers have indulged in somewhat imaginative flights of speculation. The matter has already been referred to in *ELECTRICAL ENGINEERING* (Nov. 27th, p. 672), but it may be of interest to indicate a little more precisely the stage to which the scheme has been brought. As has been remarked before, the main object of the Bill is to render possible a postponement of the date, at present fixed at 1931, when the present London companies' undertakings can be purchased by the London County Council, to modify the nature of the terms upon which such purchase can be made, and to give the companies concerned power to enter into agreements with each other and with the London County Council to effect a reorganisation and consolidation of London's electric supply. The scheme is really in a much more preliminary stage than one would suppose from some statements which have appeared in the Press. The County of London Co., it must be understood, is seeking not so much to effect an amalgamation of the existing London supply companies into one concern, as to bring about a consolidation of their supply. It is not intended that the present companies should lose their individualities, but it is hoped that the advantages and economies of bulk supply on a large scale may be made available by the conversion of some of the smaller existing stations into sub-stations, while the main supply is given by one or more new large power-houses, and the extension of some of the larger existing ones. To facilitate such a scheme the County of London Co. is taking the first step in promoting this Bill. The other companies have had the matter under consideration for some time, but have not yet actually come into agreement; in fact, the matter is still to a large extent in the melting pot. The Bill, however, is drafted with the object of enabling the necessary agreements to be completed between the parties, without further Parliamentary sanction being necessary. The County Council, a special Committee of which has had the question of the electric supply of London under consideration for some two years, and has now the expert assistance of Mr. Merz, is opposing the Bill, but the promoting Company anticipates that this is mainly with a view to obtaining a *locus standi*, and is sanguine—perhaps too sanguine—that agreement will ultimately be arrived at between the Council and the companies. It is premature to say much as to the engineering details of the scheme, but, as we pointed out a week or two ago, it is significant that during last session the County of London Co. obtained an option for a site of 23 acres close to Barking which might be used for the purpose of a large new generating station. That the scheme is a large one is obvious from the fact that about thirteen companies, with an aggregate capital of over fourteen millions, would probably be involved. Considerable new capital will, of course, also be required for the rearrangement of the systems, and the building of new stations.

The main clause of the Bill states that it is for the purpose of facilitating the making or carrying into effect of any "association agreement" between any two or more of the London electric supply companies (notwithstanding anything contained in the London Electric Supply Act of 1908 as amended or extended by the London Electric Supply Act, 1910, . . . or any other Act of any of the London electric supply companies). It provides that the London County Council and the companies may at any time within three years from the passing of this Act enter into any agreement for the postponement, whether conditional or otherwise, of the date at which the Council may purchase the companies' undertakings or any parts of them, and for the variation of the terms and conditions upon which the purchase is effected.

The preamble of the Bill states that it is one "To benefit the consumers of electrical energy within the County of London, and materially improve the position of the Council as the purchaser of the undertaking of the said Company." The contention of the Company is that if agreements can be come to for the Company or companies to unify conditions of electric supply in London prior to 1931, then, in the event of the Council purchasing at that date, they will purchase under very much improved conditions than will be the case if the present position is maintained until 1931, and the work of unification put in hand then. On the other hand, of course, the terms of the Bill would provide for any agreements that might conceivably be entered into, under which the companies would continue to work the unified system after 1931.

## THE LEEDS STRIKE

THERE are distinct indications that the strike of the municipal workers at Leeds will quickly end, a result largely due to the few loyal workers who remained at their posts, and the spirited action of a large number of members of the public who have gone to their assistance. The strike commenced on Wednesday last week, and during the next few days extended in smaller or larger degree to practically all departments, and it has been computed that there were 5,000 men on strike.

That the action of the public has been largely responsible for foiling the leaders of the strike is well shown by what has taken place at the electricity works, which is being run by a nucleus of engineers and loyal workmen, admirably assisted by a large voluntary staff drawn from the citizen's ranks. The engine-drivers and stokers, after giving seven days' notice, left work at the expiration of the night shift on the day following the notice, but the supply of electricity has been maintained without the slightest falling off in pressure, and without asking the public to restrict their consumption. Indeed, the station on Friday carried its record load of 13,500 kw., compared with last year's maximum of 10,700 kw. The management is convinced that the works could, if necessary, be kept going permanently under the existing arrangements, as there is a large reserve list of volunteers anxious to come in and help as soon as there is room for them.

A somewhat similar condition of affairs has obtained in the tramway department, which has been able to maintain a very useful service of cars, and it is the work of these two departments which has had more than anything else to do with the present tendency of the strike to break up.

## THE PHYSICAL SOCIETY'S EXHIBITION

THE ninth annual exhibition of electrical, optical and other physical apparatus, promoted by the Physical Society of London, was held on Tuesday at the Imperial College of Science. Interesting displays were made by different firms, and the experimental demonstrations proved a great attraction. These demonstrations included one by Prof. J. T. Morris and Mr. J. F. Forrest on the electric arc as a standard of light, and one by Prof. J. A. Fleming, F.R.S., of a method of producing vibrations on loaded and unloaded strings. By imparting the waves to the string through a rotary crank driven by an electric motor, the phenomena of stationary waves, &c., under different conditions were illustrated. About twenty firms were showing electrical instruments, including a bold show by the Weston Electrical Instrument Co. On this stand the Weston synchroscope proved a source of attraction, while the miniature precision direct-current ammeters and voltmeters exhibited remarkable sensitiveness and dead-beatness. These neat little moving-coil instruments are designed for a variety of purposes, and are so small that they may be put in the pocket, while the internal construction is quite up to the Weston Co.'s usual high standard. The voltmeters read up to 150 volts without the use of resistances, and the ammeters up to 30 amperes without the use of shunts. Another new type of instrument shown was a combined illuminated dial ammeter and voltmeter with specially made movements for use on electric vehicles. Although new to this country, this instrument, we were informed, has been in extensive use in America for some time past. A large display of miscellaneous instruments for all purposes was made by R. W. Paul, while the Record Electrical Co., Ltd., showed examples of the well-known "cir-scale" ammeters and voltmeters. In these 300° of scale is traversed by the pointer. Evershed & Vignoles, Ltd., showed the "Megger" and "Ducter," and Nalder Bros. & Thompson had on view the latest type of "Ohmer" with vibrating reeds, as well as a circuit-breaker allowing of fine adjustment on both A.C. and D.C. circuits, and examples of dynamometer-type instruments. Gambrell Bros., Ltd., showed for the first time a moving-coil galvanometer, with pointer or mirror, which requires no levelling. It proved to be very sensitive as well as robust. The movement is suspended below the coil, so that it always remains central, and a very small gap is allowable. A 2,000 mm. deflection per micro-ampere with lamp and scale at one meter is obtained. In addition, exhibits were made by Isenthal & Co., Ltd.; Elliott Bros.; Foster Instrument Co.; Crompton & Co., Ltd.; Cambridge Scientific Instrument Co., Ltd., who showed the electrostatic oscillograph devised and perfected by Prof. H. Ho and Prof. S. Kotô (*ELECTRICAL ENGINEERING*, Nov. 20th, p. 644); Synchronon Co., Ltd.; J. J. Griffin & Sons, Ltd., who showed, among other things, an aluminium hot-plate with automatic temperature regulation; A. C. Cossor, Ltd., and others.

Wireless apparatus was especially represented by Marconi's Wireless Telegraph Co., Ltd., Ludgate Wireless Co., and Muirhead & Co., Ltd., who showed the ingenious Heurtley magnifier and two sets of Colonel Squier's "Wired-wireless" field apparatus (see *ELECTRICAL ENGINEERING*, Vol. VIII., p. 302, June 6th, 1912). Another exhibit which attracted much attention was that of Duram, Ltd., which showed the various stages of tungsten wire from the ore to the final lamp filament, as carried out by this Company in this country.

## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,370.

In modern turbo-generators of large capacity, what is the usual percentage of reactance? What are the advantages and disadvantages of high reactance?—A. S. T. I.

(Replies must be received not later than first post, Monday, December 29th.)

### ANSWERS TO No. 1,368.

I am putting in motor drives in a sawmill, and should be glad of an idea of the sizes of motors required. One is to drive countershafting with five circular saws on (all push benches without power feed), one 48-in. saw, three 36-in. saws, and one 40-in. saw; and the other to drive two horizontal frame saws and friction hauling gear. The motors will be for continuous current and are to run at about 800 r.p.m.—F. H. G.

The first award (10s.) is given to "A.G.R." for the following reply:—

In reply to "F. H. G.'s" inquiry, I should like to point out that the power taken by the various machines will vary between very wide limits, according to the class of wood to be cut, and that as he does not state the conditions, only average figures can be given. To quote a few examples of actual machines will give "F. H. G." an idea of the variation in power taken in cutting different woods:—

(a) A circular saw of 36-in. diam. cutting yellow pine 11 in. deep at 20 ft. per min. took 2.9 h.p. running light, and 18 h.p. with load on. These figures do not include the power taken by the shafting and motor which was about 3.8 h.p.

(b) Saw-mill circular saw (to take 60 in. diam. saw) driven by a 30-h.p. 600-r.p.m. shunt wound motor through a belt. Speed of saw 750 r.p.m., cutting damp pitch pine from 10 in. to 17 in. thick (average 14 in.). Power taken: Max. 36 h.p., min. 21 h.p., mean 26 h.p.

(c) Circular saw 33 in. diam. cutting cross-cut Lignum Vitæ 9½ in. deep by 18 in. long took 2.3 h.p. running light, and 7 h.p. with the load on. The figures do not include power lost in shafting, &c., which amounted to approximately 3.7 h.p.

(d) Circular saw 32 in. diam. cutting yellow pine 11 in. deep at 7 ft. per minute, took 1.4 h.p. running light, a maximum of 9.5 h.p. and a mean of 6.9 h.p. with load on, exclusive of power lost in motor and shafting, &c., which was 3.6 h.p.

Referring now to the case under consideration, the following table shows approximately the average power which will be taken by the various machines (exclusive of power lost in shafting):—

Machine.	H.P. running light.	H.P. with load on.
36-in. circular saw	2.4	16.0
40-in. "	3.0	20.0
48-in. "	4.3	28.0

The total h.p. will therefore be:—

For 1-48-in. circular saw ...	28 h.p.
" 3-36 in. " ...	48 h.p.
" 1-40-in. " ...	20 h.p.
	96 h.p.
Allow for h.p. lost in shafting ...	20 h.p.
Total ...	116 h.p.

Allowing that the machines will not be working at a maximum rate at the same time, a 100 h.p. 800 r.p.m. shunt-wound motor could be used. The efficiency of such a motor would be about 92 per cent., so that the power taken from the supply mains would be 81 kw. With reference to the second part of the question, a figure for the power taken by the friction hauling gear can hardly be given with any accuracy without knowing the actual conditions of operation, &c. The power required for a horizontal frame saw of average size would be about 4 to 5 h.p., exclusive of the power required for the shafting.

The second award (5s.) is made to "W. H.," who writes as follows:—

There is scarcely sufficient information in the question to give a really accurate estimate as to the power required by the various saws, as no details are given as to the type of saw, whether "cross cut" or "swage," nor is there anything to state the kind of wood to be worked. We will assume that ordinary cross-cut saws are to be installed, and that ordinary soft woods are to be worked. The powers required by the various saws would be as follows:—

A 48-in. cross-cut saw requires 13 b.h.p.  
3-36-in. cross-cut saws require 30 b.h.p.  
1-40-in. cross-cut saws require 11 b.h.p.

Thus making a total b.h.p. of 54.

It will probably be correct to state that there will never be more than four saws working simultaneously; thus if we install a 40-45 b.h.p. motor running at a speed of 800 r.p.m., and driving on to the countershaft by means of belting, this should give all the required power. The most suitable type of motor would be a shunt-wound machine fitted if necessary with commutating poles. It should be noted that for driving saws singly, a slightly compounded motor should be used, in order to obtain some flywheel effect, but in the case of group drive this is hardly necessary. The motor should be of the "drip proof" or "pipe ventilated type," with dustproof bearings. This class of motor is much cheaper than a totally enclosed machine would be.

With regard to the other motor required for driving two horizontal frame saws, and also for supplying power to a friction haulage gear, no details are given as to the purpose of the haulage gear, so we will assume that 5 h.p. would be required for this purpose. This will, of course, be a very intermittent load, and might well be taken care of by the overload capacity of the motor. The two frame saws will require from 20 to 25 h.p. each, thus making a 40-50-h.p. motor suitable for the purpose. If, therefore, we install a 50-b.h.p. motor running at 800-r.p.m., this will be sufficient to take care of the 5 h.p. required for the haulage gear. This motor would also be of the "drip proof" or "pipe ventilated" type, with dustproof bearings. In case any unusual woods are to be worked, the following figures should be of interest. Ordinary hard woods would require about 20 per cent. more power than those stated above, and extremely hard woods would require from 60 per cent. to 100 per cent. more power. Swage saws would require about 2½ times as much power as the cross-cut saws mentioned above.

**Power Supply across the Sea.**—While the supply of power to Copenhagen from Trollhätten, Sweden, is still under discussion, a second and similar scheme for the supply of power across the Skagerrak has been mooted. According to the *Elektrotechnische Zeitschrift*, the scheme involves the development of a water-power near Christiania, Norway, and transmission by submarine cables across the Skagerrak to the northern district of Jütland, Denmark.

**Annual Dinner of the Scottish Local Section of the I.E.E.**—The principal guest of the annual dinner of the Scottish Local Section of the Institution of Electrical Engineers on Thursday last was Lord Rosebery. Mr. J. A. Robertson, Chairman of the Section, presided, supported by Mr. James Lowson, Vice-Chairman, and Mr. W. P. McWhirter, Past-Chairman, and a number of other notable men were present. Mr. A. Bruce Anderson proposed the Imperial Forces, and in replying Commander Acklom referred to the many uses of electricity in the Navy, and Sir George Beatson replied for the Army. Sir J. Ure Primrose proposed the Houses of Parliament, and the speech of the evening was the reply of Lord Rosebery, who proposed an amusing scheme for voting electrically at Parliamentary divisions, and touched on a number of general subjects, regretting the ruinous competition in national expenditure and the gradual invasion of personal liberty by present-day legislation. Mr. D. T. Holmes replied for the House of Commons, and the toast of the City of Glasgow was proposed by Dr. S. Z. de Ferranti, and responded to by Lord Provost Stevenson. The toast of the Institution was proposed by Bishop Campbell, and replied to by Mr. W. Duddell, F.R.S., and the final toast was "The Scottish Local Section," proposed by Mr. J. E. Kingsbury, and replied to by the Chairman. During the evening a presentation of a gold watch was made to Mr. J. E. Sayers, with a diamond pin for Mrs. Sayers, on the occasion of the retirement of Mr. Sayers from the Secretaryship of the Section.



**A "No Trouble"  
Remote Control  
Switch**

**SPECIFY  
'IGRANIC'**

**CLAPPER and  
CONTACTOR TYPE.**

IGRANIC ELECTRIC Co. Ltd.  
LONDON and BEDFORD.

## THREATENED STRIKE OF ELECTRICAL WORKERS

### Men's Reply to Masters

THE Electrical Trades Union has replied to the letter from the London Electrical Masters' Association, given on p. 696 of our last issue. Following the receipt of this letter, a meeting was held on Monday, when the following resolution was passed:—

"This meeting of members of the Electrical Trades Union instructs the London District Committee that they cannot accept the terms of the letter of December 8th from the London Electrical Masters' Association, and cannot enter into negotiations excepting the questions to be discussed by the suggested conference are dealt with on their merits, without any previous conditions being exacted and without prejudice."

This resolution has been communicated to the masters, and in an accompanying letter it is stated that the suggested conditions contained in the masters' communication have never before been put to or agreed upon by any workmen's association previous to the questions at issue being discussed. We understand that the only dissentients from the above resolution were those who desired immediate action to be taken.

We have received the following letter from Mr. J. Potter, London District Secretary of the Electrical Trades Union. The statements he makes are in direct conflict with those made to our representative last week by Mr. Duncan Watson himself:—

"DEAR SIR,

"I notice in last week's issue of your journal that a report is given of the strike which has occurred at the new buildings which are being erected for the Pearl Life Assurance Co. in Holborn, together with an interview with Mr. Duncan Watson who is the Contractor for the electrical installation of the premises. The statements contained therein are fraught with several inaccuracies, though the responsibility does not rest with you.

"A stranger reading your report would reasonably believe that Mr. Watson is one of the most fair and impartial of employers but our experience has been entirely to the contrary, in fact I do not think it any exaggeration to state that he has given us as much trouble to obtain for our members reasonable conditions, as any other two Contractors in London. Two years ago Mr. Watson was not paying to his wiremen more than 9d. an hour; I am given to understand a considerable number were receiving less. At that time several of his men joined the Union with the hope of securing an improvement in their conditions and we reported the firm to the Home Office in connection with the contract at Wormwood Scrubbs Prison, with the result that one of the men at least had a sum considerably in excess to that stated last week refunded to him. This apparently did not suit Mr. Watson, who informed the members of the Union that he would refund all the monies they had paid if they would sever their connection with us; if not they would have to leave his service, several remained with us.

"Later, having previously approached the Pearl Co., with regard to the contract, we heard that Messrs. Duncan Watson & Co., were to do the work on the building in Holborn, and that he was paying lesser rates than those obtaining with the reputable firms of the Metropolis. Negotiations ensued with the Assurance Co., the Architect, and Mr. Watson, but owing to their protracted character a considerable portion of the work was completed before the latter gentleman could be induced to pay a maximum with him, of 9½d. an hour, and that only occurred a few months back. Since then we have approached the men to join with us, but the previous experience seemed to be a barrier, so our General Organiser secured a letter from Mr. Watson stating they could decide for themselves. In order to counteract this letter Mr. Watson convened a meeting of his men in his own time at his Office, which was addressed by Mr. Pulvermacker, one of the principals of the firm.

"During the afternoon I received information that this meeting was taking place, attended, and sent in the information that I was there. It was certainly left to the men to decide whether they would hear me, and it is certainly humorous that Mr. Pulvermacker had hardly disappeared round the corner before they invited me up to the room. Having addressed them for about half an hour and answered quite a volume of questions, I also left. On a secret ballot, twenty-one out of twenty-three present decided to join, one remaining neutral, and one

only hostile to the Electrical trades Union, the vote being taken when I was not present.

"This result was not anticipated, for a further meeting was called, Mr. Watson with his Engineers being present. At this meeting I am given to understand the men were told, 'that they were to decide for themselves whether they would join the Union, but they must clearly understand that there would be a breach in that confidence which had existed in the past, which might never be healed,' and to use a vernacular phrase 'that done it.' Personally I think these men bear a very strong resemblance to sheep, and one of their number confessed they did.

"Up to that time not one of Mr. Watson's employees had ever received more than tenpence an hour, these being charge hands, the wiremen with very few exceptions more than ninepence, shortly after these men received an increase of one halfpenny an hour.

"Our members contend that the Electrical Trades Union has been largely responsible for this result, and that they have a just claim in demanding that these men should bear their burden of the responsibility, and that can only be done by their joining the organisation, therefore they have refused to work with them.

Yours faithfully,

J. POTTER,  
District Secretary."

Work is proceeding upon the Pearl Assurance building, although none of the strikers have resumed.

## CORRESPONDENCE

### ELECTRIC CIRCUIT THEORY AND CALCULATIONS.

To the Editor of ELECTRICAL ENGINEERING.

SIR,—I thank you for the review of the above book, which appeared in your issue of the 11th inst. At the same time, I should like to be allowed to comment on the following two observations made by your Reviewer:—

(a) "But little space is devoted to the magnetic circuit."

(b) "It seems wrong to assume that the reader is more likely to have a knowledge of elementary electricity and magnetism, and yet not know how to multiply and divide decimal fractions."

As regards (a), I was not aware that any space at all had been given to the magnetic circuit. There is certainly not a single numerical example relating thereto, and this omission is intentional; for, as stated in the Preface, "the magnetic circuit, which concerns design work more than installation work, is ignored altogether." Your Reviewer might have pointed out the advantage of this procedure.

As regards (b), your Reviewer ought to know that there are plenty of what might be termed "ordinary electrical workers" who would be quite at sea with decimals. It would have been more effective had he expressed an opinion on the Arithmetical Section as a whole, which had considerable care devoted to its 44 pages. It is not supposed that every reader will want to read this section, but it is there for those who do.

Further, as regards (b), I do not think it illogical to assume that some readers might have an elementary knowledge of electricity and magnetism and yet not be *au fait* with the matters dealt with in the Arithmetical Section, which, by the way, extend a good deal beyond the multiplication and division of decimals. It is specifically pointed out in the Introduction that those who have not the aforementioned knowledge should straightway acquire it.

I should like to say, in conclusion, that the contents of the book are founded on fairly intimate knowledge of what is required by its intended readers, and also that it has been exceptionally well received by teachers of wide experience.

I am, sir,

Yours faithfully,

W. PERREN MAYCOCK.

West Norwood, December 13th.

[The main duty of a reviewer is to make clear the scope of the book he is reviewing, and to let it be understood to what class of readers it will be useful. This, in our opinion, he has done with accuracy and discretion; our readers, after perusing Mr. Maycock's long letter in addition, will now possess the fullest possible information.—Ed. E. E.]

## "ELECTRICAL ENGINEERING" PATENT RECORD

*(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)*

### Specifications Published December 11th, 1913

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

26,548/12. **Incandescent Lamps.** J. R. QUAIN. The filament is wound in a helical groove on a silica core mounted in the lamp socket. Filament breakage is said to be reduced. One figure.

26,726/12. **Course Recorders.** E. C. VILLIERS. A magnetic wheel works over the surface of an iron plate to which it is attracted. The direction of this wheel is taken from the compass, and the speed is taken from engine, propeller, road wheels, &c., as convenient. Four figures.

29,268/12. **Unidirectional H. P. Discharges.** O. J. and L. LODGE. Vacuum valves and a mechanical interrupter are connected in series in the secondary circuit of an induction coil. The valves are isolated by the interrupter, except at special moments in the cycle. Three figures.

3,864/13. **Heating Elements.** A. C. MICHIE and R. A. S. PAGET. Spiral or straight flexible wires are drawn into tubes of fused silica or other refractory material bent into tortuous curves by means of gaseous or liquid suction and pressure with or without mechanical vibration. Nine figures.

5,173/13. **Magazine Arc Lamps.** A. E. SPENCER and JOHNSON & PHILLIPS. The feeding tappets traverse a path at a slight angle to the longitudinal axis of the carbons in the magazine. The carbon about to come into operation is guided so as to become inclined to the remaining carbons, and to displace the burning carbon till it assumes its normal position. Two figures.

6,192/13. **Synchronising Clocks by Wireless.** R. L. DES ORDONS. A selection is made from the signals received by a station, depending on their duration and the intervals between them. The circuit of an electromagnet is closed by each signal and controls a second electromagnet. The switch contacts remain closed for a certain time after the first electromagnet ceases to be energised, so that signals separated by a shorter interval than that for which the contacts are closed result in an uninterrupted current in the second electromagnet. Five figures.

### Specifications Published To-day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free.

Names in italics indicate communicators of inventions from abroad. Summaries of some of the more important of these patents will appear in our next issue.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** B.T.-H. Co. (*G. E. Co., U.S.A.*) [Resinous and wax-like condensation products] 24,254/12; WATERS [Protective systems] 26,961/12; B.T.-H. Co. (*A.E.G.*) [Control systems] 27,236/12; MARTIN [Grips for wires] 78/13.

**Dynamos, Motors and Transformers:** B.T.-H. Co. and WHITAKER [Rotary converters] 26,680/12.

**Electrometallurgy and Electrochemistry:** KENDALL [Treatment of alkali chlorides] 26,896/12; SIEMENS & HALSKE [Electrolysis of halogen alkalis] 18,102/13; Soc. ANON. L'OXYDRIQUE FRANÇAISE [Industrial electrolysis of water] 18,818/13.

**Heating and Cooking:** UNIT ENGINEERING Co. and BROWN [Water-heaters] 759/13; ARPIN [Heaters] 10,289/13; MARKS (*Landers, Frary & Clark*) 10,579/13; JUNG [Food-warmers] 18,592/13.

**Ignition:** VON KLAEDEN [Conductor for explosive charges] 17,261/13.

**Incandescent Lamps:** FULLER, 5,209/13; PLECHATI [Connecting filaments to leading-in wires] 13,406/13.

**Storage Batteries:** WACKWITZ [Grids] 15,719/13.

**Switchgear, Fuses and Fittings:** MIDDLETON, BAKER, FARNDON and MORRIS [Motor starters] 26,912/12 and 24,054/13; B.T.-H. Co., ASH and WATSON [Automatic slip regulators for induction motors] 27,011/12; LEDUC [Permutation switch for bolts, alarms, &c.] 27,609/12; [Bolts for locks] 27,610/12; B.T.-H. Co. (*G. E. Co., U.S.A.*) [Switches] 4,835/13; B.T.-H. Co. (*A.E.G.*) [Fuse plugs] 5,523/13; RASCH [Switches] 8,665/13; POLLAK [Pressure regulators and switches combined] 15,950/13.

**Telephony and Telegraphy:** AHLEMEYER [Telephony] 7,221/13; SIEMENS BROS. (*Siemens & Halske*) [Telephony] 12,566/13; MEYER [Telephone table instruments] 14,780/13; SIEMENS & HALSKE [Relay] 17,137/13.

**Miscellaneous:** GIBBONS and BLAKE [Control of bulkhead doors] 19,192/12; ARON, WIENER and X.L. ELECTRIC Co. [Clocks] 19,257/12; PEDERSEN [Variable speed gearing] 26,760/12; EVANS (*Deutsche Maschinenfabrik A.G.*) [Pulley block] 28,665/12; STOCKDALE [Burglar alarms] 1,764/13; WILSON (*Wilson*) [Lock position indicator for railway carriages] 9,195/13; DORRICOT

[Tracker bars for musical instruments] 13,546/13; CARL ZEISS [Lighting system for cinematographs] 17,245/13; SENFFLEBEN [Submarine mines] 17,441/13.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Distributing Systems, &c.:** KETTERING [Selective distributing systems] 7,545/13; LEC [Utilisation of oscillating current energy] 24,458/13.

**Electrometallurgy and Electrochemistry:** CHEMISCHE FABRIK VON HEYDEN A.-G. [Alkali metals and alloys] 25,957/13.

**Incandescent Lamps:** DEUTSCHE GASGLÜHLICHT A.-G. (AUGES) [Bulbs with reflector] 15,360/13.

**Instruments and Meters:** LEEDS, 25,716/13 and 25,717/13.

**Telephony and Telegraphy:** Soc. MARIUS, LATOUR ET CIE [Frequency transformer for wireless] 26,934/13.

**Traction:** FRENCH WESTINGHOUSE Co. [Railway signalling] 22,029/13.

**Miscellaneous:** OTTO [Dirigible torpedoes] 24,802/13; CLERC [Clocks] 25,977/13; GROSSHEINTZ [Artificial daylight] 26,117/13; POETZELBERGER [Musical key instruments] 26,388/13; SIEMENS & HALSKE [Rivetting] 27,050/13.

### Applications for Amendment of Specification

7,689/02. **A.C. Track Circuit Signalling.** J. B. STRUBLE. The Union Switch & Signal Co., of Pennsylvania, has made application for permission to amend this specification on the ground that "certain of the claims in their present form contain subject-matter which is anticipated."

4,677/06. **Enclosed Flame Arc Lamps.** A. BLONDEL. The patentee is seeking leave to amend the specification in order "to limit the scope of the patent." The gases are drawn immediately after their formation through an opening round the arc, and are returned, after purification through a lower co-axial opening, so that the rising gases directly surround the arc.

### Amendments made and Allowed

11,375/12. **Automobile Control.** M. L. WHITFIELD and C. C. COWAN. As a result of the extended investigation under Section 8 of the Act, a disclaimer has been inserted in this specification, which deals with a petrol-electric driving system.

### Opposition to Grant of Patents

3,878/12. **Shaft Rotation Indicators.** P. R. KEEPIE and H. M. R. MADDICK. The Comptroller has allowed the grant of the patent in spite of opposition. The invention relates particularly to the indication on a ship's bridge of the direction of rotation of the main propeller shafting.

5,692/12. **Shaft Rotation Indicators.** J. C. CLARKE and CHADBURNS (SHIP) TELEGRAPH Co. This patent, which has a similar object to the one above, was also opposed, but has been allowed.

### Expiring and Expired Patents

The following Patents expire during the current week, after a life of fourteen years:—

25,186 of Dec. 19th, 1899. **Receiving Aerial Circuits for Wireless.** G. MARCONI and the MARCONI Co. The specification refers back to patents Nos. 12,326/98 and 6,982/99. The primary of an induction coil is connected between the aerial and a condenser. The detector is connected across the outer ends of the secondary, which is wound in two parts, while a local circuit is connected across the inner ends.

25,346 of Dec. 21st, 1899. **Perforators for Automatic Telegraph Transmitters.** A. S. FRAMPTON and F. L. MUIRHEAD. A construction is given by means of which the accurate lateral adjustment of the position of the base plate that carries the punch-block relatively to the spur wheel is obtained. A feature is that the punches are easily removed and replaced.

The following are the more important Patents that have become void through non-payment of renewal fees.

**Switchgear, Fuses, and Fittings:** [R. HADDAN (*Elec. Device Co., U.S.A.*) [Motor controller which cannot be moved forward faster than at a predetermined rate] 18,744/02.

**Traction:** O. BÖHM and R. MENCKHOFF [Changing vehicle batteries] 17,349/01; E. W. HART and W. P. DURTALL [Electric transmission system for self-contained vehicles] 17,248/05; W. S. HAMM [Railway signal lamps] 2,375/07.

**Miscellaneous:** J. WATKINSON and A. E. PAYNE [Combined carbon and metal resistances] 19,219A/06; E. KLUPATHY and C. BERGER [Control of torpedoes and submarine mines] 18,025/08; H. BAUMGARTNER [Lift type apparatus to prevent sea-sickness on ships] 18,062/08.

## ELECTRIC TRACTION NOTES

The New York Central and Hudson River Railroad has recently ordered six 600-volt locomotives weighing 110 tons each. They will be able to develop 2,000 h.p. continuously or 2,600 h.p. for one hour. These figures are equivalent to a tractive effort of 14,000 lb. at 54 m.p.h. continuously, or 20,000 lb. at 49 m.p.h. on the one-hour rating. Thus trains weighing over 1,000 tons can be worked continuously. There are eight two-pole gearless motors, insulated for 1,200 volts, each driving one axle. The frame is of the articulated type with bogey guiding trucks at each end. The motors are provided with forced air ventilation. Ten similar but slightly less powerful locomotives are already in use.

The Board of Trade has called the attention of the Tramways and Light Railways Association to the following source of danger which may arise in tramcar controllers:—In the case of a recent accident, caused by a car getting out of control on a falling gradient, it was subsequently discovered that the insulation of one of the controller leads had become chafed in such a way that if contact took place with an adjacent (No. 3) terminal at the bottom of the controller, a short circuit across both armatures would be created, and the magnetic brake would thereby be rendered inoperative. The ordinary tests made before the car was put into service failed to detect any such short-circuit, but it was subsequently proved by trial on the ground that, owing to vibration or some other cause, contact did take place, with the result that a short-circuit of the nature mentioned above was established. The Association proposes to form a small special committee to go into the matter.

In giving its assent to a double-deck form of trolley bus for the Brighton to Hove scheme, the Board of Trade has stipulated that the vehicle must have an overall width not exceeding 7 ft. with a 10-in. ground clearance. The Hove Corporation suggest that the Brighton Corporation should use the vehicle on a trial route before finally adopting it.

There is some talk in financial circles of a rearrangement of the capital of the Underground Electric Railways Co. and the other companies affiliated with it, now that practically all the amalgamation schemes and agreements have been put into force, in order to bring into line the various classes of shares which now exist, with a view to putting the whole position on a more equitable basis.

Although not of a directly electrical nature, an interesting development has taken place in connection with the Oxford electric tramway dilemma. The Council does not appear anxious to take any immediate steps to secure the penalties from the National Electric Construction Co. which it can claim under the Acts of Parliament, neither has any agreement been made between the Council and the company as to running the tramways. In the meantime a service of motor omnibuses has been placed upon the streets, in spite of the fact that the Council has refused to license them. Curiously enough also in this case, the Council does not seem anxious to take legal proceedings against those responsible for this "illegal" bus service.

The Municipal Tramways Association is convening a conference of metropolitan tramway authorities with the view of formulating some scheme whereby the recommendations of the House of Commons Committee on Motor Traffic may be put into force.

The Highways Committee of the L.C.C. recommends an expenditure of £750 on the preliminary work of preparing plans, &c., for linking up the tramway system, and doing away with all "dead ends."

## TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

The following details of the Constantinople telephones taken from the *Zeitschrift für Schwachstromtechnik* are of interest. The payments to the Turkish Government will comprise 15 per cent. of the total receipts, and also 14s. per mile of telephone line, while the Government have the right to purchase the undertaking after a period of ten years. The Company can employ non-Turkish officials and engineers for the first ten years only, and the Government can demand the establishment of a school of telephone engineering in Constantinople or the sending of suitable members of the Government staff to Europe for instruction. On account of the several languages spoken in Constantinople, every ex-

change official must speak at least three—French, Turkish and Greek—and other officials speaking the English, German, Armenian and Slav languages will be stationed in each exchange. The number of contracted subscribers has reached 3,000 already, of which one-quarter are private subscribers.

The *Elektrotechnische Zeitschrift* announces that the long-distance Pupin-coil (ELECTRICAL ENGINEERING, July 18th, 1912, p. 410, Vol. VIII.) telephone line between Berlin and Milan is completed, and is undergoing trials under the supervision of representatives of the three Governments interested, namely, Germany, Switzerland and Italy. Direct connections will also be made between Milan and Zurich and Basle by the Swiss Government.

Negotiations are in progress for the purchase by the Egyptian Government of the business of the Telephone Co. of Egypt, Ltd. The purchase price would be about £1,300,000. The Company's network comprises nearly 80,000 miles of line, of which 7,150 miles are in Cairo.

The last of the series of lectures on Wireless Telegraphy which Mr. J. St. Vincent Pletts, A.C.G.I. (Chief of the Patents' Department, Marconi's Wireless Telegraph Co., Ltd.), has been giving at the City & Guilds (Engineering) College, took place last Thursday. The chief subjects dealt with were directive aerials and wave meters. The best kind of directionable receiver, said the lecturer, is that type first used by Dr. Hertz, and the best transmitter is that in which two aerials, half a wave-length apart, are used. However, as the wave-length is usually very great, this scheme is not possible, but as an approximation the bent aerial is used. For direction finding two triangular-shaped aerials are frequently employed. These are arranged at right angles, and the fields due to each are combined. The secondary coils are turned on a vertical axis until the strength of the signals is a maximum, and the direction of the signals inferred. The directive aerial has also enabled duplex working to be effected. A receiving and transmitting aerial are erected at each station, and balancing aerials are added to each receiving aerial with appropriate connections, so that the transmitting aerial at one station does not affect the receiving aerial at the same station. The necessary distance between the aerials at each station is roughly inversely proportional to the difference between the two wave-lengths employed. The Einthoven or single-string galvanometer is often used for receiving, as it has a high natural period, and consequently atmospherics do not spoil the readings. The lecturer then dealt with the mathematics of the wave meter, and showed that if  $\delta$  is the decrement of the aerial circuit, and  $\delta_w$  is the decrement of the wave meter, then  $(\delta + \delta_w) = \pi(1 - \lambda^2/\lambda_w^2)\sqrt{C^2/(C^2_{max} - C^2)}$ . Two readings are necessary—one when the circuits are in tune, and one when they are out of tune. The currents in these cases are given by  $C_{max}$  and  $C$ .  $\lambda$  is the wave-length indicated by the wave meter when the circuits are in tune, and  $\lambda_w$  when they are out of tune. If the difference between the two readings is very small, then instead of  $(1 - \lambda^2/\lambda_w^2)$  we can substitute  $2(1 - \lambda/\lambda_w)$ . It is advantageous generally to use the former, as by the use of a thermal junction and unipivot galvanometer readings proportional to the square of the current are obtained, and if the second reading is half the first, then  $\sqrt{C^2/(C^2_{max} - C^2)}$  becomes unity. In conclusion, Mr. Pletts pointed out the multitudinous duties of a wireless engineer in undeveloped countries, and indicated the great possibilities for advancement for those taking up wireless work and prepared to go abroad.

The Consul-General for the Argentine in London announces that all ships entering or leaving Argentine ports with fifty or more persons on board must in future possess a wireless telegraphy installation under the charge of a competent operator. The range of the apparatus for ocean-going vessels is to be not less than 310 miles.

According to the *Elektrotechnische Zeitschrift*, wireless communication has been attained between the station at Brussels and that at Boma in the Belgian Congo, a distance of 4,000 miles.

**Birmingham & District Electric Club.**—Mr. W. Y. Anderson has been appointed President, and Mr. W. Fennell, of Wednesbury, Vice-President.

**Electric Ambulance Service for London.**—We referred recently to the scheme of the Metropolitan Asylums Board for maintaining an electric ambulance scheme throughout their area, similar to that now in operation in the City of London. This, of course, necessitated the Board taking control of the scheme so far as it affected the area of the London County Council, but this does not commend itself to the latter body, and a report by the General Purposes Committee seeks instructions to prepare a scheme for dealing with the L.C.C. area separately from the area outside the County which comes within the district of the Metropolitan Asylums Board.

## "ELECTRICAL ENGINEERING" TRADE SECTION

— Notes on Tenders Invited and Prospective Business appear on p. 723. —

### CATALOGUES, PAMPHLETS, &c., RECEIVED

**FITTINGS.**—The Edison and Swan United Electric Light Co., Ltd., have issued a new illustrated catalogue of fittings, which is a fine production, and contains particulars of the most up-to-date styles and designs. The letterpress is printed both in English and French, and the list shows a varied range of designs and prices to suit all requirements of fancy brackets, drop pendants, table standards, floor standards, hall lamps, bedroom pendants, &c., as well as a distinguished and wide range of electroliers and semi-indirect lighting fittings all well illustrated. We are informed that delivery of any fitting listed can be had within one week from receipt of order. A copy will be sent to electrical contractors, supply companies, show-rooms, &c., post free on application.

**SCHOLEY'S MAGAZINE.**—The December issue of the interesting little magazine brought out by Scholey & Co., Ltd. (151 Queen Victoria Street, E.C.), contains among other items a biographical notice with portrait of Mr. A. L. C. Fell, chief officer L.C.C. Tramways. Special articles deal with electric lifts, domestic vacuum cleaners, and tool steel gearing.

*Readers desiring copies of catalogues or pamphlets should apply to the firms in question, referring to the notice in "Electrical Engineering."*

**CHRISTMAS PRESENTS.**—A booklet with this title, issued by the Electric Supply Publicity Committee, describes numerous electrical appliances suitable for seasonable gifts in an attractive way.

**METERS.**—We have received from the Allgemeine Elektrizitäts Gesellschaft an interesting and very well illustrated pamphlet, in German, describing the latest patterns of ampere-hour meters.

Maschinenbau A.-G. (Dessau, Germany) deals exhaustively with the construction and fitting of "Bamag" ball bearings and "Bamag" guide pulleys with guide rollers on ball bearings for all positions and for different powers. The balls and races set themselves automatically in a position perpendicular to the shaft, and they are either built up in a movable ring which is spherical on the outer edge, or in a movable housing. To protect a line of shafting from lateral motion, a ball bearing is placed by the driving pulley. The adjusting ring is so fitted into the body or housing of the bearing that it has no lateral motion. This thrust bearing, however, can only be used if the lateral pressure is small, otherwise a special bearing is necessary. The representative for the north of England and Scotland is Mr. C. A. Matthews (22 Bridge Street, Deansgate, Manchester).

**CALENDAR.**—The wall calendar of the D.P. Battery Co. is always artistic, and this season bears a fine coloured reproduction of a picture of Haddon Hall.

**MAZDA HOUSE NEWS.**—The December issue of this lively periodical of the British Thomson-Houston Co., Ltd. (Mazda House, 77 Upper Thames Street, E.C.), illustrates a number of cases of efficient and effective illumination, gives interesting information to contractors, and is enlivened by many quaint flashes of humour.

### RECORDING INSTRUMENTS

A FINE new catalogue of recording instruments has just been issued by Siemens Bros. & Co., Ltd. (Woolwich). The ink recording instruments—ammeters, voltmeters, wattmeters—are now made in two sizes, with the paper strip 70 mm. and 120 mm. wide respectively, the former with roll chart only and the latter in forms with drum and roll charts. In the last-mentioned form there is greater variety of types of movement, and frequency and phase indicators are made, as well as ammeters, voltmeters, and wattmeters, for continuous and alternating currents. A very important feature of

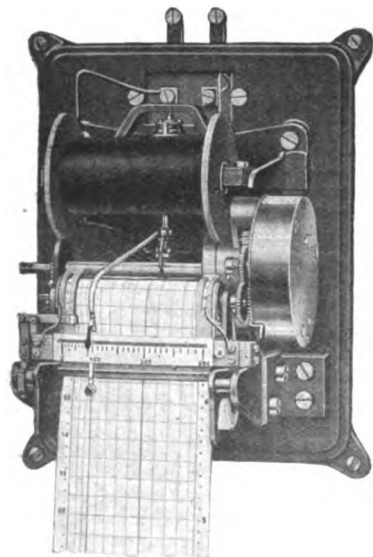


FIG. 1.—SMALL PATTERN RECORDER.

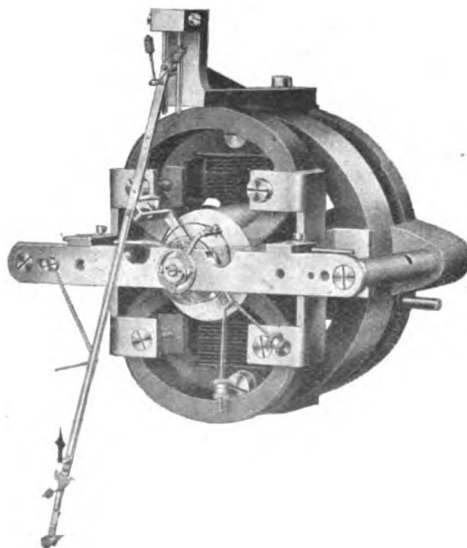


FIG. 2.—MOVEMENT OF FERRARI'S ALTERNATING CURRENT RECORDER WITH PARALLEL PEN MOTION.

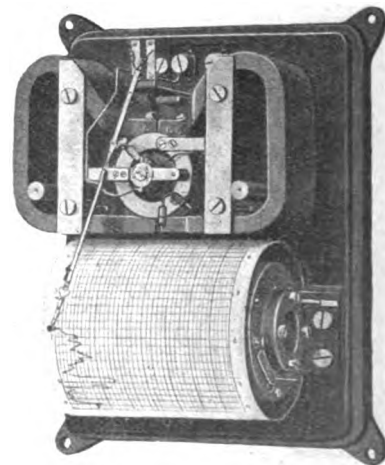


FIG. 3.—MOVING COIL RECORDER WITH DRUM CHART.

**ELECTRICAL SUPPLIES.**—New catalogues in small leaflet form dealing with steel conduits and fittings, rubber cables, and novelties in signs and illuminations for Christmas, are to hand from the Electrical Co., Ltd. (122-124 Charing Cross Road, W.C.).

**ACCESSORIES.**—We have received a copy of the latest catalogue to be issued by J. and H. Greverer (40 Southwark Street, S.E.). A very considerable range of wiring accessories, including bayonet and Edison screw lamp-holders, key and "pull-chain" switch lamp-holders, switches, adapters, and cut-outs is listed. We also note some lamp-holders for use with illuminations and temporary wiring generally, as well as some of the less common bayonet lamp-holders for special purposes. Combined aluminium lamp-holders and shades are among the other fittings listed.

**BALL BEARINGS.**—A catalogue from Berlin-Anhaltische

all these recorders is that the curves are traced in rectangular coordinates, greatly facilitating integration when required.

One form of the new small-sized instrument is shown in Fig. 1. It will be seen that the movement is provided with a vertical spindle. The pointer is curved at its front end, and its point describes a circular arc. The paper from the spool passes through suitable guides, which cause it to coincide with this arc on the line where the pointer bears upon it, and to become flat again at a distance of about 6 in. from the pointer. Hence, without any special arrangements, the division of the charts follows the same law as the natural scale of the instrument; the vertical spindle is also of advantage in reducing friction.

In the larger instruments the rectangular co-ordinates are obtained in a different way. A horizontal spindle movement



is employed with a special parallel motion for giving a straight line motion to the pen. An example of a continuous-current moving-coil recording ammeter with drum chart, shown in Fig. 3, makes this clear, and the linkages and slide at the top can be seen even better in Fig. 2, which illustrates the movement of a Ferraris or induction-pattern instrument for alternating current. A large variety of forms of instrument in different cases are listed with many useful accessories. For circuits where there is extremely rapid variation of current a form of recorder is employed where a periodic spark puncturing the paper replaces the pen and eliminates pen friction.

Complete outfits of recorders on boards or in cabinets are made up for special purposes, including tramcar testing. The list also includes full particulars of the Siemens-Blondel oscillograph.

### THE RODOLITE HEATER

WE illustrate in Fig. 1 the latest form of Bastian patent quartz tube heating element known as the "Rodolite" glower, which is being introduced by the Bastian Electric Heating Syndicate. The 10-in. glower can be made in this form up to 250 watts for pressures from 25 to 250 volts or

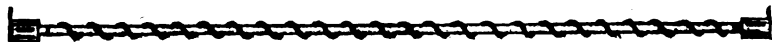
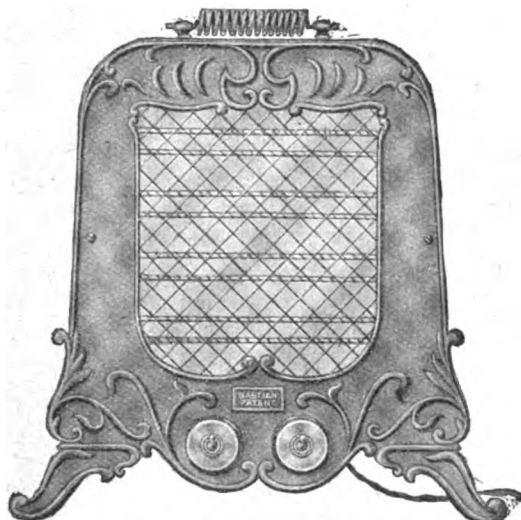


FIG. 1.—RODOLITE GLOWER.

over. The spiral of Tabasco alloy has a thread running through it, by means of which it is securely bound on to the quartz tube, and thus it can be freely handled without fear of disarranging the spiral. When the glower is placed in circuit, and current switched on, the thread "burns off"



2-KW. RODOLITE HEATER.

like a gas mantle, and the heat causes the spiral to assume a permanent set in the correct position. A 2-kw. heater fitted with these elements is shown in Fig. 2. It will be seen that with these new elements radiators of large power can be arranged in very compact form.

### LEAD COATING OF METALS

THE efficient protecting of iron and steel from corrosion and the preserving of tubes, castings and other metallic articles from acid fumes and corrosive liquors has always been of great interest to engineers and others. A process for coating metal articles with lead by electrolytic deposition to a thickness of about 1/16th of an inch has been introduced by Lead, Ltd. (1 and 2 Old Pye Street, Westminster, S.W.). Among the articles which have thus been treated are castings for centrifugal machinery, roof glazing bars and plates, springs, bolts and nuts, &c. The process, which is due to Mr. Sherrard Cowper Coles, is known as "Leadizing."

**Ediswan Concert.**—The second of this season's series of Staff and Foremen's Smoking Concerts given by the Edison & Swan United Electric Light Co., Ltd., was held at the Staff Café, Ponders End, on Friday evening, the 12th. Nearly 100 members of the staff and visitors enjoyed the evening of smoke and song. Mr. J. W. Elliott, of the Lamp Dept., was in the chair, supported by vice-chairman J. Davison, Engineering Stores Manager. Staff talent included Mr. W. W. Osborne, who sang "The Grenadier," and amused everyone with an excellent rendering of "Archibald."

### A CAPSTAN CONTROLLER

ELECTRIC capstans are appliances subject to very arduous usage in practice, and need, therefore, to be of rugged construction, while the control must also possess several automatic features. The two parts of the Igranite capstan controller, designed to fulfil these conditions, are illustrated in Figs. 1 and 2. The self-acting starting rheostat shown in Fig. 1 is controlled through the ironclad pedal switch shown in Fig. 2. The pedal switch has two sets of contacts—upper and lower—both of which must be closed to complete the circuits. The upper contacts are closed by depressing the pedal. The lower contacts are normally held by a detent, which is magnetically tripped if an overload occurs. When the detent has been tripped, the lower contacts can only be closed by removing the foot from the pedal, which, of course, opens the upper contacts, so that it is impossible to keep the circuit closed while an overload exists. The pedal switch acts as a master to control the self-acting starter, and as it handles only small currents (about 3-ampere), it is not subject to injurious sparking. The self-acting starter is fitted with an interlocked magnetically-operated clapper-type main switch (see ELECTRICAL ENGINEERING, Nov. 27th, p. 668; and Dec. 4th, p. 688). This opens and closes the motor circuit.

The following three outstanding advantages are claimed for the "Igranite" automatic capstan controller:—(1) Suitability for operation by such unskilled and heavy handed persons as shunters or dockyard labourers—absolutely mistake-proof; (2) All the parts are electrically interlocked with one another, and interchangeable; (3) The only piece of apparatus which need be in the capstan pit

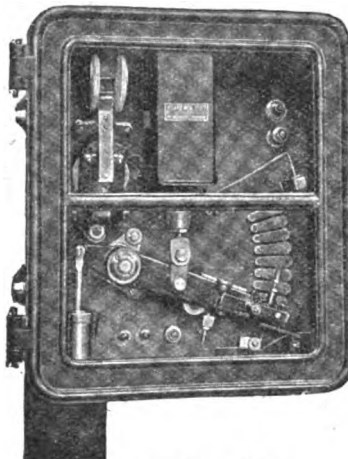


FIG. 1.—AUTOMATIC MOTOR STARTER.



FIG. 2.—IRONCLAD PEDAL SWITCH.

(usually a damp place of limited dimensions) is the ironclad water-tight pedal switch. The remainder of the apparatus can be placed in any convenient position, where it may be subject to observation or inspection at any time without the necessity of opening the capstan pit.

### "WOTAN" HALF-WATT LAMPS

LAST week we had an opportunity of inspecting a range of "Wotan" half-watt lamps at Messrs. Siemens Bros. Dynamo Works, Ltd. (Tyssen Street, Dalston). The sizes which are being manufactured are as follows:—50-65 volts, 300, 500, 1,000 and 1,500 watts; 100-130 volts, 500, 1,000 and 1,500 watts; 200-250 volts, 1,000 and 1,500 watts.

The above is the range of lamps which it is hoped will be on the market shortly. All the lamps have Goliath E.S. caps. They will be supplied, if desired, with the upper half of the bulb obscured, and also for series burning. We are informed that they can be run well five in series, so that the 50-volt lamps can be employed to replace existing arc lamps on series circuits. The half-watt rating is based, we understand, on a life of approximately 1,000 hours. In appearance the lamps have long necks, the filament is wound in a fairly close helix so that it is a considerable length and of fair thickness, and it is zig-zagged between the supports, the number of zig-zags varying with the wattage of the lamps. The arrangement for supporting the filament seems to be strong, and we are informed that the mechanical strength of the lamp is very great, and that it will stand considerable vibration. The bulb is filled with an inert gas, the function of which in enabling a higher temperature of the filament to be obtained without blackening the globe has been explained in our columns on a previous occasion.

### A NEW FITTINGS SHOWROOM

ELECTRICAL contractors, consulting engineers, architects, &c., will be pleased to know that the British Thomson-Houston Co., Ltd., have recently opened a new fittings showroom at Mazda House, 77 Upper Thames Street, London, E.C. Here are exhibited, under the best conditions, all the varieties of scientific lighting units for which the Company is famed, and also a number of new types which have not yet been described or advertised. The B.T.-H. "Eye-Rest" system is given a good show, and indirect fittings of every size and description are hanging from the ceiling. Semi-indirect lighting is represented by a wide range of Alba, Veluria, Calla and glass bowl fittings, and direct lighting by Mazdaliar, Tungstolier and other fittings equipped with Veluria, Holophane, Pyro, Opalux or Sudan glass reflectors.



NEW SHOWROOM AT MAZDA HOUSE.

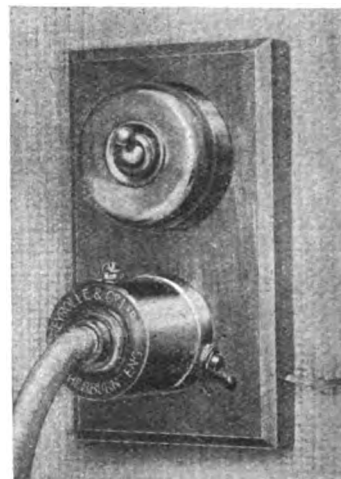
The new "Fostoria" glass table standards form an interesting feature of the showroom. In addition to the fittings mentioned above, there is a host of other material, such as wall brackets, pendants, illuminated flowers for table decoration, lamp radiators, convectors, vacuum cleaners (with several novel features, amongst which is a comparatively low price), Calorite flat irons, toasters and grills, pocket lamps, illuminated blocks, and so on. The room itself is a restful place, abounding in comfortable chairs and settees, under which is a thick pile carpet. The decorative scheme tends to light, neutral shades, French grey and cream predominating, so as to afford a harmonious background to the variegated display of fittings. The Company invite everybody who reads these lines to visit Mazda House showroom within the next few days.

### EARTHED WALL PLUGS FOR USE IN PRIVATE HOUSES

WHERE electrical apparatus is used in the neighbourhood of water-pipes or other metallic conductors at earth potential, it is essential to avoid risks of electric shock by earthing the enclosing covers. This precaution is made compulsory in factories which come under the Home Office regulations.

A. Reyrolle & Co., Ltd. (Hebburn-on-Tyne), have introduced a special design of wall plug for such purposes. The fitting is neatly enclosed in a metal cover and the plug portion is designed to lap over the socket in such a way that whether the plug is partially withdrawn or not, it is impossible to make accidental contact with the pins. The framework of the socket and also of the plug have proper arrangements for taking an earth connection. The earth wire at one end is wound round and soldered to a water-pipe. The other terminates on a screw which is visible on the outside of the plug socket. Several Borough Electrical Engineers are making a special point of earthing all cooking and heating apparatus on their mains. The greatest precautions are taken in factories to enclose all live conductors carefully, and to provide proper earthing arrangements for cases in order to avoid risks of shock to careless operators. These precautions are just as essential in the private house, especially where there are children. It is therefore to be recommended that the electrical equipment of the home should be entirely free

from such risks. The Reyrolle wall plug for domestic use is a decided step in this direction. The plug is perhaps

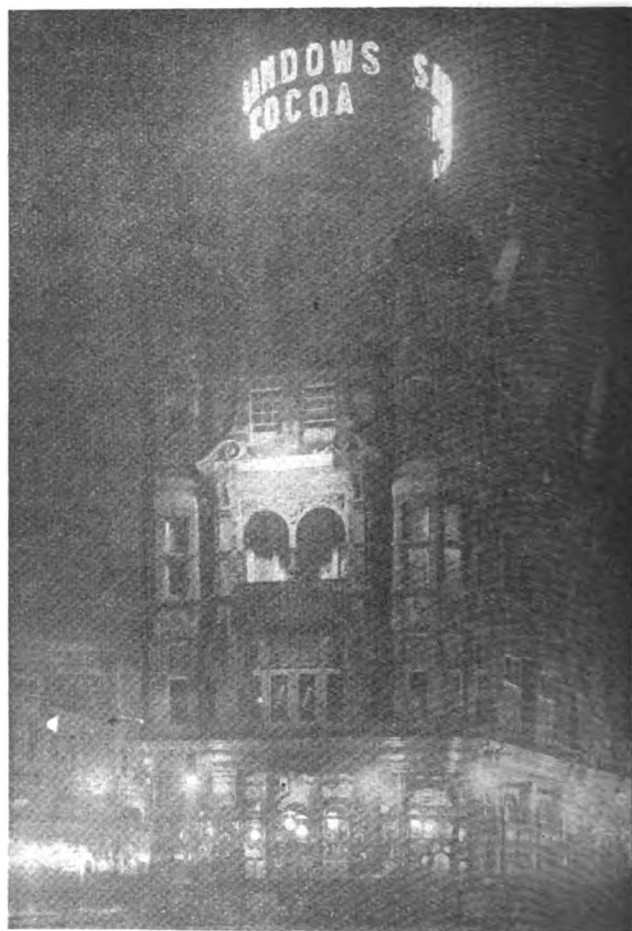


REYROLLE WALL PLUG WITH EARTHING ARRANGEMENT.

heavier than one generally associates with domestic work, but its design and finish are such that it is not unsightly or out of place in living rooms.

### A LARGE ELECTRIC SIGN

WE illustrate here a large electric sign which the Sun Electrical Co. (118 & 120 Charing Cross Road, W.C.) have recently erected at the Elephant & Castle Hotel. This is one of two recently erected for Sandow's Cocoa Co., the other being installed on the top of the dome of the Angel,



LARGE ELECTRIC SIGN AT THE ELEPHANT AND CASTLE.

Islington. Both are prominent features, and afford an exceptional advertisement, and it is noteworthy that notwithstanding the distance between the two buildings in question, each sign is visible from the other. Each letter in the sign is 2 ft. 9 in. high, and each sign contains just over 300 lamps.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

### Generating Stations, Sub-Stations, Mains, &c.

**Ashton-under-Lyne.**—Sanction has been granted to a loan of £18,552 for electrical extensions.

**Devonport.**—A 1,250-kw. turbo-alternator with converters, switchgear, &c., is required. The total extensions are estimated to cost £11,866.

**Holmfirth.**—A loan of £7,500 is to be taken up in connection with the bulk-supply scheme.

**Kirkby Stephen.**—The local gas company has decided to install an electric lighting plant, and to issue debentures to provide the necessary capital.

**Monmouth.**—The sum of £1,500 is to be spent upon bringing the cable system up-to-date.

**Portsmouth.**—An additional generating set is required.

**South Africa.**—According to the *African World*, a loan of £40,000 is to be taken up by the Graaff-Reinet Council for electric lighting purposes.

**Wigan.**—H.T. feeder cable, transformer and switchgear. Borough Electrical Engineer, December 29th. (See advertisement on another page.)

**Wolverhampton.**—Mains are to be extended at an estimated cost of about £200.

### Wiring

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Barnet.**—New infirmary.

**Bury.**—Electric lighting of Ainsworth Sanatorium for the Bury and District Joint Hospital Board. Clerk, Cross Street.

**Dewsbury.**—Electric lighting of Council schools.

**Edinburgh.**—Winter Gardens, West Princes Street. City Superintendent of Works.

**Herne Bay.**—Electrical installation for Board of Guardians.

**Heywood.**—New mill. Mutual Spinning Co.

**Leeds.**—Extensions of infirmary. Clerk to Guardians, South Parade.

**London: L.C.C.**—180 points at the Popham Road elementary school. (See advertisement on another page.)

**Redhill.**—New police and fire stations.

**Salford.**—New works after fire. Wilkes Bros., Brook Street.

**Smethwick.**—Extensions at Waterloo Road schools. Secretary, Education Committee.

**Warrington.**—Elementary school. Education Secretary.

### Miscellaneous

**South Africa.**—The Heidelberg Municipality is about to invite tenders for an electric lighting scheme, says the *African World*.

**Bradford.**—Traction motors, controllers, resistances, circuit-breakers, junction boxes, &c. Manager, January 3rd.

**Lowestoft.**—A loan of £1,500 for meters is to be applied for.

**South Africa.**—The South African Railways Administration invite tenders for 15,794 tungsten filament lamps. January 27th. Tender Board, S.A.R., Johannesburg. Copies of the specification may be obtained from the High Commissioner for the Union of South Africa, 32 Victoria Street, S.W.

**Swinton.**—A street-lighting scheme at an estimated capital cost of £1,621, and an annual maintenance cost of £550, is before the Council.

## TENDERS RECEIVED AND ACCEPTED

**Aberdeen.**—A contract for "Wotan" and "Tantalum" drawn-wire lamps and carbon-filament lamps for the Aberdeen Steamship line has been placed with Siemens Bros. Dynamo Works.

**Batley.**—The Corporation has accepted the tender of the Brush Electrical Engineering Co. for a 1,200-kw. Ljungstrom

turbo-generator. In making the recommendation, the Chairman of the Electricity Committee stated that the guarantees of the makers were such that there would be no risk in entering into the proposed contract.

**Bedford.**—Twenty tenders have been received for the mixed-pressure turbine, exciter, air filter and condensing plant, and two tenders for the water-tube boiler, mechanical stoker and coal-handling plant, included in the new scheme of extensions.

**Bournemouth.**—The tenders of the United Electric Car Co. for car bodies at £499 each, and the British Westinghouse Co. for electrical equipments at £343 each, have been accepted.

**Keighley.**—The tender of the Cedes Electric Traction Co. for the supply of trolley omnibus line equipment at £923 per mile, and four vehicles at £720 each has been accepted.

**Llanidloes.**—A seven years' contract for street lighting has been entered into with the local electric lighting company.

**London: Hammersmith.**—Fifteen tenders have been received for the supply of fifty arc lamps, and those of Siemens Bros. Dynamo Works and the General Electric Co. have been accepted.

**Plymouth.**—The tender of Johnson & Phillips at £581 has been accepted for the supply of switchboard panels. This was the lowest tender received.

**Sal.**—The following tenders have been received:—**Battery:** Premier Accumulator Co. (accepted); Tudor Accumulator Co., Hart Accumulator Co., Chloride Electrical Storage Co., D.P. Battery Co., Electrical Power Storage Co., J. Fuller & Son, Pritchett & Gold, Sandycroft, Ltd. **Booster:** Electric Construction Co. (accepted), Crompton & Co., General Electric Co., Mather & Platt, Veritys, Ltd. **Electromotors, Ltd., Electrical Power Storage Co., Siemens Bros. Dynamo Works, Lancashire Dynamo Co., British Westinghouse Co., Bruce Peebles & Co., British Thomson-Houston Co.**

**Walsall.**—A contract for traction-type "Tantalum" lamps for the local tramways has been placed with Siemens Bros. Dynamo Works.

**Wolverhampton.**—The tenders of Willans & Robinson at £18,159 for a 4,000-kw. turbo-alternator with condenser, &c., and Reyrolle & Co., at £650, for switchgear extensions, have been accepted.

The Edison & Swan United Electric Light Co., Ltd., has added two battleships to the list of those lighted with Royal Ediswan lamps, viz., H.M.S. *Emperor of India* and a Turkish battleship.

## APPOINTMENTS AND PERSONAL NOTES

Mr. J. S. Gibson, Shift Engineer at the Dewsbury electricity works, has resigned.

Mr. Sellars, at present heating and cooking representative in the West Ham Electricity Sales Department, has been appointed superintendent canvasser, in succession to Mr. Hellaby, recently appointed at Sunderland.

Switchboard attendants wanted for L.C.C. tramway sub-stations. (See advertisement on another page.)

## MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. George Smith & Son, 5 Philpot Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night, was £66 15s. to £67 5s. (Last week, £66 15s. to £67 5s.)

FOR  
**STEAM JOINTS**  
USE



**JOHN HUDSON & CO.'S SUCCESSORS, Mansell St., London, E.**

## LOCAL NOTES

**Bury: Overhead Wires.**—The sanction of the Board of Trade is to be sought for the erection of an overhead line to the premises of the Bury Paper Making Co.

**Dewsbury: Conditions of Charge Engineers.**—The Association of Electrical Station Engineers has asked for an interview with the Electricity Committee to discuss the working conditions at the works, and one is to be arranged.

**Galashiels: Electric Supply.**—Messrs. Balfour, Beatty and Co., who recently promoted the Galashiels & District Electric Supply Co., have been in conference with the Council as to the terms upon which the company's undertaking might be acquired in the future, and also as to the charges to be made by the company in the meantime. The company's representative refused to give a guarantee as to charges, but anticipated that the charge for current for the small consumer would be 5d. or 6d. per unit, and probably 2d. per unit for power. The Council has decided to engage a consulting engineer to advise as to the steps it should take for protecting the ratepayers' interests by attempting to secure the insertion of clauses in the company's provisional order.

**Southampton: Electricity Undertaking.**—The disagreement between Mr. H. F. Street, the Borough Electrical Engineer, and the Chairman of the Electricity Committee on the question of charges, referred to in our last issue, was discussed at the Council meeting last week. A number of councillors aired their views, mostly in favour of the good work carried out by the electricity undertaking in the past, and the present satisfactory financial position, but as no recommendation was put forward by the Lighting Committee, no definite action was taken. Presumably, therefore, the present scale of charges will remain in force.

**Teignmouth: Electric Lighting.**—The Council has decided to abandon the idea of undertaking an electric lighting scheme itself, but will give facilities for a company to do so.

**Truro: Electric Lighting.**—As reported in our columns earlier in the year, the Truro Council were granted an electric lighting order by the Board of Trade. A communication has been sent to the Cornwall Electric Power Co. to ascertain the terms upon which a supply in bulk could be given to the Council.

**West Bridgford: Electric Supply.**—The Derbyshire & Notts Electric Power Co. intended to include this district in their bill which they are promoting next session to extend their present area of supply. The West Bridgford Council, however, having intimated their determination to keep the electric supply powers for the district in its own hands, the Company has dropped its proposal. The Council is to apply for an electric lighting provisional order.

**Whitstable: Electric Supply.**—Applications have been invited for subscriptions to an issue of capital by the Whitstable Electric Light Co.

**Fire at a Cable Works.**—The Chemical Laboratory of the St. Helens Cable & Rubber Co., Ltd., was burnt down on Sunday night, the 7th inst., but luckily without damage to the rest of the premises. Careful investigation proved that the Suffragettes had nothing to do with it.

**The New Ediswan Showrooms.**—In a recent issue some particulars were given of coming Ediswan events, and we are now able to supplement that information by further details. The policy of the company, summed up in a few words, will be to provide an up-to-date and efficient market for trade customers and their clients, for everything electrical. The new premises at 123 125 Queen Victoria Street will have a trade counter entrance at Nos. 228 and 229 Upper Thames Street, where arrangements will be made for a quick counter trade. Large stocks will be held in the building, and in addition the company will provide a rapid motor van service from the Ponders End works for bulk deliveries, and a motor trier service for small deliveries. The large showroom will be fitted with special consulting rooms for the benefit of the trade who may bring their clients, and will contain a selection of artistic fittings and apparatus second to none. In order further to promote rapid communications and deliveries, a private telephone line is being erected between the showroom and the works, and additional public lines are being connected to both these premises. It is anticipated that when all these arrangements are completed the trade will be provided with a highly organised distributing centre which will meet a long-felt want.

## COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &amp;c.

**Tramways Light & Power Co.**—This company, which has the controlling interest in the Derbyshire & Nottinghamshire Electric Power Co., Nottinghamshire & Derbyshire Tramways Co., Leicestershire & Warwickshire Electric Power Co., Midland Electric Light & Power Co., Ltd., and the Leamington & Warwick Electrical Co., is issuing £200,000 five per cent. debenture stock at 98.

**Companies Struck off Register.**—The names of the Mutual Electricity Supply Co. and the Premier Electric Lamp Co. will be struck off the register of joint stock companies in three months unless cause is shown to the contrary.

## NEW COMPANIES

**EDISON & SWAN ELECTRIC CO. (INDIA),** 36-7 Queen Street, E.C. Capital £10,000.

**ELECTRICALS.**—Cathedral Buildings, Dean Street, Newcastle-on-Tyne. Capital £10,000. Electrical and mechanical engineers.

**SOMERBY ELECTRIC LIGHT CO.,** 33 Regent Street, Melton Mowbray. Capital £1,000.

**STANDARD METER CO.,** Victoria Works, Narrow Lane, Whitefield, nr. Manchester. Capital £20,000. Manufacturers of electric and other meters.

**LLANIDLOES ELECTRIC LIGHTING CO.**—Capital £3,000. Registered by Roberts & Co., 63 Queen Victoria Street, E.C.

**WESCOSCOPE,** 5 Upper Mill Hill, Leeds.—To take over the business of electrical engineers now carried on by the Wright Electrical Sales Co., Ltd.

**CHINNERY'S,** 23 Old Street, E.C. Capital £2,500. Manufacturers of and dealers in electrical fittings and appliances, &c.

**ELECTRICAL WORKS (MILLER),** 16 John Street, Bedford Row, W.C. Capital, £25,000. To found electrical manufacturing in Germany and elsewhere.

**Electricity in the Printing Trade.**—A lecture on this subject was given by Mr. G. E. Phillips on November 22nd at a meeting at Nottingham of the North Midlands branch of the Printers' Managers and Overseers Association. Commencing with lighting, he emphasised the necessity for the avoidance of glare. In composing rooms he favoured lamps in opaque reflectors, which almost "hood" the light just above the eye-line rather than the absolutely uniform indirect lighting, but press rooms were best lighted with high candle-power units placed as high as possible with local lights fixed under the feed boards, &c., to assist in making ready. With regard to electrical driving, he showed the much greater economy obtainable by separate motors to each machine than by one prime mover large enough to drive them all together. He outlined the requirements of a controller for flat-bed press-driving, dwelling on the necessity for provision for "inching" without burning the contacts. The elaborate push-button control systems in use for driving large rotary newspaper presses by which the machine can be inched, started, accelerated, retarded, stopped, or locked from various positions were referred to. The Holmes-Clatworthy, and other systems of drive for this class of work were described.

**Ball Bearings.**—Some of the conclusions of Prof. J. Goodman contained in a Paper read before the Institution of Automobile Engineers on the design of roller and ball bearings may be of interest to electrical engineers, in view of their general adoption for motor bearings. He gave the following working formula for maximum safe working load in lbs. to the allowed:—
$$Kmd^2 / (nD + C'd)$$
 where  $m$  is the number of balls,  $d$ =diam. of ball in inches,  $N$ =r.p.m., and  $D$ =diam. of ball race from point of contact of balls. The constants  $C$  and  $K$  are as follows:—For thrust bearings,  $C=200$ , and  $K=500,000$  for flat races, 1,000,000 for hollow races, when the radius of the race is about twice that of the ball, and 1,250,000 when the radius is 9/16ths that of the ball. For journal bearings,  $C=2,000$ , and  $K$  has double the values given above. The lecturer said that roller bearings under very heavy load always showed a considerable end thrust, which seriously increased the friction of the bearing.

## John E. Raworth,

Queen Anne's Chambers, Chartered Patent Agent  
30, Broadway, Westminster, London, S.W.



# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 365 [Vol. IX., No. 52]  
*All rights reserved.*

THURSDAY, DECEMBER 25, 1913.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.  
SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES AND TECHNICAL COLLEGE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

*Other Advertisement Rates on Application.*

*Latest Time for Receiving*

Letters for Insertion, Tuesday first post.

Small Advertisements and Official Announcements, Wednesday first post.

Displayed Advertisements, Tuesday first post.

Corrections in Standing Advertisements, Monday first post.

All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 302-306, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Cireling, Fleet, London." Telephone No.: 5509 Holborn.

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

**CHRISTMAS HOLIDAYS.**—The Offices of "Electrical Engineering" will be closed from Dec. 25th to 27th inclusive.

All communications relating to our issue of next week, whether for the Editorial or Advertisement Department, should be sent us at once.

### SUMMARY

WE give the main clauses of the London Electric Supply Bill, which is being promoted by the County of London Electric Supply Co., on page 726.

A PAPER was read recently before the Birmingham Local Section of the Institution of Electrical Engineers by Mr. A. R. Everest, on the work of the International Electrotechnical Commission on Standardisation of rating of electrical machinery. (Page 726.)

THE I.M.E.A. Electric Vehicle Committee has appointed sub-committees, who will shortly proceed to detail work on the various questions which they are to take in hand. (Page 726.)

IN the discussion on Mr. H. C. Gunton's Paper on electricity in the Post Office, some indications of the present engineering tendencies were given. (Page 727.)

MR. H. L. SMITH discusses the cogging of induction motors in a Paper dealing with the design of these machines. (Page 727.)

A PATENT specification by H. Leiser is opposed by the B.T.-H. Co. on the ground of anticipation. The specifications published by the Patent Office on Thursday last include one by E. G. Waters for a system of feeder protection against faults, one for connecting metal filaments to leading-in wires by J. Plechati, as well as some relating to heating and cooking. Two patents relating to push-button electric lifts by H. Rowntree are about to expire after a full life. (Page 728.)

SUITABLE material for the tanks of oil switches, &c., is referred to in our questions and answers columns. (Page 729.)

WE give some details of the construction of a sensitive telephone devised by Mr. S. G. Brown. These telephones may be suitable for use as loud-speaking telephones for the electrophone service.—A high resistance telephone meter, to indicate at the subscribers' station the calls registered against him by the meter at the exchange, has been devised by the Engineering Department of the Post Office.—The question of the distribution of the final assets of the National Telephone Co. was considered by Mr. Justice Sargant last week. (Page 729.)

A DISPUTE has arisen between the Brighton and Hove Corporations as to the use of a trolley arm or flexible connection for the trolley 'buses. (Page 730.)

A FINE fitting equipped with glass spheres, and a new form of electric sign, are illustrated on page 731.

A NOTABLE advertising campaign is referred to in our Trade Section. (Page 731.)

A NEW power station is to be erected at Walsall; an expenditure of £60,000 is contemplated at Rochdale; £30,000 at Southend; £29,000 at Southwark; £9,000 at Hammersmith; and £6,000 at Stoke Newington.—A turbo-generating set, rotary converter, switchgear, &c., is required at Carlisle. (Page 733.)

SPECIAL attention is directed to the Barcelona Exhibition, to be held in 1915.—Complaints have been received with regard to the Chester Corporation's water-power generating station, in that it is alleged to have reduced the depth of water available for the steamboats.—A reduction has been made in the charges for power for heating and cooking purposes at Northampton.—A large power contract at Aberdeen has led to considerable controversy. (Page 734.)

### The London Electrical Engineers.

MONDAY, DECEMBER 22ND, TO SATURDAY, DECEMBER 27.—Headquarters open for Regimental business only.

MONDAY, JANUARY 5TH.—A. Company. Technical Instruction, 7 to 10 p.m.

TUESDAY, JANUARY 6TH.—B. Company. Technical Instruction, 7 to 10 p.m.

WEDNESDAY, JANUARY 7TH.—Recruits only. Infantry Drill and Technical Instruction, 7 to 10 p.m.

THURSDAY, JANUARY 8TH.—C. Company. Technical Instruction, 7 to 10 p.m.

FRIDAY, JANUARY 9TH.—D. Company. Technical Instruction, 7.30 to 9.30 p.m.

Special Class on Crossley Engine, 7 to 8 p.m.

SATURDAY, JANUARY 10TH.—Headquarters open from 10 a.m. till noon.

## LONDON ELECTRIC SUPPLY

AS so much interest is being taken in the scheme for the consolidation of London's electricity supply, foreshadowed by the Bill which has been deposited in Parliament, it may be of interest to give a few more particulars of the Bill itself which became available in printed form after our last issue.

The preamble, after explaining how, by the Electric Lighting Acts of 1882 and 1909, the companies were prohibited from associating with any other party supplying electrical energy, but were allowed a certain amount of linking-up facilities by the London Electric Supply Act of 1908, and how the London County Council in 1910 received power to buy up all the companies' undertakings together in 1931, points out that as the proximity of this date of purchase creates difficulties in the way of "effectually carrying out in the most advantageous manner possible" the linking-up and consolidation provided for by the Act of 1908, it is expedient that the London County Council should be empowered to postpone the date at which, and to vary the terms upon which, the undertakings of the companies may be purchased.

The two main clauses of which the Bill consists, the general drift of which was indicated in last week's ELECTRICAL ENGINEERING, read as follows:—

(1) For the purpose of facilitating the making or carrying into effect of any association agreement between any two or more of the London Electric Supply Companies and notwithstanding anything contained in the London Electric Supply Act 1908 as amended or extended by the London Electric Supply Act 1910 and the London (Westminster and Kensington) Electric Supply Companies Act 1908 or any other Act any of the London Electric Supply Companies being parties to any association agreement or proposed parties to any intended association agreement on the one hand and the Council on the other hand may at any time within three years from the passing of this Act enter into and may carry into effect any agreement for the postponement whether conditional or otherwise of the date at which the Council may purchase the undertakings or any part or parts of the undertakings of such companies parties to any such association agreement or proposed parties to any such intended association agreement or any of them and for the variation of the terms and conditions upon which such undertakings or part or parts of undertakings or any one or more of them may be purchased and for making new provisions with regard to such purchase.

(2) Any agreement made under the powers of this section between the County of London Company and the Council may notwithstanding anything contained in the Electric Lighting Acts 1882 to 1909 or in the Romford Order provide for the purchase by the Council as part of the undertaking of the County of London Company of any generating station authorised by the Romford Order and in the event of any such agreement being made the rights (if any) of any local authority under the Romford Order or the Electric Lighting Acts 1882 to 1909 incorporated therewith to purchase any such generating station shall cease and such agreement may be carried into effect by the parties thereto.

**Metal Filament Lamp Patents.**—Wolfram-Lampen A.-G. successfully sued Mr. W. J. Johns, Mr. C. Harris, and Mr. C. Werth (who carried on business as the Oro Light & General Supply Co.) in the King's Bench Division last week for payment of £571 4s. for metal filament lamps supplied. It was argued for the defence that the lamps were bought on the understanding that the lamps did not constitute any infringement of the patent rights of Osram Lamp Works. They regarded this understanding as a warranty, and as they were unable to resist the successful proceedings for infringement by Osram Lamp Works, they refused to pay for the lamps. After hearing evidence, Mr. Justice Bankes decided that there was no warranty, and that all Wolfram-Lampen A.-G. did was to express its honest opinion that there was no infringement, therefore he gave judgment for this company for the amount claimed, with costs.

**Newcastle Local Section of the Institution of Electrical Engineers.**—The annual dinner of this section was held on Tuesday of last week, when an interesting speech was made by Mr. P. V. Hunter in proposing the toast of the Industries and Commerce of the North-East Coast. He looked to the facilities which they had for cheap electric power supply to bring back the chemical industries to their district, and foresaw great developments in that direction. Councillor Johnstone Wallace (Lord Mayor of Newcastle) replied, and Councillor H. Shaw (Sheriff) proposed the Institution, and Mr. W. Duddell, in replying, said that he believed that Tyneside was to be the leader in electrochemistry and electrometallurgy, as it had already led the way in steam turbines. Mr. W. Faraday Proctor proposed the toast of "Armstrong College," to which Dr. Hadow replied, and the toast of the visitors, proposed by Mr. W. C. Mountain, was replied to by Sir Charles Parsons.

## STANDARDISATION OF ELECTRICAL MACHINERY

A PAPER by Mr. A. R. Everest on the work of the International Electrotechnical Commission on standardisation of the rating of electrical machinery was read before the Birmingham Local Section of the Institution of Electrical Engineers on Dec. 10th. The author said that the rules adopted at the recent I.E.C. meeting in Berlin established the I.E.C. standard of quality, as regards temperature, for electrical machinery, but agreement was not reached on the further question of rating owing to differences of opinion regarding the value for the cooling air temperature. Although the life of the insulation really depended on the hottest internal temperature, it was sufficient to specify limiting observable temperatures as taken by thermometer. The following are the values for the quantity agreed on:—

Non-impregnated cotton, 80° C.; impregnated cotton or paper: general, 90° C.; single layer field coils, stationary or moving, 95° C.; stationary coils solidly impregnated throughout, 95° C.; rotor and stator windings having the slot portion solidly impregnated or moulded, 95° C.; enamelled wire (without cotton), 105° C.; mica, micanite, asbestos: general, 115° C.; single layer field coils stationary or moving, 120° C.; stationary coils solidly impregnated or moulded, 120° C.; windings permanently short-circuited: insulated, 100° C.; non-insulated, 110° C.; commutators, slip-rings, 90° C.; bearings, 80° C.

With regard to the vexed question of overloads, the I.E.C. has decided that any machine intended for continuous service should be ordered, designed, and rated for the highest load it is expected to carry, and that it should be capable of carrying this rated load continuously without exceeding the temperature limits of the table. No overloads are permissible beyond this rated load. As already stated, agreement has not yet been reached as to the maximum air temperature to be assumed in conjunction with the above figures for specifying temperature rises. Great Britain and the United States desired 40° C., and a minority of other countries desired 35° C. Finally the question was referred back to the National Committees.

## THE ELECTRIC VEHICLE COMMITTEE

THE third meeting of the Electrical Committee of the I.M.E.A. was held on Dec. 11th. A letter was read from Sir Edward Henry, Chief Commissioner of Police, regretting that he was unable to become a member of the Committee, but expressed his keen interest in the matter.

Mr. E. S. Shrapnell-Smith was elected to represent the Incorporated Motor Users' Association. The following sub-committees were appointed:—**Technical Sub-Committee:** Messrs. R. A. Chattock, F. Ayton, J. E. Edgcome, R. E. Mossay, E. S. Jacob, C. Jenkins, J. Christie, W. H. L. Watson, and the B.E.A.M.A. representatives of the dynamo, motor and switchgear sections; **Commercial Sub-Committee:** Messrs. R. A. Chattock, F. Ayton, F. E. Gripper, E. S. Shrapnell-Smith, A. H. Seabrook, A. C. Cramb, H. Faraday Proctor, W. S. Naylor, J. F. Monnot, W. R. Rawlings, and J. S. Highfield. The Technical Sub-Committee will consider arrangements to recommend for charging batteries; the most suitable sizes of charging outfits; instructions for charging batteries, rules for use in maintenance of electric vehicles; standard ratings for motors; standard battery voltages; standard ratings for commercial vehicles; wiring details; standard charging plug and receptacle; standard battery units; electric lighting on vehicles. The Commercial Sub-Committee will consider the drafting of a circular letter to electric supply undertakings re provision of charging facilities, tariffs, publicity, &c., insurance rates, parades and exhibitions; the collation and publication of information; taxation; maps and lists of charging stations, and advertising. With a view to the international standardisation of the charging plug and receptacle, the Secretary was directed to get into touch with the German and French Institutions of Electrical Engineers on the matter.

**Crystal Palace School of Engineering.**—The inspection of the various departments of the school and the ceremony of announcing the list of certificates awarded by the examiners, by Colonel Sir David Burnett, took place on Friday last.

**International Exhibition.**—An international exhibition of "Electrical Industries and their Applications" is to be held in Barcelona from March to December, 1915. The exhibition will admit all kinds of machinery, apparatus, processes, and raw materials for the production, transmission, or application of electrical energy. Applications for space should be made to the General Secretary of the Exhibition, Barcelona, before November 30th, 1914, and a copy of the prospectus, rules, and regulations may be seen at 73 Basinghall Street, E.C.

## ELECTRIC POWER IN THE POST OFFICE

THE Discussion at the Institution of Electrical Engineers last week of Mr. H. C. Gunton's Paper, "The Employment of Power in H.M. Post Office," was rather protracted owing to the large proportion of time devoted by various well-meaning speakers to mutual thanks, admiration and sympathy. We would suggest that it would be of advantage if this tendency were a little curtailed, so that members could have more time for intercourse after the meetings.

According to Mr. Gunton, Mr. W. Slingo (Engineer-in-Chief to the Post Office), and Mr. A. J. Stubbs (Assistant Engineer-in-Chief to the Post Office), the main object of the Paper is to show the world that the Post Office uses a vast amount of power for auxiliary purposes, and that its engineering is not confined solely to the sending of messages by telegraph and telephone; but it is hardly likely that such a gigantic and varied business as that now carried on by the Post Office could be successful without the extensive use of electricity. That the Post Office is very progressive in this direction at the present time is abundantly clear, while it also seems that any changes in the engineering practice are always delayed until it can be definitely shown that the new plant will be on a sound financial basis, and even then the conservatism of the staff seems to be an important factor in delaying alterations. A very important factor, which would perhaps tend to make the Post Office appear still more conservative than it is, is the fact that new appliances are often submitted without the design being such that it can work in with the specialised conditions prevailing. With regard to the proposed new tube railway, Mr. Slingo said that the Post Office was not looking out for something new to undertake, as had been suggested in some quarters. There were also some people who said that the Post Office did not need it, and that if they did they did not know how to make it nor how to use it when made. However, they did want the railway, and they were absolutely certain that it would result in a great financial saving as well as relieving the congestion in the streets. Mr. Slingo also said that it is the policy of the Post Office, when it contemplates adopting a new machine, first to build one and try it, and when satisfactory to call in contractors and let them improve it if they could. Whenever possible work is given to outside firms, but very often contractors cannot work so economically as the Post Office. It was formerly the practice with new cables, for the Post Office to buy the cable and draw it in and do the jointing itself, but extensive contracts were now out to see whether the whole operations cannot be done more economically by the contractors.

Major W. A. J. O'Meara, who opened the discussion, remarked that but little progress in the design of sorting machinery has been made recently in other countries. About eight years ago he went to the United States of America, and Mr. Gunton had been able to so improve the machinery being used there that he could now be said to be "leading the world" in this department. Mr. C. H. Wordingham (Chief Electrical Engineer to the Admiralty) commented on the arrangements whereby the high-pressure supply could be fed from the low-pressure supply, and in reply to a further remark by him, Mr. Gunton said that Post Office specifications were sectionalised. The first, or general part, varies in almost every case, while the following individual parts are built up of a number of "standard" leaflets. Mr. J. S. Highfield (Chief Engineer, Metropolitan Electric Supply Co.) remarked that it would seem that the cost of the electric supply to the Post Office is only a very small proportion of the total working costs, so that the greatest consideration is that of reliability. This would be better obtained by each Post Office having its own generating station and a standby battery. From considerations of comfort and space, however, in many cases the Post Office now purchases power from an outside source. He referred also to the difficulty which he had experienced in getting "men and machines to fit." Where a large number of men are employed it is necessary to improve the design of machinery very gradually. Mr. Roger T. Smith (Chief Electrical Engineer, Great Western Railway) described the Paper as a somewhat welcome departure from many Institution Papers, as it dealt with the design and working of machinery driven electrically, instead of with electrical machinery. He asked what was the proportion of the total energy required by the Post Office conveyors when running light. For lifting large loads he had found that the same amount of energy was used by crane, conveyor, lift, or tip to cover the same distance, but only in the case of the conveyor was practically a 100 per cent. load factor approached, therefore a very low charge for energy should be made in these cases. Mr. Gunton explained that they generally used low efficiency irreversible gearing for the conveyors so as to get greater safety, but lately they had been using high efficiency gearing, coupled with better brakes. It made little difference in the power taken whether the conveyor was loaded or not.

**British Electrical and Allied Manufacturers' Association.**—At the Council meeting held on the 18th inst., the following firms were elected members of the Association: Fraser & Chalmers, Ltd.; Johnson & Phillips, Ltd.; Thomas Kesnor & Co., Ltd.; The Record Electrical Co., Ltd.

## THE COGGING EFFECT IN INDUCTION MOTORS

A PAPER dealing with the electrical design of induction motors was read by Mr. H. L. Smith before the Rugby Engineering Society on December 9th. The design from a practical point of view, using standard frames, was clearly discussed, and various phenomena illustrated by five actual machines. It was pointed out that the "cogging" of squirrel-cage motors is due to zig-zag leakage, and may therefore be expected to be greatest in motors with short pole pitches and small numbers of slots per pole, i.e., in slow-speed motors, and least in high-speed motors. Therefore the rotor slots for machines with small numbers of poles can be larger and fewer in number than for machines with large numbers of poles without deleterious results. The practice of making the number of rotor slots incommensurable with that of the stator slots is effective so long as the rotor is central. But when the bearings wear, the bulk of the zig-zag flux is on one side and the stator develops a "governing tooth" and slot. As every rotor tooth passes the governing slot it makes it alternately easier and more difficult for the zig-zag leakage to pass, and the rotor tends to stick in the position of minimum reluctance. But the flux in the governing tooth is zero twice in a cycle, and at each of these two instants the rotor is free to move forward one rotor slot-pitch. If the zig-zag leakage is bad enough, the machine will continue to run at this peripheral speed of two rotor slot-pitches per cycle. A three-phase, squirrel-cage, 4-pole, 220-volt,  $\frac{1}{2}$ -h.p. motor, having twelve slots on the stator, i.e., one slot per pole per phase, and twenty-three on the rotor, with a dispersion coefficient about 17 per cent., exhibited this tendency well. The peripheral speed at synchronism of his machine is 11.5 rotor slot-pitches per cycle, and the speed of zero cogging two rotor slot-pitches per cycle or  $\frac{4}{23}$  that of synchronism, i.e., 260 r.p.m. Owing to the short-circuit current being smaller, relative to the normal current, than is the case with any ordinary motor, the rotor may be held stationary with full volts on the stator for quite a length of time without the machine getting unduly hot, or the applied voltage may even be transformed up when all these cogging effects are exaggerated.

**The Leeds Strike.**—As indicated in our last issue, the strike of municipal workers at Leeds has practically broken down, the authorities having taken the firm action of giving the strikers a date by which to send in their applications for resuming work. This seems to have had the desired effect in all departments except the gas works, but so far as the tramways and electricity departments are concerned, things have almost resumed their normal condition.

**The British Standard Meter Specification.**—Several practical points were referred to in the discussion at Leeds by the Yorkshire Section of the Institution of Electrical Engineers on Tuesday, December 9th, of Mr. S. H. Holden's Paper on the British Standard Specification for Consumers' Electric Supply Meters. The Paper itself was referred to in ELECTRICAL ENGINEERING, November 13th, page 626. Several station engineers spoke in favour of a standard arrangement and marking of terminals, and agreed that it was objectionable to have to drill the cases to fix labels. With regard to insulating materials, Mr. T. Roles (City Electrical Engineer, Bradford) was particularly against the use of ebonite. Other points mentioned were the necessity for provision for earthing the covers, and the desirability of limiting the losses in the pressure coil which sometimes gets so hot as to produce steam and spoil the bearings. Some speakers preferred glass to metal cases. It was also suggested that a general reduction in the speed of the main spindle would be an advantage.

**International Engineering Congress, 1915.**—Some further particulars are to hand of the International Engineering Congress which is to be held from September 20th to 25th, 1915, in San Francisco, in connection with the Panama-Pacific Exhibition. The sessions will be divided into eleven groups, one of which will be devoted to electrical engineering, another to mining engineering and metallurgy, another to the Panama Canal, and the rest to other branches of engineering, and numerous Papers are expected in each section. The Proceedings will be published in separate volumes for each section, and it may be noted that the Electrical Engineering volume will contain a certain amount of material from other sections, dealing with phases of contact or overlapping between electrical engineering and the various other branches of engineering work. All Papers and discussions will be printed in English. The fee for participation in the Congress is five dollars, including any one volume of the proceedings, but a further subscription, not exceeding \$3.50 each, may be made for other volumes. Excursions will be arranged to points of general and engineering interest in the district. Application forms for membership are being circulated, and any further information can be obtained from Mr. W. A. Cattell, Secretary-Treasurer International Engineering Congress, 1915, Foxcroft Building, San Francisco, Cal., U.S.A.

## "ELECTRICAL ENGINEERING" PATENT RECORD

*(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)*

### Specifications Published December 18th, 1913

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

26,680/12. **Split Pole Rotary Converters.** B.T.-H. Co. and F. P. WHITTAKER. The auxiliary poles have a regulating winding, while commutating poles are excited with direct current from the armature. Frequencies as high as 50 cycles per sec. may be dealt with, and if the armature is rotated towards the auxiliary poles a leading current is taken from the line. Two figures.

26,912/12 and 24,054/13. **Induction Motor Starting.** V. G. MIDDLETON, C. J. BAKER, F. FARNDON, and D. K. MORRIS. To secure adequate protection against excessive current during starting and while running, it is claimed in the first specification to use a combined switch and automatic electromagnet and thermal circuit-breaker, in which the effective rating is altered by the pressure on the switch handle, causing closing, and restored when the handle is released. Adjusting means are provided. Seven figures. The second specification claims a switch for putting two fuses in parallel at starting and only one when running. Seven figures.

26,961/12. **Circuit Protection.** E. G. WATERS. To cut out a feeder on the occurrence of a fault, the primary of a bus-bar transformer is in series with two parallel feeders, in each of which is a current transformer. One coil of a reverse current relay is in the secondary circuits of these relays, while the other coil is in series with the secondary of the bus-bar transformer. One figure.

759/13. **Water Heaters.** UNIT ENGINEERING CO. and F. A. BROWN. A sectional heater has each unit made of two plates with openings so that a chamber is formed with inlets on one side and outlets on the other side. The heating elements are provided with similar openings to register, and are contained between the chambers. Four figures.

10,289/13. **Heaters.** C. ARPIN. A resistance wire is wound in a helix over a glass tube, which may have an internal core of metal for thermal storage, while a second glass tube surrounds the first. The outer surface of this tube is given a metallic coating, and is varnished so as to be a good radiator. Three figures.

13,406/13. **Attaching Metal Filaments to Leading-in Wires.** J. PLECHATI. The filament is pressed cold into the softer supports or leading-in wires by direct pressure, a hand press and die being used. Three figures.

18,592/13. **Food Warmers.** A. JUNG. The warming chambers are surrounded by water heated by a resistance helix in an annular space in the water. The helix is connected to a float, so that as the water-level falls it is compressed and *vice versa*. Two figures.

### Specifications Published December 24th, 1913

The following Patent Specifications are published on Dec. 24th, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free.

Names in *italics* indicate communicators of inventions from abroad. Summaries of some of the more important of these patents will appear in our next issue.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** B. T.-H. Co. (*A.E.G.*) [Motor control] 27,624/12; B. T.-H. Co. (*G.E. Co., U.S.A.*) [Motor control systems] 3,685/13.

**Dynamos, Motors, and Transformers:** BROLT, LTD., BROOKS and HOLT, 27,664/12; PHENIX DYNAMO MFG. Co. and POHL [Rotary converters] 28,108/12.

**Electrometallurgy and Electrochemistry:** JOHNSON [Reduction of zinc ores] 27,881/12; MARINO [Salicylate electrolytes] 28,953/12; STASSANO [Furnaces] 22,723/13 and 22,724/13.

**Heating and Cooking:** BERRY [Cookers] 28,046/12; DOWSING and HUNTLEY [Element] 29,750/12; B.T.-H. Co. (*G.E. Co., U.S.A.*) [Heating and drying] 3,148/13.

**Ignition:** LAWRENCE [Generators] 11,990/13.

**Instruments and Meters:** CAMPBELL, BLACKWELL and COLPITTS [Measuring circuit capacity] 2,009/13.

**Switchgear, Fuses, and Fittings:** CURTIS, MACKLEY and ADAMS MFG. Co. [Motor controller] 27,563/12; RAE and CUNARD STEAMSHIP Co. [Controllers] 28,605/12; HUBBELL [Lamp sockets] 3,682/13; LANGER [Automatic switch for illuminated advertisements] 9,769/13; HOVLAND [Relays] 11,131/13.

**Telephony and Telegraphy:** ZYVOSTENSKÁ BANKA V. PRAZE [Winding and starting the number switches for automatic telephones] 27,382/12; SIEMENS BROS. and PETTIGREW [Telephone selectors] 1,299/13; WADE (*Elektrizitäts A.G. Hydrawerk*) [Loud speaking telephone stations] 14,729/13; KNIGHT [Ships'

telegraphs] 15,123/13; LOGAN [Interrupters for telephone circuits] 17,775/13; SIEMENS & HALSKE [Telephone circuits] 21,222/13.

**Traction:** B.T.-H. Co. (*Curtis*) [Ship propulsion] 29,190/12; B.T.-H. Co. (*G. E. Co., U.S.A.*) [Vehicle trucks] 2,804/13; JEFCOATE [Railway signalling] 4,485/13; JOHNSON [Automatically stopping trains] 10,404/13.

**Miscellaneous:** LOWE [Batteries] 27,633/12; BEDFORD and ERDMANN [Catalysts] 27,718/12; NEUFELDT & KUHNKE [Gyro-compasses] 27,739/12; VARIABLE SPEED GEAR and ROBSON [Hydraulic transmission gear for vehicle lighting systems] 28,300/12; STEEL, PEECH & TOZER and BOWEN [Electromagnets] 29,863/12; DOUGLAS [Flash lamp for use as fog signal] 4,699/13; NATHORST [Magnetic separators] 12,368/13; OPPEN [Electrostatic machines] 24,911/13.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** HEINS [Substitution resistances for lamps] 10,018/13; FELTEN & GUILLAUME CARLSWEEK A.-G. [Single conductor cut-out to come into operation upon a short-circuit or serious leakage occurring] 27,347/13.

**Incandescent Lamps:** SKAUPY [Electric gas lamps] 14,591/13; MOORE LICHT A.-G. [Vacuum light apparatus] 27,426/13.

**Instruments and Meters:** A.E.G. [Primary current coil bobbin] 21,959/13.

**Switchgear, &c.:** COLAS [Brushes] 23,754/13.

**Telephony and Telegraphy:** SIGNAL GES. [Radiating system for wireless signalling from aeroplanes] 23,728/13; PARRA [Fixing cables to insulators] 26,600/13; SIEMENS & HALSKE [Telephone circuits] 27,452/13.

**Traction:** SIEMENS-SCHUCKERT [Electric vehicles] 27,472/13.

**Miscellaneous:** KRUPP GRUSONWERK [Magnetic separators] 24,355/13; KRAUSE [Separating out dust particles suspended in gases by means of H.P. current] 27,059/13 and 27,060/13.

### Opposition to Grant of Patents

19,345/12. **Vehicle Lighting Dynamos.** S. L. PRICE. Opposition has been entered to the grant of this patent (*ELECTRICAL ENGINEERING*, October 30th, p. 608).

22,041/12. **Tungsten for Drawn Wire Lamps.** H. LEISER. Opposition to the grant of this patent (*ELECTRICAL ENGINEERING*, October 30th, p. 608) has been entered by the B.T.-H. Co. on the ground of anticipation by patent No. 8,031/10.

### Appeal from Comptroller's Decision

9,673/12. **Direction "Tell-Tales."** J. C. CLARKE and CHAD-BURN'S (SHIP) TELEGRAPH CO. The Comptroller's decision to allow the grant of this patent in spite of the opposition is being appealed against.

### Expiring and Expired Patents

The following Patents expire during the current week, after a *life of fourteen years*:-

25,767 of December 30th, 1899. **Adjustable Speed D.C. Lift Motor.** H. ROWNTREE. Both armature and field are revoluble and speed adjustment is effected by adjusting the current supplied to either, one of which is rotated by a separate motor. Two figures.

25,768 of December 30th, 1899. **Lift Push-button Control System.** H. ROWNTREE. The system is inoperative so long as any well gate is open, and when a push-button is operated at a landing or in the car the operation of any other push-button is ineffective until the cycle of operations set in motion by the first is complete. Five figures.

The following are the more important Patents that have become void through non-payment of renewal fees.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** S. WATKINS (*Consolidated Rly. Elec. Ltg. & Equip. Co., U.S.A.*) [Electro-magnetically controlled train-lighting equipment] 17,601/01; V. P. VON PINDTERSHOFFEN [Non-hygroscopic conduits and joints for mains] 19,861/06; SIEMENS DYNAMO WORKS, C. A. ABLETT and H. CROWE [Driving rolling mills] 18,575/08.

**Dynamos and Motors:** B.T.-H. Co. (*A.E.G.*) [Commutators] 18,460/08.

**Switchgear, Fuses, and Fittings:** C. C. GARRARD and FERRANTI [Adjustable time lag circuit breaker] 19,570/07.

**Telephony:** I. B. BIRNBAUM and H. G. WHITE [Step-by-step selector switches] 17,957/05.

**Traction:** A. DESCUBES [Complete railway signalling system applicable to any method of working the points] 17,362/04; SIEMENS BROS. (*Siemens & Halske*) [Control and locking of motor-driven semaphore signals] 19,639/06; [Signal lever locking] 19,558/07.



**START  
RIGHT!**

**INSIST ON  
'IGRANIC'**

**SWITCHGEAR  
YOU CAN RELY  
ON IT!**

IGRANIC ELECTRIC Co. Ltd.  
LONDON and BEDFORD.

**QUESTIONS AND ANSWERS  
BY PRACTICAL MEN**

**RULES.**

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

**QUESTION No. 1371.**

A 230 volt installation is running on a circuit containing several electric cranes and other motors. An earth is reported on the main board, and in investigating this, two 230 volt 16 c.p. lamps in series were connected between the negative main and earth, and showed a red glow. When they ceased to glow they were tried on the positive side and glowed again. This change over occurred several times a day. Sometimes, however, the lamps would show a full light, which indicated that about 460 volts was present between one pole and earth. How can this be explained?—CONSTANT READER.

(Replies must be received not later than first post, Monday, January 5th.)

**ANSWERS TO No. 1,367.**

The composition of an oil-resisting alloy is required, suitable for cast-metal tanks, for use with oil-immersed apparatus; the alloy must have been found successful in practice, and be inexpensive to make. Any special foundry precautions should be stated.—"U. R."

The first award (10s.) is made to "L. B." who writes as follows:—

The largest electrical manufacturers in this country for cast tanks of oil-immersed apparatus use ordinary cast-iron. These are thoroughly galvanised both inside and out, thereby closing all pores. No special mixture or foundry precautions are required apart from the general practice. The tanks are cleaned after casting by air or sand blasting, then pickled in weak sulphuric or hydrochloric acid solution. To remove any traces of grease, bath in potash or soda solution, and finally cleanse in hot water. After thoroughly drying, they are then galvanised by the ordinary dipping process.

There is a special aluminium alloy also suitable which is occasionally used where the magnetic effect of cast-iron would be detrimental, but sheet-steel is often preferable.

No second award has been made.

**The New and the Old.**—The famous Egyptian temple of Rameses II., over 3,000 years old, is now illuminated by electric lamps for the benefit of tourists. It is also stated that the big bronze Buddhas in the temple at Nikko, Japan, have recently been modernised by having the candles in the eyes replaced by tungsten filament lamps. Nikko receives electric power from a hydro-electric plant.

**TELEPHONY AND TELEGRAPHY  
(INCLUDING WIRELESS)**

Some particulars appeared in *ELECTRICAL ENGINEERING* last week of experiments with Mr. S. G. Brown's telephone relay, and also with a German relay, on a long telephone line between London and Cologne. In addition to Mr. Brown's relay being used for telephony, it has been employed to a considerable extent in wireless telegraphy to reinforce the currents at the receiving end. The relay for this purpose differs in some respects in design from the one employed for telephony, but the main principle of the secondary contacts being made by a reed, the tension of which is balanced by a magnet, is the same. Mr. Brown has also been giving considerable attention to the design of a sensitive telephone, particularly for receiving wireless telegraph signals. Instead of the usual diaphragm, he employs one of conical shape, made of very thin aluminium sheet about two-thousandths of an inch thick, the centre of which is fixed to the end of an adjustable reed which is acted on by the receiver magnet. The diaphragm is held in position by a paper or collodion edge. This has the advantage over the ordinary diaphragm that the diaphragm itself is far less rigid and in consequence more sensitive. The natural period of vibration of the system can be adjusted by means of the reed, and the arrangement also enables the magnetic circuit to be considerably better than in an ordinary receiver and the air gap to be adjusted with accuracy. In place of one central hole in the ear piece, several smaller holes are employed. With these telephones we understand very much smaller currents can be heard than with the ordinary types; in fact, some experiments have elicited that their substitution for an ordinary telephone receiver increases the range of audibility by the equivalent of five miles of standard cable. Experiments with these are also being conducted in connection with the electrophone service with a view to developing a loud-speaking electrophone receiver so as to obviate the use of listening tubes.

Owing to the large number of complaints received by the Post Office from telephone subscribers on the message rate that they are being overcharged, the Engineering Department has for some time been conducting experiments to see whether a check meter, situated at the subscribers' end of the line, could be devised which would be adaptable to all the different systems in use in this country. Although, possibly, finality may not yet be reached, a very simple arrangement has been evolved which on test has proved itself to be reliable. A high resistance electromagnet of about 4,000 ohms, entirely copper-clad, actuating a "Veeder" dial through the usual mechanism, is fixed to the subscriber's instrument. It is connected between the ringing line and earth, and is arranged so that, as the armature is attracted, the circuit of a 1,000 ohm resistance in parallel with the 4,000-ohm winding is closed, so that an augmented current flows over the line. This current, when augmented, passing through a relay at the exchange lights a lamp on the switchboard, and so indicates to the operator that the call has been recorded at the subscriber's end. The new meter, which is in addition to the meter at the exchange, is worked by the operator by the same meter key through a relay in the existing cord circuit, which connects an 80-volt battery to the answering relay between the line and earth. The subscriber's meter is not affected by the usual ringing current, as the copper covering of the coil gives it sufficiently high inductance to prevent any considerable alternating current from passing through it. As the addition of subscribers' meters would add to the complexity of the subscribers' equipment and necessitate increased maintenance charges, it is probable that any subscriber desiring this meter would be called on to pay about 10s. per annum extra rental. It will be seen from the above that the meter is no more likely to register ineffective calls than the one at the exchange, in conjunction with which it

works, and is dependent on the operator to the same extent. The subscriber can, however, immediately notify the exchange if he sees an ineffective call registered. Without great alterations to the present system, automatic meters are only possible on automatic systems where there is no possibility of wrong numbers being given. An interesting metering arrangement at the subscriber's end in this case consists of an arrangement whereby the calling subscriber's transmitter is out of action, although the called subscriber can be heard in the receiver, until the calling subscriber depresses a button in his instrument, and so registers the call.

The question of the distribution of the remaining £65,000 of the National Telephone Co.'s assets was considered by Mr. Justice Sargent on Thursday last week. He referred the matter to chambers for inquiry, and directed advertisements of the proposed distribution to be issued. Although it was decided last July that the surplus assets be distributed among the deferred stockholders, the £65,000 was kept back so that claims against the assets could be met. Although it had been notified that all claims must be proved before August 25th last, the claims which had come in since have been paid. The liquidator said that he was anxious to distribute the £65,000 among the deferred stockholders, but felt that it was not quite safe to do so without the direction of the Court.

A Paper of an unusual nature, but both interesting and valuable, was read before the Institution of Post Office Electrical Engineers on November 10th by Mr. Harvey Smith. It dealt with the question of provision for future requirements when laying telephone cables and the pipes for them. Assuming, for instance, that it is estimated that 300 lines will be required on a particular route during the next 15 years, will it be most economical to lay a 300-pair cable from the outset, or a 150-pair cable now and another in eight years, or three 100-pair cables, four 75-pair cables, or six 50-pair cables at suitable intervals of time; and again, if it pays to adopt one of the latter alternatives, will it be best to lay all the pipes at the outset so as not to have to open the ground again? The Paper explains how such problems as these are dealt with, on the basis of calculating the "present value" of the annual interest, maintenance, and depreciation charges on the various alternatives over 25 years. Several examples are worked out in the Paper, but as these are based on paying only 3½ per cent. interest on capital, the general con-

clusions summarised by the author at the end of the Paper are not generally applicable, except to British Post Office work.

Some of the members of the Hull Telephone Committee are not altogether in agreement with the recommendation to purchase the system which the Post Office recently acquired from the National Telephone Co. on the terms announced on page 685 of our issue for December 11th. The feeling is that this price is too high, having regard to the number of years' use of the plant, but a special meeting of the City Council is to be held to discuss finally the matter before any definite agreement with the Post Office is entered into.

The death is announced at Kingston-on-Thames, at the age of eighty-six, of Mr. J. W. Wilkins, an early pioneer in telegraph and wireless telegraph work. Mr. Wilkins was associated with Cooke & Wheatstone.

The Coventry Local Advisory Telephone Committee has been notified by the General Post Office of the establishment of a new and larger telephone exchange, possibly an automatic telephone exchange, and additional cables from Coventry to Birmingham.

An expenditure of £40,000 is contemplated upon additions to the Post Office telephone system in Bristol, both as regards the local and trunk line services.

An interim dividend of 10 per cent. has been announced on the ordinary shares of Marconi's Wireless Telegraph Co.

### ELECTRIC TRACTION NOTES

In response to the request by the Hove Corporation that the trolley omnibus sanctioned by the Board of Trade should be run by the Brighton Corporation on a test route before being put into service permanently, the General Purposes Committee of the Brighton Corporation has now specified a route for this purpose.

Another difficulty, however, seems to have arisen, and that is that the Hove Corporation is not agreeable to the use of trolleys, but prefers the flexible cable connection as used in the Cedes-Stoll system.

A proposal that all the electric railway, tramway and bus services in Berlin shall be amalgamated in a similar manner to what has taken place in London is under discussion.

## "ELECTRICAL ENGINEERING" TRADE SECTION

— Notes on Tenders Invited and Prospective Business appear on p. 731. —

### CATALOGUES, PAMPHLETS, &c., RECEIVED

**MEASURING INSTRUMENTS.**—A comprehensive list is to hand of "Nadir" electrical measuring instruments made by the Kadelbach and Randhagen electrical measuring instrument works of Berlin (42 Babelsbergerstrasse Wilmsdorf). This includes high-class accurate permanent magnet moving coil voltmeters and ammeters, insulation testers, and combination instruments for several ranges, in a number of forms, with portable shunts and series resistances where required. The firm also make up very conveniently arranged outfits with the necessary slide resistances and standard instruments for readily checking ammeters and voltmeters. A special section of the list is devoted to insulation testing sets, ohmmeters, &c., and among other items listed we find sensitive millivoltmeter moving coil galvanometer, resistances, relays, universal combination testing sets, and various accessories, and a special connection and resistance box to be used in conjunction with a voltmeter for fault localisation. Slide wire resistance bridges and electrical pyrometers conclude this very complete collection of apparatus.

**PHASE COMPENSATION.**—We have received from the Wagner Electric Manufacturing Company (St. Louis, Mo., U.S.A.) a pamphlet dealing with phase compensation, from the pen of Mr. Val A. Fynn, who is one of the Company's consulting engineers. The matter is a reprint of articles recently published in the *Electrical World* (New York). The author treats of the subject with especial regard to single-phase motors after having first explained the nature of a phase difference, the causes producing it, and the methods of control. The treatment is full and clear, and is enhanced in ease of understanding by 55 diagrams.

**LEADISING.**—A leaflet from Lead, Ltd. (1 and 2 Old Pye

Street, S.W.), gives illustrations of articles treated by the electrolytic lead covering process referred to on page 721 of last week's *ELECTRICAL ENGINEERING*, and gives particulars of the cost of current for depositing coatings of different thicknesses.

**FITTINGS.**—A card from Dugdell's Patents (Failsworth, Manchester) illustrates a very large number of tubular and other jointed fittings, the special feature of most of which is a patented self-sustaining joint which can be bent in any direction.

A cleverly arranged paper-weight from Ferranti, Ltd., forms a sort of circular slide rule for converting shillings and pence into decimals of a pound. This is very simple and easy to work, and will be much appreciated by the company's many friends.

We have received a useful blotter from the Hart Accumulator Co. (Marshgate Lane, Stratford, E.).

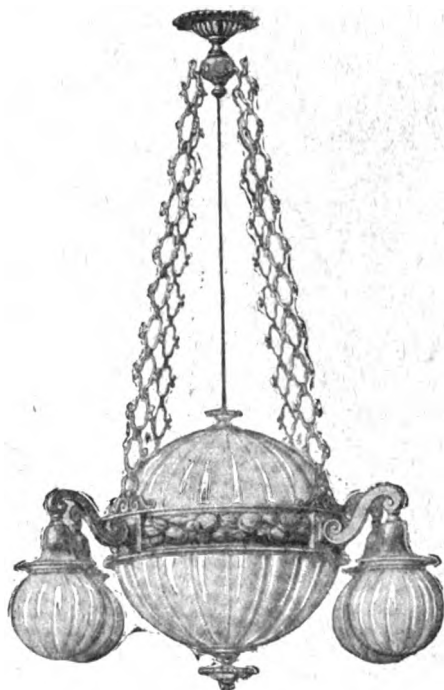
Alfred Graham & Co. (St. Andrew's Works, Crofton Park Road) are distributing to their friends a desk blotting-pad of convenient form combined with a diary.

### Shipping, Engineering, and Machinery Exhibition, 1914.

Arrangements are progressing for this exhibition, which is to be held at Olympia in September and October, 1914. The Dutch Government are organising a collective exhibit, and over 50 per cent. of the space is already booked. Among the names in the preliminary list of exhibitors we may mention the following:—Babcock & Wilcox, Ltd., British Vacuum Cleaner Co., Ltd., Electric Appliances Co., Ltd., Feld Bros. & Co., Ltd., Jacob White & Co., Ltd., J. Keith & Blackman Co., Ltd., Kelvin, Bottomley & Baird, Ltd., W. Kennedy, Magic Appliances, Ltd., Marconi's Wireless Telegraph Co., Ltd., Medway's Safety Lift Co., Ltd., Ozonair, Ltd., Pinchin, Johnson & Co., Ltd., Sunderland Forge & Engineering Co., Ltd., W. C. Tackley & Co.

## AN ALBA FITTING

IN a description of the lighting installation at the Balham Palladium, which appeared recently in these columns, reference was made to the Alba fittings employed there. It is now possible to give further particulars of this fitting, which was specially designed by the British Thomson-Houston Co. (Mazda House, 77 Upper Thames Street), for the Balham Palladium. This fitting, which is of Adams design, consists of a heavy chased corona suspended by four chains. Inside

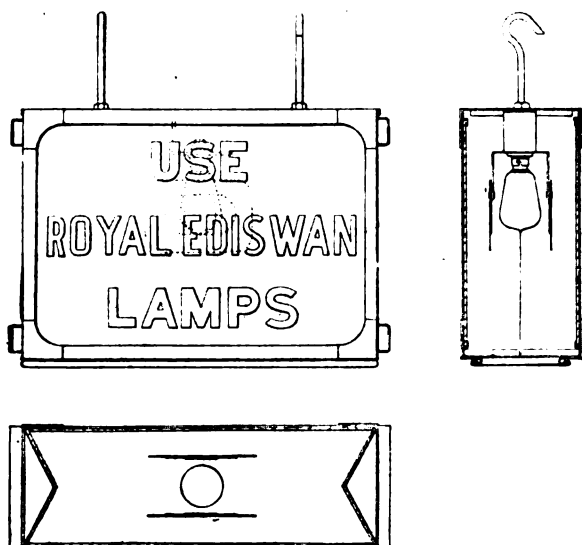


FITTING WITH ALBA GLASS SPHERES.

the corona is fixed a 16-in. Alba glass sphere, and from each of the arms depends a 6-in. ball. One 200-watt and four 60-watt Mazda lamps are used in each fitting. The metal-work of the fitting is of polished brass; its overall length is 4 ft. and its diameter 2 ft. 6in. The fitting is a fine example of the combination of efficiency and beauty in the design of lighting appliances.

## A NEW ELECTRIC SIGN

THE Edison & Swan United Electric Light Co., Ltd. (Ponders End, Middlesex), have recently acquired the manufacturing rights of the patent "Ediswan-Zenith" light-



NEW ONE-LAMP SIGN.

saving sign (Beville's Patent). The chief feature of this new sign is the reduction in maintenance cost over other types, effecting a saving in upkeep of from 50 to 70 per cent. The

chief feature is the use of a simple device which diverts the light on to surfaces where it is alone required, thus effecting a considerable saving in upkeep; at the same time a brilliant and even light is diffused over the entire surface of display. The lamp itself is between patent distributing screens, at the same time throwing its side rays on to mirrors at either end of the sign, by virtue of which arrangement an even distribution of light over a large surface is obtained without glare, whilst in the case of either single or double-sided signs the width of the containing box is reduced to a minimum. This principle is applicable to facias, projecting signs, window signs, wall signs, and, in fact, to all signs illuminated from within.

## A NOTABLE ADVERTISING CAMPAIGN

THE General Electric Co., Ltd. (67 Queen Victoria Street, E.C.), are carrying out a special advertising campaign on a very large scale in connection with the sale of their "Magnet" electric irons. Most of our readers will already have seen the four-page special advertisements which have been appearing in the *Daily Mirror*, which are extremely well arranged and effective. We are informed that nearly 200 electricity undertakings have interested themselves in the matter and distributed copies of this paper to all consumers on their mains, while over 600 contractors are co-operating in the scheme and have taken up a stock of "Magnet" irons in order to meet the demand that is bound to accrue. The Company are being particularly liberal in the terms that they are giving to agents, and are giving a bonus in the shape of a free kettle, toaster or hot-plate to those placing orders for a certain number of irons. Extensive advertising and window-dressing material has also been prepared for the use of contractors, and the General Electric Co. have fortified their own position as regards delivery by manufacturing a stock of over 40,000 irons for various voltages. The irons are being sent out complete with connectors, flexible cords and adapters ready for instant use, and another important feature of the scheme is the arrangements that have been made for giving anyone fifteen days' free trial of an iron and a three years' guarantee when purchased. The Company are to be congratulated on the enterprise and energy that they have shown in the matter, and fully deserve the large volume of business which their campaign, so suitably timed just before Christmas, is bound to bring them. The benefits to the contractors will be also on a large scale, and both the public and the supply authorities will reap great advantage.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

## Generating Stations, Sub-Stations, Mains, &amp;c.

**Belgium.**—The Antwerp Municipal Authorities invite tenders by January 19th, 1914, for two transformer cabins, a supply of armoured cable, and seventy junction boxes. Further particulars, 73 Basinghall Street, E.C.

**Carlisle.**—The Electricity Department invites tenders for two 1,250-kw. high-pressure turbo-alternators with condensing plant, rotary-converters, switchgear, &c. City Electrical Engineer, December 31st.

**Grimsby.**—Mains extensions.

**Heywood.**—An expenditure of £3,000 upon mains and services is contemplated.

**Hornsey.**—A loan of £6,000 for mains extensions is to be applied for.

**London: Hammersmith.**—The Finance Committee of the L.C.C. recommends sanction to a loan of £9,427 for mains, sub-station plant, services and meters.

**Southwark.**—The Finance Committee of the L.C.C. recommends sanction to a loan of £29,334 for additional generating plant.

## THE RECORD ELECTRICAL Co., Ltd.

LONDON OFFICE:  
CAXTON HOUSE,  
WESTMINSTER, S.W.  
Telephone:  
3067 Victoria.  
Telegrams & Cablegrams:  
"Infusion,"  
London.

WORKSHOP TYPE  
MEASURING  
INSTRUMENTS.

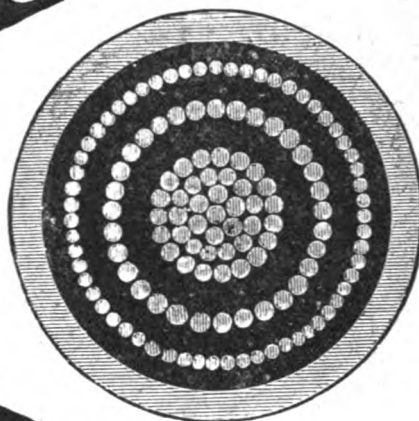
WORKS:  
BROADHEATH,  
MANCHESTER.  
Telephone:  
164 Altrincham.  
Telegrams & Cablegrams:  
"Infusion,"  
Altrincham.

Write for Prices & Particulars.

# " LIVERPOOL "

# ELECTRIC WIRES &

# CABLES



**LIVERPOOL ELECTRIC CABLE CO., LTD.,**  
**LINACRE LANE, BOOTLE, LIVERPOOL.**

Telephone:  
187 BOOTLE

Telegrams:  
"CONCENTRIC, LIVERPOOL."

## **LONDON:**

**Baxter & Caunter, Ltd.,**  
 219, Tottenham Court  
 Road, W.

## **BIRMINGHAM:**

**W. La Brum,**  
 27, Anderton Park Road,  
 Moseley, Birmingham.

## **MANCHESTER:**

**H. G. Mabbs,**  
 Marble Street, Spring  
 Gardens.

## **LEEDS:**

**Loxley & Co., Ltd.,**  
 20, Basinghall Street.

## **NEWCASTLE-ON-TYNE:**

**Robert Bowran & Co., Ltd.,**  
 St. Nicholas Buildings.

## **GLASGOW:**

**A. & J. M'Culloch,**  
 140, West George Street.

**Stoke Newington.**—The Finance Committee of the L.C.C. recommends sanction to a loan of £6,000 for mains.

**Rochdale.**—Sanction to borrow £60,000 is to be sought in connection with extensions at the power station.

**Southend-on-Sea.**—An expenditure of £30,000 on mains and feeders is contemplated, as well as the erection of two new sub-stations.

**Taunton.**—Application is to be made to the Local Government Board for loans aggregating £5,100 for extensions to the electricity undertaking.

**Walsall.**—It is stated that plans are being prepared for a new generating station at an estimated cost of £40,000. Mr. E. M. Lacey is the consulting engineer.

### **Wiring**

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Barking.**—New post office. H.M. Office of Works, London.

**Barnsley.**—New town hall.

**Belfast.**—Electric lighting of the workhouse.

**Croydon.**—Cinematograph theatre, Lower Addiscombe Road. G. W. Booth, Chandos Street, S.W.—Fifteen houses, Melrose Avenue, W. Aston, 218 Melfort Road.—Fifteen houses, Hythe Road, H. Harrison, 21 Raymead Avenue.

**Dawlish.**—New fire station, &c. Town Clerk.

**Devonport.**—Infants' school. Director of Education.

**Dundee.**—New school.

**Harrogate.**—New Council school. Borough Surveyor.

**Hull.**—Cinematograph theatre, Beverley Road. Architects, Wellstead, Dossor & Wellstead, Waterloo Chambers. Cinematograph theatre, Anlaby Road. Architect, H. P. Binks, 31 Scale Road.

**Macclesfield.**—New fire station.

**Margate.**—New town hall.

**Newcastle.**—Labour exchange, Wallsend. H.M. Office of Works, London.

**Pontypridd.**—Extensive alterations and additions to workhouse. Architects, A. L. Thomas and G. S. Morgan, 23 Gelliwasad Road.

**Richmond (Surrey).**—New cookery centre (£3,700).

**West Bromwich.**—New schools at Crotchills (£16,518).

### **Miscellaneous**

**Bristol.**—There is a prospect of considerable extensions to the street electric lighting in conjunction with a number of new streets which are to be built.

**Northampton.**—Tenders are invited for the overhead equipment, underground feeders, telephones, &c., for three miles of tramway extensions. Borough Engineer.

**Rawtenstall.**—It has been decided to substitute electric lighting for gas lighting along the main tramway routes.

## **TENDERS RECEIVED AND ACCEPTED**

**Norwich.**—The tender of Messrs. C. A. Parsons & Co. for a 3,000-kw. turbo-alternator coupled to two 1,200-kw. Siemens rotary converters at £8,578.

**London: L.C.C.**—The Edison & Swan United Electric Light Co. have been successful in securing the contract for the supply of Royal Ediswan drawn-wire tungsten filament lamps (British) to the London County Council, under Schedule 17.

**Admiralty.**—A contract for the supply of Royal Ediswan drawn-wire tungsten filament lamps (British) for H.M.S. *Tiger* has been placed with the Edison & Swan United Electric Light Co.

## **APPOINTMENTS AND PERSONAL NOTES**

We are very pleased to state that Mr. C. Turnbull, Borough Electrical Engineer at Teignmouth, who recently underwent an operation for appendicitis, is now progressing favourably.

The Erith Electricity Committee recommends that the salary of Mr. A. Coveney, Borough Electrical Engineer, shall be increased from £350 to £400 per annum.

The salary of Mr. G. Bryant, Borough Electrical Engineer, Yarmouth, is to be increased from £450 to £500 per annum by two increments of £50.



# OSRAM

## LAMPS

### Important Notice

## JUDGMENT

THE OSRAM LAMP WORKS, LTD., beg to inform the Trade and the Public that on November 26th, 1913, in the High Court of Justice, Chancery Division Mr. Justice Astbury **GRANTED AN INJUNCTION** against the **ORO LIGHT & GENERAL SUPPLY CO., LTD., 36, Cock Lane, Snow Hill, E.C.** (in default of defence), in the action against them instituted by the Osram Lamp Works, Ltd., for infringement of OSRAM Patents Nos. 23899★ of 1904 and 18622 of 1906 (the validity of which had been certified by the Court in a previous action) by the sale of

### **ORO LAMPS,**

stated by the Defendants to be manufactured by the **Wolfram Lampen Aktiengesellschaft of Augsburg, Germany.**

IT WAS FURTHER ORDERED that the Defendants deliver up to the **OSRAM LAMP WORKS, LTD.,** or destroy in the presence of their representatives, all such infringing lamps in their possession, and that an inquiry be held to ascertain what damages have been sustained by such infringement, and that the Defendants pay **THE OSRAM LAMP WORKS, LTD.,** their full costs, charges, and expenses in the action as between Solicitor and Client.

**WARNING! Dealers in and users of similar infringing lamps will be proceeded against.**

## LOCAL NOTES

**Aberdeen: Power Supply.**—The question of giving a supply of electricity for power purposes to the Broadford works has occupied a good deal of attention recently. The opposition has been directed to the point that it is not profitable to supply electricity at  $\frac{1}{2}$ d. per unit, as this is under actual works cost. The fallacy of this argument, of course, is well known in connection with power supply taken during non-peak load, and the Electricity Committee's proposal to supply up to 100,000 units at ordinary power rates and  $\frac{1}{2}$ d. per unit for all consumption in excess of that on a contract for five years, has been passed. It should be noted, however, that the voting was 15 to 14.

**Brixham: Vibration from Generating Plant.**—An action has been brought against the Brixham Gas Co. by a property owner close to the works in respect of vibration caused by some small generating sets at work on the Gas Company's premises. After a long hearing, Mr. Justice Neville, in the Chancery Division, has held that there is sufficient vibration to constitute actionable nuisance, and granted an injunction, allowing three months within which to make the necessary structural alterations.

**Chester: Water Power Works.**—In a report in which the City Electrical Engineer refers to the satisfactory working of the Dee water-power electricity works, reference is also made to a complaint by the Chester Boat Co., which runs a service of steamers on the Dee, that the operations of the power scheme have had the effect of reducing the depth of water available this winter to such an extent that there is every probability of the steamer service having to be suspended altogether next summer. A special sub-committee has been appointed to investigate the complaint.

**Hinckley: Electric Supply.**—An agreement has been come to between the Council and the Midland Electric Light & Power Co., Ltd., for the latter to apply for an electric lighting provisional order to be immediately transferred to the Leicestershire & Warwickshire Electric Power Co., which has a power station close to Hinckley. Supply will, of course, be immediately available, and under the order the Council has the right to acquire the undertaking in its district at the end of forty-two years. The Council has been advised in the matter by Messrs. Preece, Cardew & Snell, who express the opinion that a municipal undertaking could not be made a financial success now.

**Newport (Mon.): New Generating Set.**—The new 3,000-kw. 6,000-volt A.E.G. turbo-alternator was officially started up last week. A wet air filter has been installed in conjunction with this set.

**Northampton: Reduction in Cooking and Heating Charges.**—The Northampton Electric Light Co. has reduced its charge for electricity for heating and cooking purposes from  $1\frac{1}{2}$ d. to 1d. per unit. It is stated that this reduction has been made owing to the rapid increased demand for current for these purposes, whilst many of the boot manufacturers in the town are now using electric irons, pressers and stamping machines.

**Spain: International Exhibition.**—With reference to the International Exhibition which it is proposed to hold in Barcelona in 1915, as announced on another page, a document

to hand from the British Chamber of Commerce for Spain anticipates a great boom in electrical matters during the next two years. Important companies, both national and foreign, are now engaged in erecting water-power stations at the water-falls of the Pyrenees and various provinces, and it is anticipated that by the end of 1915 something like 300,000 h.p. will be available for transmission to Barcelona, and will be sold at very low rates. The Chamber of Commerce, in order to encourage interest in Great Britain in the 1915 Exhibition, has sent a deputation to England. Already the municipality and other local organisations in Barcelona have guaranteed important subsidies, that of the Town Council amounting to 10,000,000 fr. British manufacturers are urged to take interest in this Exhibition, as the Chamber of Commerce is assured that it will open an excellent market in Spain.

**Walsall: Increase in Power Charges.**—The Electricity Committee's recommendation to increase the price of current for power purposes next year by 10 per cent. has been adopted by the Corporation. The somewhat unusual comment is made in the Electricity Committee's report on the general question of developing the undertaking that although the use of electricity would be popularised by hiring motors, cookers, &c., the Committee could not recommend the expense involved.

## MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Bankruptcies.**—The application for the discharge of J. G. Hilton, Electrical Engineer, 103 Exchange Buildings, Birmingham, will be held on January 15th, 1914, at the Court House, Corporation Street, Birmingham.

Charles Blake, trading as the Bilston Electrical Co., 4 Church Street, Bilston, has been adjudicated a bankrupt.

**Liquidations.**—The statement of affairs in the liquidation of Prested Miners' Gas Indicating Electric Lamp Co., Ltd., shows a deficiency of £18,876. The failure of the Company is attributed to the fact that the lamp was too expensive to be made commercially profitable.

**Christmas Holidays.**—A. Reyrolle & Co., Ltd. (Hebburn-on-Tyne), notify that their works will be closed from Wednesday, Dec. 24th, to Friday, Jan. 2nd, and that the offices will be closed for part of that time.

The Edison & Swan United Electric Light Co., Ltd., will open their premises as usual at College Hill and Queen Street, E.C., on Saturday, the 27th, for the convenience of their customers.

**Companies Struck off the Register.**—The names of the following will be struck off the register of joint stock companies at the end of three months, unless cause is shown to the contrary:—Electricity Generating Co.; Ferabin Lamp and Electrical Accessories, Ltd.

## NEW COMPANIES

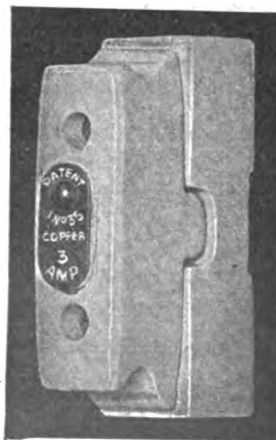
**BRITISH ARC WELDING CO. (BRISTOL CHANNEL), 2**  
Dock Chambers, Cardiff. Capital £20,000.

## FACTORY PATTERN PATENT "DAMPER" FUSES

DESIGNED TO MEET HOME OFFICE  
RECOMMENDATIONS.

All metal work protected.  
Shock-proof.

(ASK FOR LIST.)



## DORMAN & SMITH,

Ordsal Electrical Works

SALFORD,  
MANCHESTER.



# ELECTRICAL ENGINEERING

WITH WHICH IS INCORPORATED  
**THE ELECTRICAL ENGINEER**  
(Established 1884)



*Eug*

JAN 17 1914

No. 365 [VOL. IX., NO. 52]  
*Registered as a Newspaper.*

THURSDAY, DEC. 25, 1913.

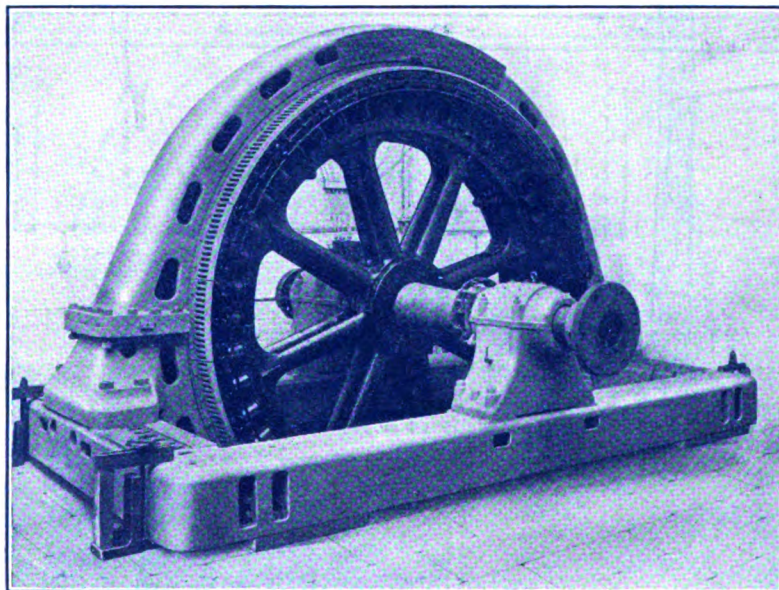
[PRICE ONE PENNY.  
*All rights reserved.*]

## VICKERS LIMITED.

TURBO-GENERATORS. MOTOR GENERATORS.  
MOTORS of all TYPES. ROTARY CONVERTERS.

Patent  
Automatic  
Reversing Drive  
for  
Reciprocating  
Machine Tools.

Schemes  
Prepared for  
the Conversion  
to  
Electrical Drive.

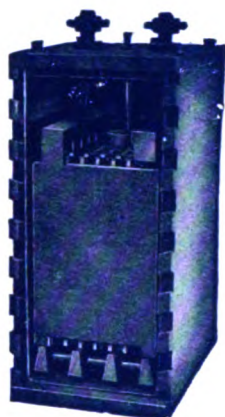


Complete  
Equipment for  
the Electrical  
Lighting and  
Driving of  
Machine Shops,  
Mills, Factories,  
&c.

3000 kw., 6600-volt, 164 r.p.m. 3-Phase Generator for the City of  
Winnipeg. Five Generators have been supplied.

RIVER DON WORKS,  
SHEFFIELD.





# THE D-P STORAGE BATTERY

FOR TRAIN  
OR YACHT  
LIGHTING

THE **D-P** BATTERY COMPANY, LTD.

Telephones : 2 Bakewell ;  
291 Westminster.  
Telegrams : " Battery, Bake-  
well "; " Cumulose, London."  
Cables : A B C Code, 5th  
Edition.

HEAD OFFICES :  
**BAKEWELL, DERBYSHIRE**

London Office :  
11 VICTORIA STREET, WESTMINSTER, S.W.

ESTABLISHED 1888  
CONTRACTORS TO  
THE ADMIRALTY  
AND THE WAR  
OFFICE

ROYAL

# EDISWAN

DRAWN WIRE LAMPS

UNSURPASSED IN ALL THE GOOD POINTS OF LAMP MANUFACTURE,

## STRENGTH - ECONOMY - FINISH

Fully Licensed under British Patents Nos. 21513/06—27712/03, and others.

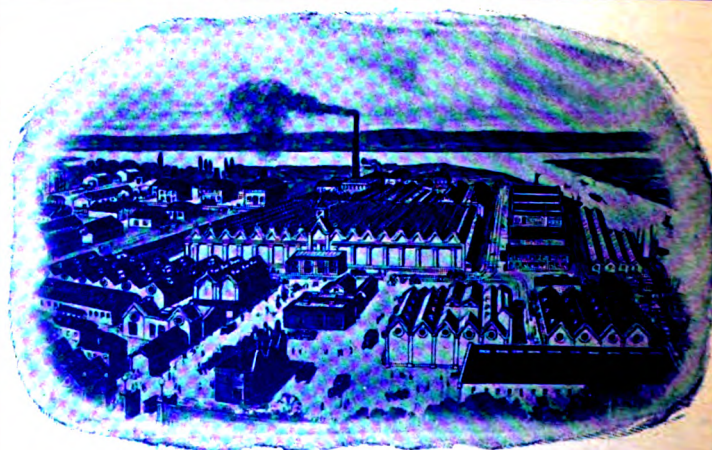
**THE EDISON & SWAN  
UNITED ELECTRIC LIGHT CO.,  
LTD.,**

**Ponders End, Middlesex.**

London Showrooms: 36-37, Queen St., & 11, College Hill, E.C.

Branches in Bristol, Belfast, Birmingham, Cardiff,  
Dublin, Dundee, Glasgow, Hull, Leeds, Liverpool,  
Manchester, Nottingham, Newcastle and Australia.

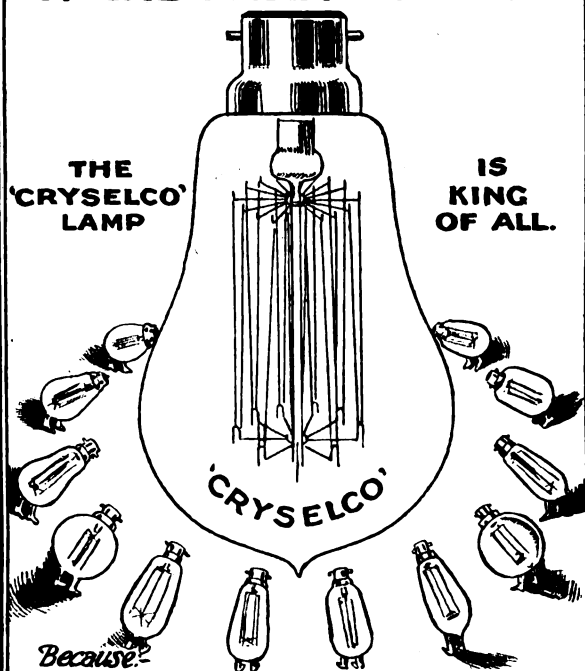
**EDISWAN**  
EVERYTHING ELECTRICAL



VIEW OF EDISWAN WORKS, PONDERS END



ALL OTHERS BOW BEFORE  
*The*  
**CRYSELCO**  
METAL FILAMENT LAMP.



*Because?*  
IT NOT ONLY SAVES  $\frac{3}{4}$  OF YOUR CURRENT BILL  
BUT IS STRONGER, BRIGHTER, &  
MORE DURABLE THAN ANY OTHER.

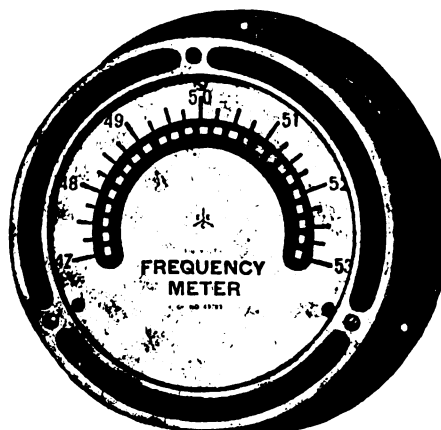
# FREQUENCY INDICATORS

RESONANCE TYPE

For all frequencies.

Accurate,  
Permanent,  
Economical  
in cost.

Unaffected  
by  
Variations  
of Voltage  
or  
Wave-form.



Model II., 25 reeds.

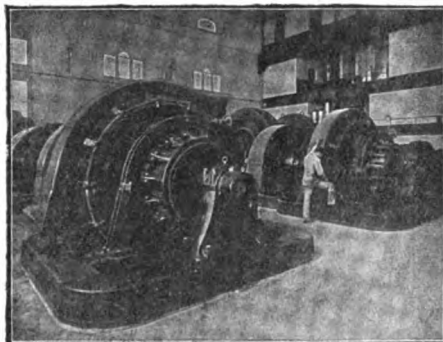
High-frequency Instruments for Wireless  
Telegraphy a Speciality.

Send for Catalogue Sheet 19.

**EVERETT, EDGCOMBE**  
AND CO. LTD.

All Enquiries to LONDON OFFICE:  
117, Victoria St., WESTMINSTER, S.W.

Sub=  
Station  
Plant



13,800  
Ampere  
Boosters

# DICK, KERR

& CO., LIMITED

HEAD OFFICE: ABCHURCH YARD, CANNON STREET, LONDON, E.C.

BRANCHES: MANCHESTER, NEWCASTLE, TOKYO, SYDNEY, JOHANNESBURG,  
BUENOS AIRES, RIO DE JANEIRO, MOSCOW, AND MILAN

# Wiring Contractors

*The following firms will be pleased to submit estimates to carry out electric light and power installations, and also extension and repair work:—*

## LONDON.

R. Brightwell, 107, Queen's Road, Bayswater, W.  
(2172 Paddington).  
Electrical Installations, Ltd., 27, Martin's Lane, Cannon St., E.C.  
(13894 Central).  
Lund Bros. & Co., 78 and 80, Queen Victoria Street, E.C.  
(1219 Central).  
Rashleigh Phipps & Co., 147, Oxford Street, W.  
(7906 Gerrard).  
Rawlings Bros., Ltd., 82, Gloucester Road, Kensington, W.  
(3370 Kensington).  
Speedy, Eynon & Co., 6, Duke Street, Adelphi, W.C.  
(8967 Central).  
Trollope & Colls, Ltd., 77, Grosvenor Road, S.W. (1971 Victoria),  
also 5, Coleman Street, E.C., and at Dorking, Surrey.  
F. Troy & Co., 194-196, Finchley Road, N.W. opposite  
L. & N.W. Railway Station). (3161 & 3162 Hampstead).

**BRIGHTON.**—Page & Miles, Ltd., 60, Western Road.

**BURNLEY.**—Simpson Brothers, Curzon Street.

**CARDIFF.**—R. Nance, 2, Dock Chambers.

**CROYDON.**—Thos. Hyde & Co., 180, London Road. (542 P.O.).

**GLASGOW & DISTRICT.**

Wm. McWhirter & Son, 212, 214, & 216, Holm Street.

**HULL.**

Alexander Shaw, 18, Story Street.

**WOLVERHAMPTON.**—Wolverhampton Electric Fittings & Installation Co., 28, Darlington Street.

The charge for insertion in the above list is 5s. per quarter (prepaid).

Only names of Wiring Contractors of good repute are accepted.

Applications should be addressed to "Electrical Engineering," Temple Chambers, London, E.C.

## ELECTRICIANS !



Have you seen

**Moseley's** latest  
**Rubber Gloves ?**

**THEY ARE ABSOLUTELY THE BEST.**

You cannot afford to run risks, and should use  
the best glove that can be made.

Write for particulars. Samples sent on approval.

**DAVID MOSELEY & SONS, Ltd.,**  
ARDWICK, MANCHESTER.

**"Calor"**  
**ELECTRIC**  
**FIRES**  
AND  
**COOKERS**

**"Calor"**  
**"Crater" Heater**



6460 10/6 Complete (subject).  
Postage 7d. extra.  
Special line to introduce Electric  
Heaters, etc. to non-users.

**TOWNSHEND'S ART METAL CO., Ltd.**  
Works and Showroom—  
Ernest Street, Birmingham. London Showroom—  
62, Holborn Viaduct.



FOR  
PAINTS,  
ENAMELS, ETC.

**CRANE'S**

FOR  
VARNISHES,  
LACQUERS, ETC.

**SPRAYERS**

SAVE  
TIME

**CRANE'S EUREKA**

SAVE  
MATERIAL

The one great antidote for competition and  
restricted output.  
Sent for the Booklet C.

**FREDK. CRANE CHEMICAL CO.**  
Armoury Close,  
Bordesley Green,  
Birmingham.

## PATENT LOUD SPEAKING TELEPHONES

COMPLETE INSTALLATIONS FOR

**WARSHIPS, MERCANTILE VESSELS,  
MINES, POWER STATIONS, ETC.**

Adopted by the British Admiralty, Foreign Governments,  
the Leading Shipping Companies, and as used in many  
Electrical Generating Stations.

**ALFRED GRAHAM & CO.,**  
ELECTRICAL ENGINEERS AND CONTRACTORS,  
ST. ANDREW'S WORKS, CROFTON PARK, LONDON.

When corresponding with Advertisers, please mention "Electrical Engineering."

THE INDIAN TRADE  
of  
BRITISH MANUFACTURERS  
can be largely increased if the advertising columns of  
**"Indian Industries & Power"**  
(incorporating "INDIAN MOTOR NEWS")

are made judicious use of.

This Journal, published at Bombay, is acknowledged to be the leading Engineering and Industrial journal in Western India. It is officially subscribed to by the Government of India, the Indian Provincial Governments and Native States throughout India.

**MAKERS OF MOTOR CARS AND ACCESSORIES**

will in particular find it an admirable medium. It was the first journal to deal with Motoring and Automobilmism in the East.

**Wheeler's Buildings,  
73, Hornby Road, Fort, Bombay**

Telegrams: "Indopower" Bombay.

Write for a specimen copy.

**BLAKE & INSULATING STAPLES**

Write for Samples and Prices.

**MOSSES & MITCHELL,**

Chiswell Works, 122-124, GOLDEN LANE, E.O.

**SEARCHLIGHTS**  
THE LONDON ELECTRIC FIRM (CROYDON)



Ladders, Steps,  
Trestles,  
Scaffolds, &c.

Sale or Hire.

**HEATHMAN & CO.**  
10, Parson's Green,  
London, S.W.



**"NADIR"  
ELECTRICAL  
MEASURING  
INSTRUMENTS**

Made by  
**KADELBACH & RANDHAGEN,**  
m. b. H., Berlin — Wilmersdorf,  
GERMANY.

The illustration shows the accurate Universal Testing Set, Model 2, suitable for the simplest tests as well as for the most accurate measurements, meter calibrations, etc. It enables measurements of current, pressure, insulation and resistance to be made over a wide range, as well as tests of lightning conductors, localisation of faults, battery tests, and power measurements. Ask for our Pamphlet No. 10, which contains an accurate description

**FIRST-CLASS REPRESENTATIVES WANTED.**

Memo for

**1914**

Write for Terms for

**POPE**

**ELASTA**  
WIRE  
LAMPS

The Strongest Known.

They infringe  
no Patents and  
our Indemnity  
holds good.



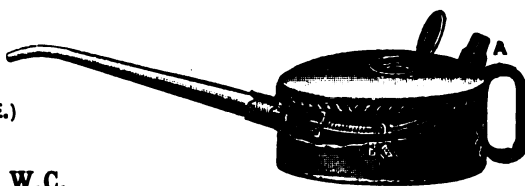
**KAYE'S LATEST PATENT SERRATED STEEL  
SEAMLESS OIL CAN**

Sole Makers

**JOSH. KAYE & SONS LTD.**

(Managing Director: W. K. KAYE, M.I. Mech.E.)

**Lock Works, LEEDS,**  
And 93, High Holborn, London, W.C.



FITTED WITH  
A New Patent Thumb Button  
and Patent Seamless Spout.  
Also in Copper or Brass for  
Electrical Purposes.

Contractors to H.M. Navy, War Department,  
Home Office, and Indian State Railways.

When corresponding with Advertisers, please mention "Electrical Engineering."

## OFFICIAL ANNOUNCEMENTS AND SMALL ADVERTISEMENTS.

Official Advertisements are charged at the rate of 9d. per line (column width).

Small Prepaid Advertisements of Situations Vacant and Wanted, Plant for Sale or Wanted, &c., are inserted at the rate of 1/- for the first 12 words and 1d. per word afterwards. Three insertions for the price of two. Advertisements can be received up till Wednesday morning first post.

Letters should be addressed to THE KILOWATT PUBLISHING CO., LTD., 203-6, Temple Chambers, London, E.C.

### TENDERS INVITED.

#### COUNTY OF LONDON.

The LONDON COUNTY COUNCIL invites TENDERS for AN ELECTRICAL INSTALLATION at the POPHAM ROAD ELEMENTARY SCHOOL, S. ISLINGTON, comprising about 130 lighting points.

Persons desiring to submit Tenders may, on and after *Monday, 22nd December, 1913*, obtain the specification, form of tender, &c., on application to the Chief Engineer of the Council, Mr. G. W. HUMPHREYS, at the County Hall, Spring Gardens, S.W., upon payment to the Cashier of the Council of the sum of £1. This amount will be returnable only if the tenderer shall have sent in a *bona-fide* tender, and shall not have withdrawn the same. Full particulars of the work may be obtained on personal application, and the drawings, specification, and other contract documents may be inspected at the County Hall before the payment of the fee.

The Contractor will be bound to pay to all workmen employed by him in and about the execution of the contract or any part thereof, wages at rates not less, and to observe hours of labour not greater, than the rates and hours set out in the Council's list, and such rates of wages and hours of labour will be inserted in and form part of the contract by way of schedule. Particulars of the Council's Standing Orders on these matters are given in the *London County Council Gazette*. Tenders must be upon the official forms and the instructions therein must be strictly complied with. No tender received after 11 a.m. on *Tuesday, 13th January, 1914*, will be considered.

The Council does not bind itself to accept the lowest or any tender, and it will not accept the tender of any person or firm who has withdrawn a tender after the same had been opened, unless the reasons for withdrawal were satisfactory to the Council.

LAURENCE GOMME,

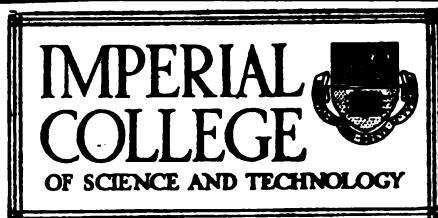
*Clerk of the London County Council.*

County Hall, Spring Gardens, S.W.,  
15th December, 1913.

### APPOINTMENTS VACANT & WANTED.

SWITCHBOARD ATTENDANTS wanted for the L.C.C. Tramways Sub-stations. Shift Duties. Wages, 30s., rising to 40s. a week. Applicants must have practical knowledge of switchboard operation, and be not less than 22 years of age. Apply to the CHIEF OFFICER, L.C.C. TRAMWAYS, 62 Finsbury Pavement, E.C.

TRAVELLER—Retail electrical experience, desires post. Wholesale preferred. Interviewing or Supervision. Apply "AMPS," 6 Alma Terrace, Torquay.



SOUTH KENSINGTON, LONDON, S.W.

The following Advanced Course of Instruction will be given, commencing in January next:—

City and Guilds (Engineering) College.

Subject— Conducted by—

Railway Engineering (including):

Railway Signalling	Mr. H. G. BROWN, M.I.E.E.
Railway Organization	Mr. W. T. STEPHENSON, B.A.
Electric Traction and Railway Electrification	Mr. P. DAWSON, M.Inst.C.E., M.I.M.E., M.I.E.E.

For further information of this and other courses to follow, application should be made to THE REGISTRAR.

**John E. Raworth,**

Queen Anne's Chambers, Chartered Patent Agent  
30, Broadway, Westminster, London, S.W.

### FOR SALE AND WANTED.

DUST SHEETS to cover Electrical Machinery, 12 feet square, 8s. 6d.—and made to any size. Best washed meat cloths, 28lb. bag, 13s. 6d. Large Chamois Leathers, 10s. 9d. doz. Chamois Cloth Dusters, 2s. 9d. doz. Swabs, 1s. 3d. doz. Try samples. WILLIAM MOORE, Lauderdale Buildings, Aldersgate, London.

CABLE CASINGS to compete against any Manufacturers in the World, trade discount on application. Creosoted troughing and timber for underground work, also woodwork of all descriptions. Send 1s. 6d. (export 3d. extra) for the most up-to-date illustrated list (264 pages) of woodwork and timber in the World, to include 4-fold, brass-jointed boxwood rule. Will return money in exchange if not worth 2s. 6d. to you. JENNINGS & Co., 955 Pennywell Road, Bristol.

GAS RETORT CARBON for sale. Pitch, Insulating Material, Carbon Electrodes. We supply the trade. V. DASHKES, 21 Water Lane, E.C.

PLATINUM UTENSILS, SCRAP, LAMP TOPS.—Best prices given by DERBY AND Co., LTD., 44 Clerkenwell Road, London, E.C. N.B.—Platinum Sold.

PLATINUM, OLD ELECTRIC LAMP TOPS, Scrap Platinum purchased for cash. Best price given.—S. W. PRICE & Co., Platinum Refiners, 13 Great Queen Street, Kingsway, London, W.C.

### ANNOUNCEMENTS RELATING TO PATENTS.

The Owner of Patents Nos. 24,696/10 relating to "Improvements in apparatus for the production, strengthening, and reception of ELECTRICAL VIBRATIONS," and 13,968/11 relating to "Improvements in ELECTRIC CAPACITIVE-INDUCTIVE COUPLINGS," is desirous of negotiating with interested parties for the granting of licenses thereunder on reasonable terms. For information apply to MESSRS. LLOYD WISE & Co., Chartered Patent Agents & Consulting Engineers, No. 10 New Court, Lincoln's Inn, London, W.C.

**REMOVAL.** Mr. J. G. LORRAIN, M.I.E.E., M.I.Mech.E., Chartered Patent Agent, has removed his office from Norfolk House, Norfolk Street, Strand, W.C., to  
**Staple Inn Buildings, High Holborn, London, W.C.**

**CAPPER PASS & SON, Ltd.,**  
Bedminster Smelting Works, BRISTOL

SELLERS OF  
**ANTIMONIAL LEAD OF ALL GRADES.**  
BUYERS OF  
**LEAD ASHES & LEAD RESIDUES FROM ACCUMULATORS.**  
Telegrams: "PASS, BRISTOL." Telephone: 3475 & 3476.

For Instructions on Cleaning and Polishing  
Electrical Fittings and Electric Cookers, read

**CANNING'S HANDBOOK ON  
POLISHING, ELECTRO-PLATING & LACQUERING.**

Fully Illustrated. Price 2s. 3d. post free. Abroad, 2s. 6d.

**W. CANNING & CO., BIRMINGHAM.**

LONDON: 18/20, ST. JOHN'S SQ., CLERKENWELL, E.C.  
MENTION BOOK REF.

### EVERY INSTALLATION ENGINEER

Should join his Trade Protection Organisation,

**THE  
ELECTRICAL CONTRACTORS' ASSOCIATION**  
(Incorporated).

Inquiries cordially invited by the Secretary,

L. G. TATE,  
20, Bucklersbury, LONDON, E.C.

When corresponding with Advertisers, please mention "Electrical Engineering."



# "SYNCHRON" THE LIFE-SAVER

**The latest invention for restoring animation after apparent death from Electric Shock, Drowning, Mine Gas Poisoning, etc.**  
**A boy can use it, no technical knowledge necessary.**

*The Star, Nov. 28th, says:—*

"Electric shocks need not necessarily prove fatal, and people who have been victims of a shock appear to be like people who have been immersed in a pond; both may be revived by means of artificial respiration.

"Some very interesting information regarding this is given in the 'Lancet' by Dr. Reginald Morton, President of the Section of Electro-Therapeutics in the Royal Society of Medicine, who states that practically no shock, however severe, need necessarily prove fatal.

"Death from electrical shock is only an apparent death at first, and whatever the conditions or severity of the accident, there is practically always a time, varying from a few minutes upwards, during which it is possible to resuscitate the victim by artificial respiration if resorted to at once.

"So important is it to commence artificial respiration quickly, that it is the first duty of the bystander to see to this before everything else."

**YOU CAN DO THIS WITH THE SYNCHRON**  
**it is always ready.**

#### AGENTS:

Messrs. HASLAM & SCHONTHEIL, Ltd.; Messrs. SIEBE GORMAN & CO., Ltd.	
British South Africa	Messrs. GEORGE ANGUS & CO., Ltd.
Rhodesia - - -	Messrs. HUBERT DAVIES & CO., Ltd.
Canada - - -	Messrs. CHAPMAN & WALKER, Ltd.

For full particulars apply to the sole selling agents for Great Britain and the Overseas Dominions—

**THE SYNCHRON CO.,** (Proprietors, Albans, Ltd.), 11, Serjeant's Inn, London, E.C.

**THE HOLMQUIST ELECTRIC CO. (1911) Ltd.,** 27, Kingley Street, Regent Street, London, W.

EVERSHED'S
CELL
TESTER

## Keep your Batteries in order

systematically by the use of

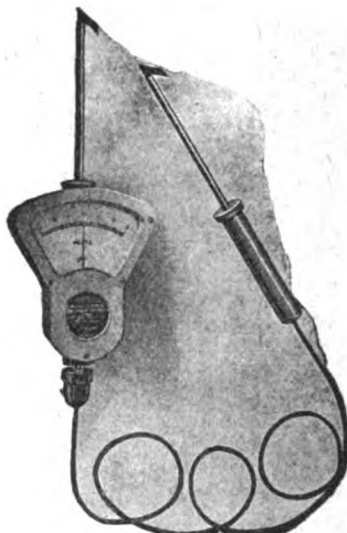
# Evershed's Cell Tester

the best thought out of all instruments ever devised for the purpose.  
Every detail is practical, and the

## Undamageable Pivots

render this instrument unique.  
Full particulars from the

**Sole Makers: EVERSLED & VIGNOLES, Ltd.,**  
 Telephone : 1370 Chiswick (2 lines).    **Acton Lane Works, Chiswick, LONDON, W.**  
 Telegrams : "Dorothea, Chisk, London."



EVERSHED'S
CELL
TESTER

# SILVERTOWN

**Over 30 years'**  
**manufacturing experience is behind**  
**SILVERTOWN ELECTRICAL PLANT**

The India Rubber, Gutta Percha & Telegraph Works Co., Ltd.  
 (The SILVERTOWN Company) were the first to manufacture  
 Gramme Machines in England, and have executed many  
 important contracts for British and Foreign Governments and  
 Corporations.

Estimates for Dynamos, Motors, Balancers, Boosters, Motor  
 Generators, Rotary Converters, Petrol-Electric Plant, Switch-  
 boards, etc., on application.

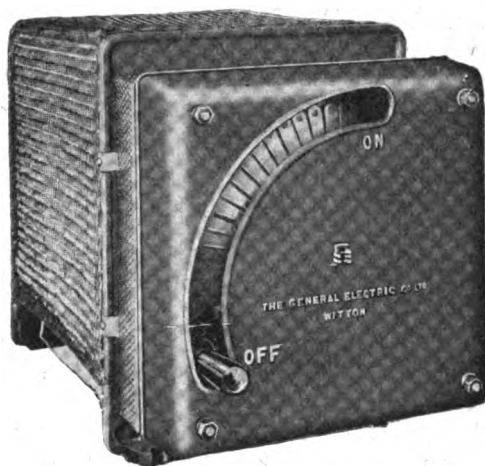
HEAD OFFICES—106, Cannon Street, London, E.C.

WORKS—Silvertown, London, E.

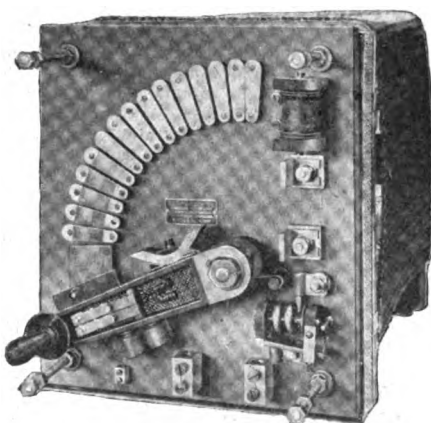
*When corresponding with Advertisers, please mention "Electrical Engineering."*

# “Witton” Starters and Controllers

Robust construction throughout. Every part easily renewable.

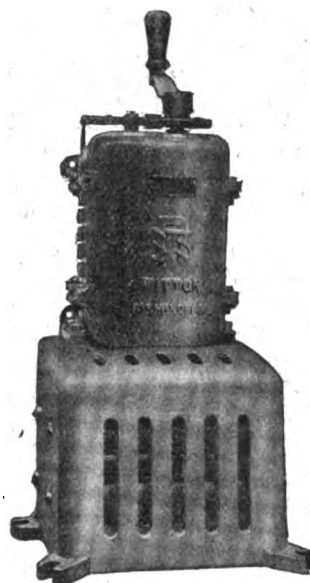


“Witton” C.C. STARTER, Type 4.



“Witton” C.C. STARTER, Type 5  
(with cover removed).

In open, semi-enclosed and totally enclosed cover patterns. Provided with self-aligning contacts, removable no-volt coil, and adjustable overload coil.



“Witton” C.C. CONTROLLER, fitted  
with Magnetic Blow-out Coils and  
barriers between fingers, mounted on  
self-contained Resistance Pedestal.

## Immediate Deliveries.

Realizing the importance of prompt deliveries and the consequent saving of time and trouble to Contractors on installation and repair work, the G.E.C. have arranged to carry large stocks of all standard types and sizes of Starters at their Central Stores, Witton, and all Branches, thus enabling orders to be executed with utmost promptitude.

Stocks are also held of Controllers ready for use, and in parts which can be assembled at short notice.

*Particulars and Prices Post Free on request.*

## THE GENERAL ELECTRIC COMPANY, Ltd.,

HEAD OFFICE: 67, QUEEN VICTORIA ST., LONDON, E.C.

Telephone: LONDON WALL 3600 (20 lines). Telegrams: "ELECTRICITY, CENT, LONDON."

Branches: Manchester, Birmingham, Glasgow, Cardiff, Newcastle, Dublin, Belfast, Bristol, Swansea, Liverpool, Leeds, Sheffield, Nottingham, Hull, Southampton, &c.



1913 - 1914

# GREETINGS

THE  
DIRECTORS, MANAGEMENT,  
and STAFF of the

## EDISON & SWAN

United Electric Light Co., Ltd.,

WISH ALL THEIR CUSTOMERS

A  
**HAPPY CHRISTMAS**  
AND  
**PROSPEROUS NEW YEAR**





The Fearful Frown,  
A sorry sight,  
Bad luck to crown,  
He's lost Fluxite.

The  
**PRACTICAL MAN**  
insists on having  
**FLUXITE**

The paste flux that  
**SIMPLIFIES SOLDERING and LEAD JOINTING.**  
It solders even dirty metals without cleaning, and is safe for electrical work. It joints lead without solder merely by the use of a blow-lamp or blow-pipe. If desired some solder can be powdered into a little Fluxite and the two applied together.

Of Ironmongers, etc., in 6d., 1/- and 2/- Tins.  
Made by the AUTO CONTROLLER CO., 70, Vienna Road, Bermondsey.

## "WATCHMAN"

**ENCLOSED CIRCUIT BREAKER, OVERLOAD ONLY.**  
FREE HANDLE.  
**METAL AND MICA.**  
CARBON BREAK.



**STOCKED IN TWO SIZES**  
**30-60 Amperes**  
**75-150 Amperes**

A HIGH-CLASS BREAKER AT A  
**VERY LOW PRICE.**

WRITE FOR LIST "W 2."

## SWITCHGEAR & COWANS, L<sup>TD</sup>.

SPRINGFIELD LANE, SALFORD, MANCHESTER.

## MICA

BRITISH MICA CO., L<sup>D</sup>.  
Contractors to  
H.M. Government,  
Lebanon Road Works,  
Wandsworth, S.W.  
Tel.—405 P.O. Putney  
Tele.—"Micamint," London.

**MICANITE**

Plate Tubes,  
Rings, &c., in

The Micanite & Insulators Co., Ltd  
WALTHAMSTOW,  
London, E.

## FOR FIBRE

SHEETS, RODS  
AND  
TUBES.

**ELECTRICAL PORCELAIN**  
OF  
HIGHEST QUALITY  
APPLY TO  
**JAMES MACINTYRE & CO., LTD.,**  
BURSLEM.

## ELECTRICAL ENGINEERING

List of Selected Technical Books  
POST FREE ON APPLICATION.

The Kilowatt Publishing Co., Ltd.,  
203, Temple Chambers, London, E.C.

**F. WIGGINS & SONS,**  
FOR  
**MICA INSULATION**  
102, 103 & 104, MINORIES, LONDON.

# THE LONDON ELECTRIC WIRE COMPANY

Telegrams: "ELECTRIC LONDON." **AND SMITHS LTD.** Telephone No. 3105 London Wall.

Offices and Warehouse: **PLAYHOUSE YARD, GOLDEN LANE, LONDON, E.C.** Works: { **CHURCH ROAD WORKS, LEYTON, E.**  
**ANACONDA WORKS, SALFORD.**

**MANUFACTURERS OF EVERY DESCRIPTION OF CABLES AND WIRES FOR ELECTRICAL PURPOSES.**

**DYNAMO WIRES** Strips and Compressed Strands. **INSTRUMENT WIRES,** Silk and Cotton Covered.  
**EUREKA, PLATINOID** and other High Resistance Wires. **ENAMEL** Insulated Wires.

**FLEXIBLES. INSULATING VARNISH. BRUSHES. FUSE WIRES. JOINTING MATERIAL.**

**HIGH CONDUCTIVITY COPPER WIRE.**  
**SPECIAL TROLLEY WIRE.**

**SILICIUM BRONZE & PHOSPHOR BRONZE WIRE.**  
**ALUMINIUM WIRE.**

# BABCOCK & WILCOX, Ltd.

## ELECTRIC CRANE DEPARTMENT:

GOLIATH CRANES, TRANSPORTERS, PORTAL CRANES, JIB TRAVELLING CRANES,  
WINCHES & CAPSTANS, COAL HANDLING CRANES, FOUNDRY CRANES, LADLE  
CRANES, SCRAP MAGNET CRANES, PIG BED CRANES, SECTION HANDLING  
CRANES, BOX HANDLING CRANES, OPEN HEARTH CHARGERS, VERTICAL INGOT  
CHARGERS, HORIZONTAL INGOT CHARGERS, &c.

**Head Office: ORIEL HOUSE, FARRINGDON STREET, LONDON, E.C.**

Telegrams—"Babcock, London."

Works: RENFREW, SCOTLAND.

Telephone—City 6470 (8 lines).

When corresponding with Advertisers, please mention "Electrical Engineering."

# TRADES DIRECTORY OF ADVERTISERS IN "ELECTRICAL ENGINEERING."

(One Free Entry is given to every Advertiser. Entries under additional headings, 6d. per insertion.)

## ACCESSORIES (Electric Light and General Supplies).

Drake & Gorham, Ltd., 66, Victoria St., S.W.  
Edison & Swan United Electric Light Co., Ltd., Ponders End, Middlesex.  
Electrical Co., Ltd., 122 to 124, Charing Cross Rd., W.C.  
Electrical Engineering & Equipment Co., Ltd., 109 to 111, New Oxford St.,  
General Electric Co., Ltd., 67, Queen Victoria St., E.C.  
Guilbert-Martin, 9, Edmund Place, E.C.  
Lundberg (A. P.) & Sons, Liverpool Rd., N.  
Scholey & Co., Ltd., 151, Queen Victoria St., E.C.  
Simplex Conduits, Ltd., 118 to 117, Charing Cross Rd., W.C.  
Sun Electrical Co., Ltd., 118, Charing Cross Road, W.C.  
Wardle Engineering Co., Ltd., 196, Deansgate, Manchester.

## ACCUMULATORS, &c.

Copper, Pass & Son, Ltd., Bedminster Smelting Works, Bristol.  
D.P. Battery Co., Ltd., Bakewell, Derbyshire.  
Electrical Power Storage Co., Ltd., 4, Great Winchester St., E.C.  
Hart Accumulator Co., Ltd., Marshgate Lane, Stratford.  
Naylor Battery Co., 1, Lammermoor Rd., Balham, S.W.  
Tudor Accumulator Co., Ltd., 3, Central Buildings, Matthew Parker St., S.W.

## ARC LAMPS AND ACCESSORIES.

British Thomson-Houston Co., Ltd., Rugby  
Drake & Gorham, Ltd., 66, Victoria St., S.W.  
General Electric Co., Ltd., 67, Queen Victoria St., E.C.  
London Electric Firm, Croydon.  
Oliver Arc Lamp Ltd., Cambridge Place, Burrage Rd., Woolwich.

## ARMATURE REPAIRS.

Marryat & Place, 28, Hatton Garden, E.C.

## BOILERS.

Babcock & Wilcox, Ltd., Oriol House, Farringdon St., E.C.

## CABLES AND WIRES.

Callenders Cable & Construction Co., Ltd., Hamilton House, Victoria Embankment, E.C.  
Drake & Gorham, Ltd., 66, Victoria St., S.W.  
General Cable Manufacturing Co., 15, Garlick Hill, E.C.  
Ges. für Elektrotechnische Industrie m.B.H., 88 Belle-Alliance Str., Berlin.  
Hensley (W. T.) Telegraph Works Co., Ltd., Blomfield Street, E.C.  
Hooper's Telegraph & Indiarubber Works, Millwall Docks, E.  
India Rubber, Gutta Percha & Telegraph Works Co., Ltd., 106, Cannon St., E.C.  
and Silvertown, E.  
Liverpool Electric Cable Co., Ltd., Linacre Lane, Bootle, Liverpool.  
London Electric Wire Co. & Smiths Ltd., Playhouse Yard, Golden Lane, E.C.  
Macintosh (Chas.) & Co., Ltd., 22 & 23, Jewin St., E.C.  
Rickard (Wm.), Ltd., Ashbourne Road Mills, Derby.  
Siemens Bros. & Co., Ltd., Woolwich.  
Union Cable Co., Ltd., Dagenham Dock, Essex.

## CASTINGS, &c.

Dore (J.) & Co., Bromley, E.

## CATALOGUES AND PROCESS ENGRAVING.

Swain (John) & Son, Ltd., Shoe Lane, E.C.

## CONDENSING PLANTS.

Mirrlees Watson Co., Ltd., Scotland Street, Glasgow.  
Storey (Isaac) & Sons, Ltd., Empress Foundry, Cornbrook, Manchester.  
Willans & Robinson, Ltd., Rugby.

## CORRESPONDENCE INSTRUCTION.

International Correspondence Schools, Ltd., Kingsway W.C.

## DIE-FINISHED CASTINGS.

Aerators, Ltd., Upper Edmonton, N.

## DYNAMOS, see Motors and Dynamos.

## ELECTRO-PLATING.

Canning (W.) & Co., 183 to 187, Gt. Hampton St., Birmingham.

## FIRE EXTINGUISHERS.

"Glou" Fire Extinguisher, 241, High Holborn, W.C.

## FLEXIBLE METALLIC TUBING.

United Flexible Metallic Tubing Co., Ltd., 112, Queen Victoria St., E.C.

## HEATING AND COOKING APPARATUS.

Belling & Co., Lancaster Works, Derby Road, Edmonton, N.  
British Thomson-Houston Co., Ltd., Rugby.  
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester.  
Dowsing Radiant Heat Co., Ltd., 105, Great Portland St., W.  
Drake & Gorham, Ltd., 66, Victoria St., S.W.  
Ferranti, Ltd., Central House, Kingsway, W.C.  
General Electric Co., Ltd., 67, Queen Victoria St., E.C.  
London Electrical Trading Co., Ltd., 185, Wardour St.  
Redelo, Ltd., 647, Royal Liver Bldgs., Liverpool.  
Schulewindt Electric Co., 40-1, Staunforth St., Birmingham.  
Siemens Bros. Dynamo Works, Ltd., 39, Upper Thames St., E.C.  
Simplex Conduits, Ltd., 118 to 117, Charing Cross Rd., E.C.  
Townsend's Art Metal Co., Ltd., Ernest St., Birmingham.

## ICE-MAKING MACHINERY.

Drake & Gorham, Ltd., 66, Victoria St., S.W.

## INSTRUMENTS.

Everett, Edgcombe & Co., Ltd., 117, Victoria St., S.W.  
Everashed & Vignoles, Ltd., Acton Lane Works, Chiswick.  
India Rubber, Gutta Percha and Telegraph Works Co., Ltd., 106, Cannon St., E.C.  
Kadelbach & Randhagen, Berlin-Wilmersdorf.  
Kelvin, Bottomley & Baird, Ltd., 18, Cambridge St., Glasgow.  
Nalder Bros. & Thompson, Ltd., 34, Queen Street, E.C.  
Record Electrical Co., Ltd., Caxton House, Westminster, S.W.  
INSULATING VARNISH, ENAMELS, PAINTS AND LACQUERS.  
Blume (Chas. H.), The White Building, Sheffield.  
Fredk. Crane Chemical Co., 22 & 23, Newhall Hill, Birmingham.  
Griffiths Bros. & Co., Marks Rd., Bermondsey, S.E.  
Pinchin, Johnson & Co., Ltd., 26, Bevis Marks, E.C.  
Sterling Varnish Co., Royal London Buildings, 196, Deansgate, Manchester.

## INSULATORS AND INSULATING MATERIALS.

Macintyre (J.) & Co., Ltd., Burslem.  
Moseley (D.) & Sons, Ltd., Ardwick, Manchester.  
Mosses & Mitchell, 122 to 124, Golden Lane, E.C.  
Sugg (William) & Co., Ltd., 63, Regency Street, S.W.  
Traut (Dr. Heinrich) & Sons, 25, Goswell Rd., E.C.  
Weidmann (H.), Kapperswil, Switzerland.

## INSURANCE.

Phoenix Assurance Co., Ltd., 19 & 20, Lombard St., E.C.

## LADDERS.

Heathman & Co., 10, Parsons Green, S.W.

## LAMP FILAMENTS.

Tungsten Wire Works, Aktiebolag, Stockholm, S.O.

## LAMPS (Incandescent).

Brimsdown Lamp Works, Ltd., Kingsway House, Kingsway, W.C.  
British Thomson-Houston Co., Ltd., Mazda House, 77, Upper Thames St., E.C.  
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester.  
Cryselco, Ltd., Kempston Works, Bedford.  
Drake & Gorham, Ltd., 66, Victoria St., S.W.  
Edison & Swan United Electric Light Co., Ltd., Ponders End, Middlesex.  
General Electric Co., Ltd., 67, Queen Victoria St., E.C.  
Pope's Electric Lamp Co., Ltd., Hythe Road, Willesden, N.W.  
Siemens Bros. Dynamo Works, Ltd., Tyssen St., Dalston, N.E.  
Simplex Conduits, Ltd., 118 to 117, Charing Cross Rd., W.C.  
Stearn Electric Lamp Co., Ltd., 47, Victoria St., S.W.

## LIFTS.

Marryat & Place, 28, Hatton Garden, E.C.  
Waygood (R.) & Co., Ltd., Falmouth Road, S.E.

## MACHINE TOOLS.

Taylor & Challen, Ltd., Constitution Hill, Birmingham.

## METERS.

Bastian Meter Co., Ltd., Kentish Town, N.W.  
Ferranti, Ltd., Central House, Kingsway, W.C.  
Isaria, Ltd., 208, Tower Bridge Road, S.E.

## MICA.

British Mica Co., Ltd., Lebanon Road Works, Wandsworth, S.W.  
Jaroslaw (D.), 19, Tower Hill, E.C.  
Micanite & Insulators Co., Ltd., Walthamstow, E.  
Secar, Page & Co., 16 & 17, Devonshire Sq., E.C.  
Wiggins (F.) & Sons, 102 to 104, Minories, E.C.

## MINE EQUIPMENTS AND APPARATUS.

Dick, Kerr & Co., Ltd., Abchurch Yard, E.C.  
Ellison (George), Warstone Lane, Birmingham.  
Ferranti, Ltd., Central House, Kingsway, W.C.  
General Electric Co., Ltd., 67, Queen Victoria St., E.C.  
Reynolds & Co., Ltd., Hebburn-on-Tyne.  
Siemens Bros. Dynamo Works, Ltd., Caxton House, Westminster, S.W.  
Switchgear & Cowans, Ltd., Springfield Lane, Salford, Manchester.  
Willans & Robinson, Ltd., Rugby.

## MOTORS AND DYNAMOS.

British Thomson-Houston Co., Ltd., Rugby.  
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester.  
Brown Boveri & Co., Ltd., Caxton House, Westminster, S.W.  
Dick, Kerr & Co., Ltd., Abchurch Yard, E.C.  
Drake & Gorham, Ltd., 66, Victoria St., S.W.  
Matthews & Yates, Ltd., Swinton, Manchester.  
Peeloe (Bruce) & Co., Ltd., Edinburgh.  
Siemens Bros. Dynamo Works, Ltd., Caxton House, Westminster, S.W.  
Vickers, Ltd., River Don Works, Sheffield.

## OIL CANS.

Kaye (J.) & Sons, Ltd., Lock Works, Leeds.

## PACKING.

United States Metallic Packing Co., Ltd., Bradford.

## PATENT AGENTS.

Lorvain (J. G.), Norfolk House, Norfolk St., W.C.  
Raworth (J. E.), 30, Broadway, Westminster.

## PUMPING PLANT.

Merryweather & Sons, Fire Engine Works, Greenwich, S.E.  
Willans & Robinson, Ltd., Rugby.

## STEAM ENGINES AND TURBINES.

Allen (W. H.) Son & Co., Ltd., Queen's Engineering Works, Bedford.  
British Thomson-Houston Co., Ltd., Rugby.  
Dick, Kerr & Co., Ltd., Abchurch Yard, E.C.  
J. Howden & Co., Ltd., 195, Scotland St., Glasgow.  
Vickers, Ltd., River Don Works, Sheffield.  
Willans & Robinson, Ltd., Rugby.

## STEAM ENGINE ACCESSORIES.

Lee Recorder Co., Ltd., 32, Deansgate, Manchester.

## SWITCHGEAR.

British Thomson-Houston Co., Ltd., Rugby.  
Dorman & Smith, Ordsal Electrical Works, Salford.  
Drake & Gorham, Ltd., 66, Victoria St., S.W.  
Eckstein, Heap & Co., Ltd., Caroline Street, Broughton, Manchester.  
Ferranti Ltd., Central House, Kingsway, W.C.  
Igranic Electric Co., Ltd., 147, Queen Victoria St., E.C.  
Record Electrical Co., Ltd., Caxton House, Westminster, S.W.  
Reynolds & Co., Ltd., Hebburn-on-Tyne.  
Switchgear & Cowans, Ltd., Springfield Lane, Salford, Manchester.

## TECHNICAL BOOKS AND JOURNALS.

Cambridge University Press, Fetter Lane, E.C.  
Cassell & Co., Ltd., La Belle Sauvage, E.C.  
Caxton Publishing Co., Clun House, Surrey Street, Strand, W.C.  
Constable (Archibald) & Co., Ltd., 10 Orange St., Haymarket, W.  
Crosby Lockwood & Son, 7, Stationers' Hall Court, E.C., and 5, Broadway  
Electric Journal, Donington House, Norfolk St., Strand, W.C. (Westminster, S.W.)  
Gresham Publishing Co., 34, Southampton St., W.C.  
Griffin (Chas.) & Co., Ltd., 12, Exeter St., Strand, W.C.  
Indian Industries and Power, 204, Temple Chambers, E.C.  
Longmans, Green & Co., 39, Paternoster Row, E.C.  
Macmillan & Co., Ltd., St. Martin's St., W.C.  
Whittaker & Co., 2, White Hart Street, Paternoster Square, London, E.C.

## TELEPHONES.

Drake & Gorham, Ltd., 66, Victoria St., S.W.  
General Electric Co., Ltd., 67, Queen Victoria St., E.C.  
Graham (Alfred) & Co., St. Andrew's Works, Crofton Park, London, S.E.  
Siemens Bros. & Co., Ltd., Woolwich.  
Western Electric Co., Ltd., North Woolwich, E.

## TESTING LABORATORIES.

Electrical Standardising & Testing Institution, (Faraday House), 62 to 70, Southampton Row, W.C.

## TRANSPORTERS.

Bleicherts Aerial Transporters, Ltd., Egypt House, 36, New Broad St., E.C.

## WATER SOFTENERS.

Kennicott Water Softener Co., Wolverhampton.

## WIRING CONTRACTORS. See page iv.

## WOODWORK CASING AND CONDUITS.

Jennings & Co., Pennywell Rd., Bristol.

When corresponding with Advertisers, please mention "Electrical Engineering."



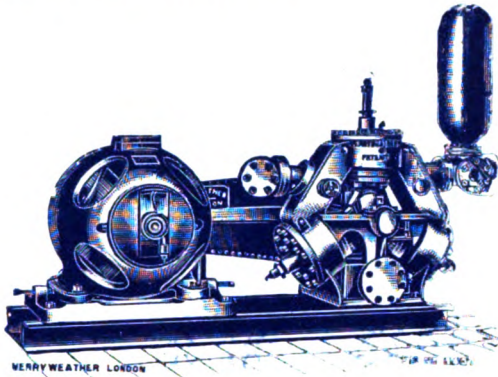
## THE "HATFIELD" PUMP

Merryweather's Patents.

**SPECIALLY SUITABLE FOR DEEP SUCTION LIFTS.**

The Radcliffe Motor Hatfield pumped continuously from 8.48 a.m. till 8.30 p.m., a run of nearly 12 hours at the East Lancashire Paper Mills fire.

The same machine pumped for 3½ hours with four jets and a 26 foot lift at the Charlton Mills fire.



## THE PERFECT PUMP

FOR

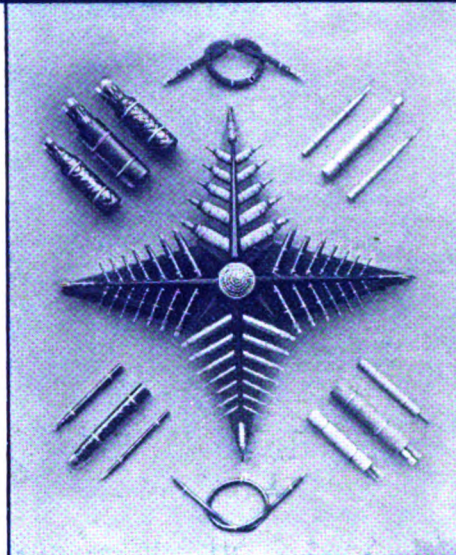
ELECTRIC DRIVING  
MANSION WATER SUPPLY  
COUNTRY WATERWORKS  
SHALLOW WELLS

DEEP WELLS  
AUGMENTING PRESSURE IN  
FIRE MAINS  
FILLING RESERVOIRS, &c., &c.

Write for Illustrated Pamphlet, 193 P.

**MERRYWEATHER & SONS**  
Fire Engine Works, Greenwich, S.E., London.

## Specialists in Rubber Wires and Cables



## CALLENDER'S

Cable & Construction Co., Ltd.,  
Victoria Embankment, E.C.

## MICA

CUT & UNCUT IN ALL SELECTED  
ELECTRICAL QUALITIES.

## MICANITE

Highest Quality. Lowest Prices.

D. JAROSLAW, 19, Tower Hill, London, E.C.

## ASBESTONITE "GNOME" BRAND.

NON-INFLAMMABLE.

WEATHER, FROST,  
OIL & ACID PROOF.  
*Specialties:* Are Shields,  
Brush Holders, Spools, Ter-  
minals, Boxes.



The FIRST  
and STILL  
The BEST

220,000 Supplied.

# PACKING

For  
STEAM  
ENGINES

**UNITED STATES METALLIC PACKING CO. LTD. BRADFORD.**

LONDON, 110 FENCHURCH ST. LIVERPOOL, 15 FENWICK ST. GLASGOW, 52 ST. ENOCH SQUARE. BOLTON, &c., &c.

REGD  
**LEKTRIK**  
ACCESSORIES

provide  
Maximum Convenience  
with  
Minimum Effort.



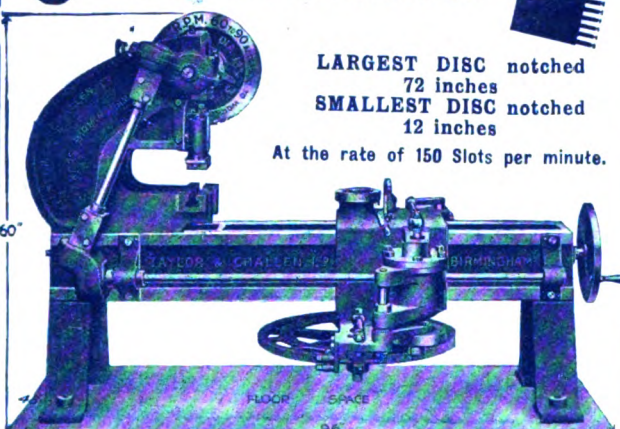


**NOTCHING PRESSES**  
FOR ARMATURE PLATES

TO CHEAPEN PRODUCTION  
AND INCREASE YOUR OUTPUT  
USE ACCURATE  
NOTCHING PRESSES

A CATALOGUE CONTAINING 300  
PRESSES AND MACHINES SUITABLE  
FOR EVERY INDUSTRY WHERE A  
LARGE OUTPUT AND CHEAPENED  
PRODUCTION IS ESSENTIAL, WILL BE  
SENT ON BONA FIDE APPLICATION.

**LARGEST DISC** notched  
72 inches  
**SMALLEST DISC** notched  
12 inches  
At the rate of 150 Slots per minute.



**TAYLOR & CHALLEN LTD.**  
ENGINEERS - BIRMINGHAM

**'STEARN'**  
ENGLISH-MADE METALLIC FILAMENT LAMPS  
(Regd.)  
"LEUCONIUM"  
Licensed under British Patent 23,889/1904.

**200 VOLT**  
**15 WATT**  
AND UPWARDS

**100 VOLT**  
**8 WATT** AND UPWARDS

REDUCED LIST PRICES

INCREASED TRADE DISCOUNT

ENORMOUS INCREASE  
IN MECHANICAL STRENGTH

Write for Prices, &c., to  
**STEARN ELECTRIC LAMP CO., Ltd.**  
47, VICTORIA STREET, LONDON, S.W.  
Works at Kew Gardens, London, S.W.

**WILLANS**

<b>STEAM TURBINES</b>	High-Pressure, Mixed-Pressure and Exhaust Types.
<b>WILLANS-DIESEL ENGINES</b> 11,000 H.P. Installed and on Order. Low Fuel Costs Reliability. Spare Parts Interchangeable in accordance with our standard.	
<b>CONDENSER PLANTS</b>	High-Efficiency Surface and Jet Types.
Illustrated Pamphlets and Details upon application.	
<b>WILLANS &amp; ROBINSON LTD.,</b> VICTORIA WORKS, RUGBY, ENGLAND.	

**TUDOR  
ACCUMULATORS**

**CHANGE OF ADDRESS**

THE HEAD OFFICE OF  
**THE TUDOR ACCUMULATOR  
Co., Ltd.,**  
HAS BEEN REMOVED TO  
**3 CENTRAL BUILDINGS,  
MATTHEW PARKER ST.,  
WESTMINSTER,  
LONDON, S.W.**

Telegrams: "SUBCONICAL, LONDON."  
Telephone: VICTORIA 2600.

**WORKS: DUKINFIELD, NEAR MANCHESTER.**











BOOKS IN LIBRARY

JUN 25 1914

